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CHEMISTRY
DEPARTMENT

E. H. Lover

THE
JOURNAL
OF *E. H. Lowe*
GAS LIGHTING,
WATER SUPPLY,
AND
SANITARY IMPROVEMENT.

VOL. XXXVII.
January to June, 1881.

LONDON :
WALTER KING
11, BOLT COURT, FLEET STREET, E.C.



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TO CORRESPONDENTS.

G. B.—Will take an early opportunity of referring to the subject in the JOURNAL.

INQUIRER.—The fact observed is due to the slow escape of gas from the cocks, or any imperfect fittings, when the pressure is removed by the closing of the main-tap. Air enters at the same places, to take the place of the gas, and it is the mixture thus formed that you have to blow out when you again try to get a light at the burners.

SOMERSET.—No doubt the proceeding was technically beyond the power of the Directors. The only persons to take exception to their course of action are, however, the Shareholders; and they are not likely to object if the district to which the mains have been carried is a fairly-paying one. Why do not the Company apply for statutory protection of their property, and to define their limits—either by an Act of Parliament or an Order under the Gas and Water Works Facilities Act, 1870—rather than for an amendment of the Articles of Association?

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 4, 1881.

1880.

A RETROSPECT OF THE YEAR.

It is the general custom to inaugurate the business assemblies of public and semi-public bodies by reading the minutes of the previous meeting. In this way the proceedings of successive gatherings, otherwise disconnected, are bound together into a continuous record. Similarly at stated periods of our rapidly-flowing existence it is well to commence a new epoch with a retrospect of what has occurred during that which

has just expired. By universal consent the advent of a new year is the acceptable time for indulging in the memories of the past, and as the practice is of distinct value, giving a true gauge of past progress and, inferentially, of future prospects, we gladly conform to it, in endeavouring to condense into a single brief summary a narrative of the circumstances, connected with the gas industry, which have marked the course of the year 1880.

First, it is a matter for general congratulation that gas undertakings in general have experienced a very successful year. The evidence of this is to be found in the prevalence of reductions in the price of gas. In all parts of the kingdom the downward movement in the selling price of our great staple has been most marked, and it is difficult to say whether this fact is the more pleasing to consumers or producers. The consumers, of course, reap the most obvious benefit; but with them the possibility of obtaining cheap gas is not of such wide-reaching and vital importance, as to the manufacturer is the corresponding ability to produce gas at prices which cause its extended and developed use as one of the necessities of town life. If a townsman cannot buy gas at a cheap rate, he has his immediate remedy of discontinuing it in favour of anything else he may prefer; but if the manufacturers cannot supply the commodity at the required price, and do not succeed in gaining, at least to some extent, the confidence of the consumer in their willingness to supply it as cheaply as possible by timely reductions, the very existence of their business may be imperilled. Hence it is that from the point of view of the producer, not less than from that of the consumer, the cheap gas of the past and beginning of the present year is one of its best and most striking characteristics.

The causes of the successful trading which has rendered reduced prices possible are mainly two—cheapness of coal and high value of residual products. The low value of most materials used in gas-works has also to be reckoned as a cause, but not, of course, to the extent of the two first named. The general depression in trade, of which these low prices are a sign, has not yet entirely passed away, nor is there any probability of a speedy return to the high-water mark of the "flush times." Some ominous fluctuations in the iron and metal markets occurred early in the year, and an era of speculation in many goods in demand for gas establishments appeared at one time imminent; but as time went on a balance was established, some things going lower than ever, while others maintained a more or less increased value. The industrial conditions of various districts throughout the country differ in accordance with the market value of their staple product. The vitality of some trade processes will probably never recover from the late heavy depression, and some trades may be expected to leave one locality for another, under certain conditions; but, on the whole, it may be said that trade in general was better last year than it was during the year before. Fortunately, as we have said, the demand for the residual products of gas manufacture, and the prices readily obtained for most of them, were remarkably heightened. Ammoniacal liquor, of all these products, was most in request at largely enhanced prices; tar also sold well, and our latest advices are that both materials show an upward tendency—a matter of moment to the many gas manufacturers who will begin the year with a diminished price for gas. Persistent slackness of trade lessens the consumption of gas, which, on the other hand, is fostered by the low rates at which the cheapness of coal and other materials, including labour, enables it to be sold. The result of these contending influences depends much on locality, some undertakings having to chronicle higher profits with diminished production, while in other cases the normal increase of production is only checked, and not actually reversed.

The use of gas for purposes other than that of illumination—such as heating, cooking, and furnishing motive power—is rapidly growing in favour. Appliances for these purposes are becoming more perfect every year, and their introduction to the notice of gas consumers is being more widely accepted as a legitimate function of gas-makers, and therefore, aided in a great measure by its cheapness, the consumption of gas by day, when culinary and industrial operations are chiefly carried on, bids fair to more closely approach the night consumption. In this respect English gas managers have not as yet attained to the experiences of some of their Continental brethren, especially of Denmark, where in many cases the day and night consumptions are equal, or nearly so. This extraordinary state of things is, of course, attributable to a condition of affairs with reference to fuel supply which, for other reasons, we may hope will never obtain with ourselves; but the time so fervently wished for by many, when all coal

will be separated into its gaseous and solid constituents before reaching the domestic hearth, and when, consequently, gas may be in infinitely greater demand than it is at present, may possibly come within the future experience of the present generation.

The consideration of the business transactions of gas undertakings brings us at once to the examination of their financial position. Gas property, as regarded by investors, has experienced some fluctuations in value during the year. It will perhaps be sufficient for the illustration of this observation to take a single example—that of The Gaslight and Coke Company's ordinary "A" stock, which was quoted at 172-175 in our Share List on Jan. 6; it afterwards rose to 186 and upwards, on the occasion of the allotment of £50,000 worth of additional capital on Aug. 26; and subsequently fell almost to the price at which it began the year, recovering slightly in the course of the following months. Beyond the inevitable variations through the incidence of dividends, there can be no doubt that something, at all events, of these vicissitudes was due to Stock Exchange operators, who were accused in the autumn of opening a "bearing" campaign. The evergreen bane of the electric light must be credited with a bad influence on the value of gas stock; not that there has been any positive "scare," but the periodical puffs of one and another kind of electric lamp form causes of permanent uneasiness to timid gas shareholders, and consequently tend to make the market chronically unsteady. Still it must be owned that all Gas Companies of good standing commanded a fair average price for their shares throughout the year.

The sliding scale, as applied to all the Metropolitan Companies save one, and to many provincial Companies, was brought into strong relief against the background of gas finance in London, by the high dividends it rendered permissible in consequence of the reductions made in the selling price by the several Companies. The Gaslight and Coke Company acquired the right of dividing $11\frac{1}{4}$ per cent. per annum upon their ordinary stock by selling gas at 3s. 4d. per thousand cubic feet, with an initial price of 3s. 9d. In the present year the price will be lower, and the dividends consequently higher. The most striking illustration of the action of the sliding scale, however, comes from the southern side of the Thames, as we have on record the fact that the South Metropolitan Company, by virtue of their statutory regulations, and of other conditions to be mentioned later on, arrived at the position, unprecedented in the history of authorized gas undertakings, of being qualified to pay $11\frac{3}{4}$ per cent. per annum on one portion of their capital; and even this must be considerably surpassed in consequence of the conditions under which the Company enter upon the New Year.

With respect to purely Metropolitan gas affairs, the year has closed on a very different system of organization for the supply of the southern district than that which existed when it began. The early part of the year saw the prosecution of negotiations for the amalgamation of the Phoenix Company with the South Metropolitan Company, and the fusion was consummated in March by an Order in Council. It is unnecessary to refer to the details of the scheme more than to mention that at the time of amalgamation the Phoenix Company were charging 3s. 4d. per thousand cubic feet for gas, as compared with 3s. charged by the South Metropolitan Company; and the two undertakings might have been kept practically distinct, though under one head, until the end of the year. It was determined, however, to consolidate all the amalgamated district under a uniform rate from Midsummer last, and as a result certain distinctions in the classes of capital employed were obliterated. Altogether the past year was a memorable one for the gas interest in South London.

Although nothing definite was done in the direction of further consolidation of the London Gas Supply, the practical possibility of constituting the Thames a boundary between two great organizations has apparently become more generally accepted. The Chartered Company have not taken any fresh steps in the direction of amalgamation, having probably been occupied with the affairs of their own internal administration. A void was created on the Board of the Company by the death, on the 8th of July, of Mr. F. J. Evans, the Engineer-Director of the Company; and, contrary to expectation, the vacancy has not been filled up. This action of the Board is the more remarkable as the Company have no responsible Chief Engineer, and it may be fairly said that in deliberately declining to avail themselves of an opportunity of filling the vacancy by an appointment which would have tended to unite the northern and southern interests, the Directors have committed a grave diplomatic blunder.

Nothing special characterized the gas legislation of the

year. The divided character of the parliamentary session, due to the occurrence of the general election in April, had a perceptible influence in deterring all but unavoidable applications for legislative powers. But while there was nothing to remark as of exclusive importance to Gas Companies in the proceedings of the old or the new Parliament, the latter added to the Statute Book a measure which affects gas undertakings in common with every other industry throughout the country. The Employers' Liability Act, which came into operation with the commencement of the present year, is designed to effect a sweeping alteration in the relations between employers and workmen. Employers are now made more distinctly liable, under certain conditions, for compensation for injuries sustained by workmen in their service. The effect of the measure cannot be estimated until it shall have been in actual operation for some considerable time; but at present there is much talk of a general system of insurance for the protection of employers.

The progress of the acquisition by local authorities of gas undertakings has been maintained during the year, several considerable provincial gas companies having submitted more or less cheerfully to the "happy despatch." The inevitable must be accepted, and it is idle to grieve over a tendency which, whether for evil or for good, is a sign of the times, and cannot, therefore, be removed; but it is painful to read the arguments repeatedly adduced in local prints in favour of such purchases. The disposition to treat the gas consumer as a milch-cow for the partial support of the remainder of the community, is almost always present when gas property first becomes subject to public management. It is pleasant to record that this feeling, which is strictly analogous to the fancied necessity for "protection" felt by some nationalities, does not persist in all cases. In a few instances during the past year, the most conspicuous being the town of Halifax, the policy of selling gas nearly at cost price has been deliberately accepted, and we have hopes that the same principle will gradually spread, as town councillors and others advance in the study of true local political economy.

The law courts have been fairly well occupied with gas men and gas affairs. The noteworthy cases are, however, few. The Stretford Gas Company have been convicted of an illegal appropriation of excessive profit, and the proceedings against the Company are not even yet finally determined. This prosecution was the more remarkable as being the first taken under the provisions of the 35th section of the Gas-Works Clauses Act, 1847. Another important case was that of Johnson and others against The Gaslight and Coke Company, in the Common Pleas Division of the High Court of Justice, whereby the plaintiffs sought to recover damages from the defendant Company for personal injuries caused by an escape of gas from the Company's main. Many points of principle in regard to the respective liability of Gas Companies and Highway Authorities were involved in the case, which was ultimately decided in favour of the defendants. The responsibility of Gas Companies for road repairs was defined in another case, wherein the Vestry of Mile End Old Town summoned The Gaslight and Coke Company before a Police Magistrate, for neglecting to reinstate a road opened by them for the purpose of inspecting and repairing a main. In this case also the defendants were victorious. An appeal made to the Supreme Court of Judicature in the matter of the Birmingham Corporation and West Bromwich gas arbitration, to set aside the Umpire's award, was dismissed; and this was the only instance of a gas case being carried to the Court of Appeal. Matters of much personal interest to Directors of Gas Companies were involved in the prosecution of the Chairman and Deputy Chairman of the Tottenham and Edmonton Gas Company for consuming gas without payment. Much feeling was displayed in the conduct of this case, which, having been sent for trial by the Magistrates, resulted in the bills being thrown out by the Grand Jury. Beyond these there were contained in our law record only the usual cases of petty felonies and offences.

An event which, besides being unfortunate in itself, might have led to even more regrettable results, occurred in the beginning of July in the neighbourhood of the Tottenham Court Road, London, when a new 36-inch gas-main, belonging to The Gaslight and Coke Company, exploded with frightful effect. Two men were killed and several persons were more or less seriously injured. The destruction to property was also very great along the line of main, and much terror was felt by the public generally in reference to the occurrence. The prompt measures taken by the Company, and their subsequent action in meeting the claims for compensation resulting from the accident, have, however, largely operated in already consigning the event to partial oblivion.

Strangely enough, a somewhat similar accident took place in Bilston very shortly after the Tottenham Court Road incident, and, although it did not cause any loss of life, and but little damage was done to property, it attracted more attention than was due to its inherent importance, in consequence of the disturbed state of public feeling caused by the greater explosion in London.

One of the events of the year was the Exhibition of Apparatus for the Production of Artificial Light opened in Glasgow in September. The most important undertaking of the kind that has yet been held, it was very successful, and attained to quite a national distinction. The comprehensive nature of the exhibition was its most striking peculiarity—gas, oil, and electricity being displayed side by side as luminants. Gas products, and what may be termed the secondary uses of gas, were also very fully illustrated; and although the trials of various electric lighting systems which had been arranged in connection with the exhibition could not be carried out, in no other respect was the result of the show a disappointment to either exhibitors or the public. Gas apparatus exhibitions were also held during the year at Dublin, Belfast, Manchester, Leicester, Coventry, Blackburn, and other places, the majority of which were attended with sufficient local interest to manifest the desire generally felt by the public for information respecting the proper use of gas.

Last year was comparatively barren of new inventions relating to gas, but it witnessed the spread of many more or less novel improvements in gas manufacture and utilization. The employment of generator furnaces for heating retorts, long established in France and Germany, was introduced into several provincial gas-works on the designs of Herr Liegel, of Stralsund; and at the South Metropolitan Gas-Works an entirely original and independent series of experiments in the same direction, leading to highly successful results, was carried out under the direction of Mr. G. Livesey. The West mechanical stoking apparatus has continued to hold its own in the estimation of gas engineers; and advances in the application of labour-saving machinery in gas-works have been made by Mr. W. J. Warner, of South Shields. Several large gasholders have been constructed during the year, notable among them being a number of treble-lift holders, thus marking a curious revival of an old method of construction. A treble-lift holder, 216 feet in diameter and 160 feet high when inflated, was commenced at the South Metropolitan Gas-Works in the course of last autumn, and when completed it will be the largest gasholder in existence—a position which is, however, threatened by two holders to be constructed at Birmingham from the designs of Mr. Charles Hunt, the tanks for which, 240 feet in diameter and 51 feet deep, have been commenced. The progress of invention and improvement of apparatus for using gas has been continuous. Gas lighting by large burners, of sometimes many hundred candle power, is now commonly practised. Much assistance in establishing reliable data respecting powerful gas-burners was afforded by the exhaustive experiments with different kinds of large lamps carried out by Mr. Hunt, at Birmingham, and the display of street illumination in that town which resulted from these experiments was one of the most brilliant examples of the capabilities of gas for lighting large areas that has yet been shown to the public. Later in the year Herr F. Siemens, of Dresden, introduced into this country his regenerative gas-lamps, which appear to develop the illuminating power of gas to a greater degree than any other description of burners previously made. Dr. Adams, of Glasgow, showed at the Glasgow exhibition a gas-heated stove of novel construction, which is said to be a great advance on all the older forms of gas-stoves. Several new forms of gas motors were invented, but nothing of this nature has yet proved itself superior to the Otto engine, to the rapid adoption of which must be ascribed the extended consumption of gas for the production of motive power.

The electric light, still the most formidable rival of gas lighting for public favour, continued to grow in popularity during the year, but chiefly on its established lines. The Crompton, Brush, Jablochkoff, and one or two other arc-lights, have been adopted by various Railway Companies for lighting stations, goods yards, &c., and the Commissioners of Sewers of the City of London have decided to try several systems of electric lighting on a line of some of the principal City thoroughfares and bridges. Beyond this no progress has been made; the adaptation of the light-producing power of electricity for domestic use is still a *desideratum*—though not to us. Mr. Swan, of Newcastle, created a sensation by exhibiting his incandescent electric lamps in that town, and at a lecture delivered by him in London; and Mr. Maxim

and Mr. Edison, in America, have been trying to construct thoroughly satisfactory incandescent lamps on principles very similar to those on which Mr. Swan works. But it cannot be said that any of these investigators has achieved other than experimental success. It is not to be denied, nor should gas manufacturers shut their eyes to the fact, that a great many former profitable customers, consuming large quantities of gas and giving the smallest possible amount of trouble, have commenced to use electric lighting during the past year, and have consequently abandoned, either altogether or in part, the use of gas. Railway stations, one after another, have been fitted with electric lamps; and while no more favourable situations for advertising the new system of illumination could be suggested, considering the many thousands of people who pass through a large railway terminus every day, but small effort appears to have been made, by those most interested, to retain these very important positions for gas. We consider that the true policy of gas manufacturers at the present juncture is to retain every consumer by all possible means, and that to let a railway company go after strange lights “because we can afford to ‘lose their custom’” is an error, the magnitude of which may be discovered too late. It cannot be too clearly stated that no business, whatever its character, can long be successfully carried on when customers are allowed to drop off, not from any real discontent, but through the supineness of the management. To some extent, however, electricity as a lighting medium has achieved discredit on account of its positive danger. It was long contended that no risk to life or property was incurred by users of the electric light, which in this respect was popularly believed to be much superior to gas. Two fatal accidents, at Aston and on board the *Livadia* respectively, to incautious handlers of the conducting wires, and a serious mishap from a similar cause, which occurred to such an expert as the Engineer to one of the electric lighting companies, combined to shake the confidence of the public in the absolute safety of electricity as used for lighting, and this disquietude was heightened by the testimony of Mr. W. H. Preece, the Government Telegraph Electrician, as to the risk of lighting coal mines by powerful magneto-electric currents, a slight leakage from which might at any moment fire an explosive mixture of inflammable gas and air.

As each year is supposed to bring out some startling discovery in physical science, last year was no exception to the observed rule, and this time the discovery was so far peculiarly interesting to light-producers as it consisted in making a ray of light bear audible messages. Professor Bell's photophone, although as yet more curious than useful, may be found susceptible of wonderful development.

A discussion on the cause and cure of town fogs has brought into considerable notice the capabilities of gas for warming apartments. Dr. C. W. Siemens and others have proposed various kinds of gas fires to supplant coal in ordinary fireplaces; but it remains to be seen whether the latest public fancy, which prompts to a feeling of discontent with coal fires as connected with smoky skies, will die out as suddenly as it has arisen, or endure long enough to bear useful fruit. It is evident the extended use of gas fires and cooking-stoves will be highly instrumental in lessening the smoke-pall which at present hangs so heavily over our crowded cities and towns, although it must be long before all the good effect of the use of gaseous fuel will be perceptible from a sanitary standpoint.

The meeting of the British Association of Gas Managers in London, under Mr. C. Hunt, of Birmingham, the Vice-President, who was called to the chair in the unavoidable absence of Mr. Douglas, the President, was highly successful in respect of the business transacted and the attendance of members. The presidential address was in itself a particularly able review of the position and prospects of the gas industry, and Mr. Hunt received from the members the graceful and well-deserved compliment of election to the office of President for the following year, and, as a further acknowledgment, the meeting for 1881 was fixed to be held in Birmingham, where Mr. Hunt will have the opportunity of conducting his visitors over his own interesting works.

The various district gas managers' associations, English and Scottish, showed undiminished vitality, and held many successful meetings during the year. It has, however, become generally felt that the progress of these provincial organizations has rendered necessary some change in the character of the central Association, if the latter is to preserve its commanding interest and importance. Various propositions in view of this necessity have been made, and it may be expected that the forthcoming meeting at Birmingham will be especially noteworthy as an occasion when some important

changes in the constitution or work of the British Association will be recommended by the Committee.

Of matters personally interesting to gas engineers and others concerned in the work of gas supply, there are but few to remark upon here. The elimination of gas engineers consequent on the progress of amalgamation was exemplified in the person of Mr. Corbet Woodall, who retired from the Phoenix Company upon its coalition with the South Metropolitan Company. It was also announced that Mr. Robert Jones, the Senior Engineer of the Commercial Gas Company, would retire from active duty in that office in favour of his son, Mr. Harry E. Jones. Mr. John West, late of Maidstone, was appointed Chief Engineer to the Gas Committee of the Manchester Corporation. During the past few weeks Mr. Robert Mitchell, of Dawsholm, has been appointed Chief Engineer to the Edinburgh and Leith Gas Company. Beyond these there have been only the usual number of changes in the management of other undertakings.

Death has removed from among us several well-known figures besides Mr. F. J. Evans, whose demise has been already alluded to, but may be mentioned again on account of the leading position filled during so many years by that gentleman, who left none behind to fill his place. As the originator and designer of the largest gas-works in the world, Mr. Evans will not be forgotten as long as London is lighted with gas, although he is quite as worthy of remembrance, for other reasons, by the profession he adorned. In Mr. W. T. Fewtrell, F.C.S., the readers of the JOURNAL lost a man whose critical writings had for many years marked, in these columns, the progress of gas affairs; and he also left King's "Treatise on Coal Gas," of which he was Editor, conjointly with Mr. T. Newbigging, still unfinished. Mr. W. Haseldine Pepys, late of the Imperial Continental Gas Association, who died in Germany, in September last, was one of the earlier school of gas engineers. Mr. J. Barclay, of Brechin, and Mr. F. W. Brothers, of Chorley, also died during the year—the former at a ripe age, and the latter when still young. Mr. B. M. McCrae, late of the Dundee Gas-Works.

Finally, we have to say a few words in reference to the JOURNAL. It will have been noticed that during the latter part of the past year a new column, intended to contain scientific and practical notes on various subjects of interest to gas and water works engineers, has taken a regular place in our pages. This experiment has answered so well that it will be continued. It has already received some support from our readers, who have from time to time contributed to it information useful to their professional brethren. We trust this valued assistance will be maintained and increased. The contemplated abolition of the "Circular to Gas Companies" in favour of a less restricted editorial review of gas affairs, has already been announced, and a few other minor changes in JOURNAL arrangements will be concurrently introduced. We shall endeavour, as heretofore, to keep our readers acquainted with the best and most modern developments of home and foreign gas engineering, to the practical side of which we shall devote particular attention. In conclusion, it is with the greatest satisfaction that we are enabled to express the conviction, popular clamour and forced competition notwithstanding, that the gas industry, both as regards its stability and its prospects of continued expansion, has never been more favourably circumstanced than at present; and that it now enters upon a new year under as promising auspices as any other of the arts and manufactures of this busy land.

On Friday next there will be offered for sale by auction a portion of the unissued stock of the South Metropolitan Gas Company. The total nominal value of the stock to be sold is £30,000, comprising the unissued "B" stock of the Company, as authorized by their Act of 1876, amounting to £18,000, and £12,000 of the £232,000 of "C" stock, authorized by the same Act. There will therefore remain £220,000 of the "C" stock to be raised at a future time. The conditions as to the dividends payable on these two classes of stock are specified in the Company's Act, and in the Scheme of Amalgamation of the South Metropolitan and Phoenix Companies. Dividends on the stock to be sold will accrue from the 1st inst., and as the price of the Company's gas was reduced to 2s. 10d. per thousand cubic feet from the same day, their initial price being 3s. 6d. per thousand feet, the "B" stock will be entitled to a dividend of 11½ per cent., and the "C" capital to a dividend of 12 per cent. This will be the first issue of the latter class of capital, which bears the whole of the dividend earned by it under the sliding scale, and does not contribute to any other class of stock, as inadvertently stated in our

last week's notice of the Company's proposed Bill for next session. It is unnecessary to go into details explanatory of the financial position of the Company, or of the character of their business, in order to point out the value of their security to an investor. All this goes without saying, and we shall be prepared to hear that high prices have been realized for the small portion of stock now offered to the public.

Water and Sanitary Affairs.

THE unsettled state of the political atmosphere renders it all the more difficult to calculate the probabilities of the Metropolitan Water Question during the year on which we have entered. The state of Ireland presents a problem which will tax the utmost energies of the Government, in addition to which there is the pressure of Irish obstructiveness in the House of Commons itself. The public mind is also anxious and excited in respect to the Sister Isle, and while it is certain that the Home Secretary will prepare a Bill for the creation of a Water Authority, it is difficult to predict what will be the fate of that measure in the troublous session now about to commence.

Mr. Keates's report on the conflicting analyses of the London Water Supply is already attracting considerable notice, and may possibly lead to the adoption of some better system in regard to that matter. While analysts may differ as to the chemical process which they shall adopt, they might at least agree as to the unit of measure. Analyses made in parts per 100,000 and parts per 1,000,000 have the disadvantage of not being identified with any popular and well-known quantity. On the other hand, grains per gallon refer to a standard unit with which everybody is familiar, and it is to be remembered that these analyses are supposed to be published for the information of others besides professional men. There is, it is true, no great difficulty in translating the figures from one standard to the other; but the calculation takes time, and people generally require to have information of this kind put before them in the shape which is most readily available for their use. It would seem as if the water analysts wished to show their absolute independence of each other, and delighted to act without precedent. If they agree in nothing else, they might very properly, and without any sacrifice of dignity, adopt the gallon as the basis of their figures. Perhaps in course of time they would come to an agreement in other respects. At present they do not even coincide in their choice of the constituents concerning which they give the quantities. Analyses which are not comparable with each other, lose much of their practical value.

The conduct of the Local Government Board in not only rejecting the irrigation scheme proposed by the Lower Thames Valley Main Sewerage Board, but at the same time signifying their favourable opinion of another plan, has naturally excited some remarks. There are two ways of looking at the subject. It is possible, on the one hand, to condemn the conduct of the Government department in apparently going out of its way to recommend a scheme which was not before it, and which the Local Authorities do not care to adopt; while, on the other hand, it may be said that the unusual course of commending a rival scheme has been adopted in order to help the authorities of the district out of a prolonged difficulty. Government departments are not very well liked by local authorities, sometimes for good reasons, at other times for reasons that are not altogether good. It is not pleasant for the Local Authorities to have their plans overruled, and to have something else urged upon them which they do not approve. But if there are reasonable grounds for the course taken by the central power, the procedure need not excite any anger. In this instance, the irrigation scheme may have been the best that could have been devised for the purpose, and we presume it was. But it was open to some grave objections in reference to a portion of the London Water Supply, and we hardly know how the Local Government Board could disregard such objections as these. A mere desire to grasp at power and overrule other parties would be very unworthy of an important Government department, though something of the kind does occasionally show itself. There may be grounds, with which we are unacquainted, for impugning the conduct of the Local Government Board in this matter; but their avowed preference for the West Kent scheme does not appear to us as proving anything amiss. It may be that such a proceeding is a singular one; but, on the whole, it may be thought better for a Government Board to go a trifle out of its way to help matters forward, than to act perfunctorily and let everything

drag. The Thames Valley drainage needs expediting by some means or other, and the case may be deemed somewhat exceptional.

Dr. Stevenson Macadam, in a paper read before the Scottish Society of Arts, has been calling attention to the necessity of some further steps being taken for the ventilation of the sewers of Edinburgh, and has also dwelt on the importance of the subject generally. According to the remarks of the learned Doctor, we should conclude that the ventilation of the main sewers in the Scottish capital was very much neglected. He observed that it was possible the condition of some of the Edinburgh sewers was such as to necessitate their reconstruction; but he considered this to be a lesser evil than the continued existence of an unventilated, bad sewer. The question is not one that is easily dealt with. If the sewers are to be ventilated, the gas must get out somewhere else, and wherever it goes there is a risk of annoyance and perhaps mischief. Yet nothing can be worse than to attempt to seal up the public sewers, the effect being to force the imprisoned gases up the house drains into the adjacent dwellings. Where the connections with the houses are arranged so as to effectually prevent the passage of gas from the main sewers into the dwellings, there is still a risk of the air about the houses being dangerously polluted. But with a plentiful inlet of air to the main sewers, there is a likelihood of the gas being highly diluted before it escapes, and outlets should be provided where they are least dangerous. The upward tendency of sewer gases points to the value of elevated outlets, though in certain states of the weather even these are open to suspicion. Numerous outlets, at elevated points, together with means for the abundant entrance of air into the sewers, appear to be the chief points for practical consideration. The waste-pipe leading from the cistern to the house drain is, we may hope, one mode of ventilating the sewers which will not be tolerated much longer. Yet it appears, according to Lient-Col. Bolton, that houses of a certain class are still being built with cisterns arranged after this deadly fashion.

An interesting discussion on the chemistry of sewage precipitation recently took place in the Chemical Section of the Philosophical Society at Glasgow, and stands adjourned until the 24th inst. The subject was brought forward by Dr. W. Wallace, in a paper describing some experiments of his own, as also the results of sewage precipitation in a number of English towns. Purification by chemical treatment, Dr. Wallace considered, had been much misunderstood, and had been consequently discredited. Because this method had not done all that had been claimed for it, some persons had been inclined to regard it as a failure, and unworthy of consideration. He admitted that the idea of making a profit by the sale of the precipitate or sludge should be abandoned, but this was no reason why a chemical process should not be adopted for the purpose of sewage purification. Dr. Wallace was in favour of lime as the precipitating agent. Alumina produced a more satisfactory effluent, but involved a fourfold expense. A cheap variety of sulphate of alumina might perhaps be obtained from sources which he indicated, and if the price could be made to approximate to that of lime he should give it the preference. It was stated by Dr. Wallace that a process had been invented for the extremely rapid oxidation of the effluent from precipitation, whether by lime or alumina, and he hoped the particulars would shortly be made known. By this process he was led to believe that the effluent would be rendered entirely innocuous before being sent into the rivers. Of course, the difficulty besetting all these projects consists in the disposal of the sludge. It was calculated by Dr. Wallace that the sewage of Glasgow, ranging from 40 to 70 million gallons daily, would produce not far short of 700 tons of wet sludge, equal to 135 tons of dry, as the daily quantity to be got rid of. Making use of lime, the annual cost of precipitation, not including interest on works, would probably amount to something like £25,000. But Dr. Wallace had arrived at the conclusion, by the light of his own experiments, that the Glasgow sewage, by this outlay, would be so purified that when discharged into the Clyde, at a point below the city, no nuisance could possibly arise.

Perhaps at the next meeting of the Glasgow Philosophical Society we shall hear something about the virtues of the A.B.C. process, which would add 179 tons of dry material to the dried sludge, thus making a total of 314 tons, to be sold as "native guano," at £3 10s. per ton, so creating a revenue of more than £1000 a day. What might be the cost of doing all this is another question. The effluent produced in this fashion is undoubtedly good, where the process is carried out to the full; but the commercial element has to be considered.

Despairing of profit, the towns seek to have as small a loss as possible. Comparing the Glasgow sewage with that of London, we observe that, according to the reckoning of Dr. Wallace, the former produces one ton of dry sludge per 400,000 gallons, whereas in the A.B.C. experiments at Crossness, it was shown by the official report of Mr. Keates, that the sewage produced one dry ton per 190,000 gallons. Yet Mr. Keates reported the sewage to be "abnormally weak" during the Crossness experiments, owing to the prevalence of rain. The circumstance is doubtless explained by the fact that the Glasgow sewage amounts to 93 gallons per head of the population daily, while that of London is less than 40 gallons per head. That precipitation can do much for the abatement of the sewage nuisance, there is no doubt; but in the case of large towns, the quantity to be dealt with is enormous, the Crossness trial showing that the total solid deposit from the London sewage at that date—now eight years back—would have been about 654 tons per day, supposing it to be dried. Adding to this the precipitating material, also estimated as dry, the daily total becomes rather more than 1500 tons. This is an alarming figure, and yet it is barely one-half the average daily weight of coal carbonized by the Chartered Gas Company. Sewage, however, is a peculiarly troublesome article, and this is especially apparent when we consider the immense volume of water which has to be treated in order to get possession of the solid ingredients, each ton of dry deposit corresponding to 848 tons of London sewage. In Glasgow this proportion is fully doubled.

THE HISTORICAL PARALLEL BETWEEN GAS AND ELECTRIC LIGHTING.

A YOUNG Transatlantic contemporary, devoted to the interests of general science, has recently been occupied with a tolerably ingenious attempt to prove an analogy between the present status of the electric light and that of gas lighting during the first decade of the present century. Among its other functions, *Science*—the publication in question—fulfils that of ministering at the shrine of Edison, and it is evidently to wipe off the reproach of delay, which has lately been levelled at that gentleman in respect of the long-promised manifestation of his transcendent glory as an illuminator, that the Editor of *Science* has tried to find and substantiate an argument of a *tu quoque* character. How far he has succeeded it will be our present business to inquire.

It must be conceded that, in the article now before us, the writer shows that he has taken no small amount of trouble in burrowing among old numbers of the *Philosophical Journal* and the *Philosophical Transactions* of circa 1810, in search of contemporary notices of the then novel means of illumination. We observe the familiar names of Murdoch, Winsor, and others, who, in the dark ages of universal candle-light, were the pioneers of the movement which has since grown to such importance; and several of their statements and estimates are reproduced in full. The curious old-fashioned form of these communications is presumably much admired by the writer, as going to show the crudity and vagueness of the knowledge of the subject possessed by its earliest expositors, and the kind of criticism, and even obstinate incredulity, against which they had to contend for so many years. The inference intended to be drawn from this is, of course, that everything must have a beginning, and that as gas lighting, born amongst such inauspicious surroundings, has attained to the position of an acknowledged necessary of urban existence, lighting by electricity (till now labouring under similar disadvantages) is destined for a parallel success. We have all heard arguments such as these advanced with more or less plausibility; and, without altogether denying the fairness of the historical comparison, it must be said that reasoning of this kind generally includes several assumptions that are distinctly erroneous, and is therefore misleading. The present case for electric lighting, as based almost entirely upon what are assumed to be absolute historical facts, is so far from being an exception to this rule that it may be taken as a good example of it.

To begin with, a strict analogy between two widely separated cases is very rarely to be found. Resemblances between independent groups of facts are common enough, and may be used with striking effect to illustrate an argument; but it is unsafe to employ them as arguments to be relied upon as affording proof positive that the subjects of similar influences are themselves comparable in all respects. Evidence based upon comparison of circumstances is eminently unsatisfactory, for if the comparison can be shown to fail in any important points, the whole argument falls to the ground. Let us see how far the comparison between the inauguration of gas as a lighting medium on a practical scale, and the recent revival of effort in the direction of lighting by electricity, is true and reliable. We know that gas lighting, if its commencement be dated from Mr. Clegg's first construction of works for the production and utilization of purified gas, is now somewhere about 73 years old; and as the first electric arc-light was shown by Sir Humphry Davy in 1810, it might be said that this method of procuring light is nearly as old. It will, however, be less open to dispute if the age of practicable electric lighting be dated from the conversion of power into magneto-electric energy and then into light, by Holmes, in 1853. The first thought that would be naturally suggested by the fact that gas has been in common use so much longer than electric lighting, is the conclusion

that, given as long a life, the latter will at least be as perfect as the other. But looking a little deeper into this part of the question—will it be contended that, in all which appertains to human effort, one year of our time is to be considered no more than equal to one of the years of the present century before steam machinery was known? Where were, then, the facilities for the interchange of ideas, the mechanical appliances, the trained minds, and the skilful hands of the present day? How much of the slow progress of gas in those early days was attributable to its own inherent difficulties, and how much to the state of philosophical thought and of the industrial arts upon which it had to rely for its promulgation and actual embodiment? Can it be said that the hindrances to the development of a new process at a time when anything new was regarded with intense suspicion, and when the blacksmith was the only representative of the modern army of workers in metal by hand and power, are comparable to the conditions of our day? One of the criticisms on Murdoch's proceedings quoted by the writer of the article before us—that the introduction of gas is to be opposed because it would tend to raise the price of butchers' meat—shows at once what mountains of ignorant prejudice and false social science have had to be removed by the faith of the pioneers of modern material advancement. Yet we are coolly bidden to regard epochs simply by their chronological value!

But this source of weakness in any purely historical comparison of two eras is sufficiently exposed by being mentioned. No elaborate explanation of the differences between 1881 and 1810 is needed, the point once brought forward may be left to assert itself without calling for further support. There is, however, another discrepancy in the supposed parallel, arising from the different classes to which the early advocates of gas and the modern partizans of electric lighting belong. Murdoch (a mechanic) and Winsor (an ill-informed enthusiast) were pitted in the old days against such men as Sir Humphry Davy, then as now an acknowledged master of physical science. True, the gas men had some powerful friends, otherwise their case would have indeed been hopeless; but what a difference is there between a time when a deputation of the Royal Society advised that gasholders should be confined to a certain size and enclosed within strong buildings, and the present liberal patronage enjoyed by electricians! No one who knows how the world, despite modern iconoclasm, still pins its faith to men rather than measures, will be disposed to undervalue the extent to which Murdoch and his friends were weighted, or the modern rivals of their descendants favoured by influences such as this. Therefore we contend that the reason why electric lighting hangs fire, in spite of the extraordinary efforts that are being made to render it universally applicable to the same extent that gas has been from Clegg's time, is simply because it presents inherent difficulties such as the best men of the modern scientific world, working under the most favourable conditions, have failed to overcome.

Again, it is pointed out that, as the first attempts at gas lighting were disconnected undertakings to supply separate mills, factories, &c., with gas made on the premises, herein is another analogy between it and electric lighting; which, hitherto successful mostly in independent examples, is likewise to experience a development into general use. This result may be achieved—we do not deny its possibility; but it is singularly inconclusive to say that because gas lighting has so progressed, therefore electric lighting must do so. It would be just as logical to say that naphtha must eventually be laid on in pipes because gas is so treated. It should not be forgotten that if it were true—which it is not—that organized public gas supply was a long time in making its appearance, after the possibility of gas lighting in separate establishments had been proved, the absolute novelty of such a proposal would at that time have powerfully acted as a bar to its acceptance, even if the necessary appliances, such as pipes, &c. (the lack of which has already been alluded to), had been readily available. The lighting of independent establishments was a natural beginning in a period when a more extended scheme would have been as strange as the method of illumination itself. Now-a-days, on the contrary, it is a backward step that has to be taken with electric lighting, in consequence of the more approved principle, to which we have so long become accustomed, being inapplicable. What we are about to allege will, of course, be denied by the partizans of electric lighting—and indeed the exact contrary is taken for granted by the writer of the article now under notice, in a remarkable passage which will be found quoted below; but it is nevertheless true that although gas was first used in independent establishments, its reliability and other advantages, transcending anything that had previously been employed as an artificial luminant, were conclusively proved by such trials, and were generally admitted before its further and more public introduction was attempted. It has not yet been shown that the electric light is similarly superior to gas in every respect wherein the two lights can be compared with each other. It cannot even be asserted as a positive fact that any single warehouse, factory, shop, or other building has yet been so thoroughly and completely lighted by electricity as to altogether banish gas or other handy lighting medium from its precincts. When we know that in a single large establishment, wherein a reliable light is of primary importance, the gas supply has been cut off and electricity is solely depended on, we shall look for the speedy extension of the new system for ordinary business purposes; but, until then, we must be pardoned for believing that gas is still master of the situation.

Finally, to close this somewhat extended notice of an article which is chiefly noteworthy as an example of a widely-prevalent method of bolstering-up the theory of electric lighting, in its relation to the community, by analogies drawn from the success of gas

lighting, it is quite amusing to remark that the writer treats of the domestic utilization of the electric light as an accomplished fact. The three concluding paragraphs are worth reproducing *in extenso*—

First, the possibility of using the electric light for general illuminating purposes was denied, then its adaptability for large buildings was admitted, and now finally its use for domestic purposes is unquestioned.

The economy of electric lighting was also assailed; but the arguments are now getting stale. As each consumer had at first to make his own gas, so the first idea of electric lighting was coupled with the necessity on the part of each consumer to own his own electric generator; and it was reserved for Edison to reform the whole system, and put it on a practical footing. He first publicly exhibited an electric lamp that could compete with gas, and that was adapted for the general illumination of houses by electricity; he first subdivided the electric current, and thus demonstrated that its economic use was a possibility; and he will be the first to achieve the final triumph of establishing a central station for the manufacture of electricity, and conducting it to the houses of the people.

Capitalists combining with scientific experts and patent pirates may endeavour to strip Edison of the honours due to him, earned by patient and exhaustive study of the question. That the electric light would eventually supersede gas for general illuminating purposes no one doubted; but that Edison, by bringing to bear upon it his great inventive powers combined with almost unlimited resources, has advanced the time for accomplishing the result by at least 50 years, will be admitted by all unprejudiced persons.

The words "the electric light" in the first paragraph are either a misprint for "gas light," or the comparative sense of the opening sentence of the second paragraph is destroyed; the whole is evidently intended to be taken as the jubilant utterances of a disciple respecting his master's success. But against this it is necessary to state that intelligence has reached us within the past month of a heavy call having been made upon the shareholders of the Edison Electric Light Company, whose previous contributions are said to have been swallowed up in experiments. It is also announced that the carbon loop, the essential feature of Edison's incandescent lamp, is still to be perfected; and that an agent has been recently despatched to Brazil to seek proper materials for its fabrication. He is expected to be absent for at least a year. We leave to those concerned the task of reconciling these little discrepancies, which may, of course, be quite unimportant; but, meanwhile, it will indeed be an example of the irony of Fate if either Maxim, or Swan, or any other more obscure inventor, should succeed in actually attaining the end always *all but* reached by Mr. Edison.

SOUTH METROPOLITAN GAS-WORKS.

GAS-RETORT FURNACES.

We are compelled to break the series of descriptive notices of the new works at the Old Kent Road station of the South Metropolitan Company, in consequence of the treble-lift gasholder, the illustrations of which should naturally follow those of the concrete tank actually constructed for it, being still unfinished. It is our intention only to describe works as completed, and we shall therefore have to wait until the holder has been erected before giving its description in detail. Instead of proceeding with the holder, we now return to the other extremity of the process of gas manufacture, and in the plate accompanying the present number of the JOURNAL will be found complete drawings of the carbonic oxide gas furnaces in the latest form as adopted at these works. The illustrations and the following description of the construction and working of the new furnaces—which the kindness of Mr. G. Livesey, in giving us the fullest possible information, enables us to publish—may be taken as representing the fruit of the experience of Mr. G. Livesey, Mr. F. Livesey, Mr. Somerville, and the very intelligent foreman, acquired in experiments lasting nearly two years, during which period many different forms of gas furnaces were successively tried and abandoned. It must, however, be borne in mind that even these furnaces are so far from being considered perfect by the above-named gentlemen, that arrangements are just now in progress from which better results are expected, for reasons which will be explained later.

For a proper understanding of the principles underlying the experiments instituted by Mr. Livesey, with a view to the discovery of a method of using gaseous fuel for heating retorts which should be free from most of the objections previously applicable to carbonic oxide generators, we must refer to the paper read by Mr. F. Livesey at the last meeting of the British Association of Gas Managers, and to the articles on the subject which have appeared in our columns during the past two years. The information therein given must be collated with the present notice.

The early experiments in this direction at the Old Kent Road were for a year or more made with square-built generators standing separate from the retort-stack and underneath the charging floor, in a stage retort-house. The best of these furnaces were not very satisfactory; there was a great draught, which caused a most intense heat at the fire-bars, to prevent which water and steam were tried with small effect. The air also made its way up the sides of the generator, between the walls and the fuel, cutting the brickwork and burning the carbonic oxide gas in the generator, instead of in the retort-setting, where it should have been used. This latter was a very serious defect, and caused an attendant loss of heat, the radiation from the sides of the brickwork generator being so great that the temperature of the under storey of the house, or "coke-hole," as it would generally be called, was as great as in front of the retorts. It was found impossible to prevent the undesirable infiltration of air through the walls of the separate generator, and in view of the fact that the loss of heat by radiation and contact of air with the exterior of the generator was so excessive, it occurred to Mr. Livesey, after many devices had been tried, including several copied from Continental and American examples, that the proper place for the generator was *inside* the setting, just as the old direct-acting

furnaces were situated. This involved a certain sacrifice of space in the arch, for the room required for the enclosed generator would have accommodated another retort; but the possible gain in fuel and in the convenience of the workmen warranted a trial of the idea. By this time it is needless to say that Mr. Livesey had satisfied himself of the advantages of gaseous firing on general principles, if only the observed difficulties could be surmounted. The attempt was made at first without much success. The second supply of air intended for the combustion of the carbonic oxide was intended to be heated on the strict "regenerative" principle—by means of channels in the brickwork beside the exit flues. This was a failure; the flues being on the top of the benches, the air had to be drawn downward to the furnaces, and this being contrary to the natural law, which would cause the heated air to ascend, an excessive draught was necessary in order to bring it down; and, moreover, the brick air-channels employed leaked so badly as to be useless. Then it was remembered that some 14 or 15 years ago, Mr. F. C. Hills had patented an arrangement for heating the air supply for ordinary furnaces by causing it to pass through a rectangular cast-iron pipe 9 inches by $4\frac{1}{2}$ inches interior measurement, laid beneath the bottom retorts throughout the setting, one pipe serving each furnace. This plan had been tried at the South Metropolitan works; but the air passing through the pipes became so heated that when delivered at the grate it melted everything. A modification of this plan has been found to give good results in the system of generator firing now finally adopted, and is one of the most important features of the present design.

It should be stated that these furnaces are not *regenerative* in the full meaning of the word; that is to say, the air used in complete combustion is not entirely heated by the waste products of combustion escaping to the chimney after having done their work in the setting. What is really done will now be explained. It will be seen by the drawings that the usual arches are utilized; the furnace being carried down quite to the *extrados* of the lower arch, which is built just here of fire-brick in three rings. The crown of this arch is pierced by a slot 2 ft. 6 in. long and 3 inches wide, which is lined with a cast-iron curb bracketed in the middle of its length. This slot admits air to the generator for the primary formation first of carbonic acid and afterwards, by reduction, of carbonic oxide gas, which is effected by the passage of the air upwards through the fuel. The generator is always kept filled with fuel to a height of from 3 ft. to 3 ft. 6 in. A $\frac{1}{2}$ -inch steam-pipe will be observed ranged alongside the under side of the slot. In this pipe are 12 small holes distributed along the length of the opening in the arch, from which steam, at a pressure of about 35 lbs. per square inch, is directed into the opening. This is to prevent the formation of clinker, and also to keep down the temperature of the lower part of the generator, when the combustion is naturally most intense, to limits which prevent the destruction of the fire-bricks that would otherwise ensue. Both these objects, upon which the practicability of generator firing depends, are completely secured in this way, with an expenditure of steam which costs no more than the annual value of the boiler and apparatus required, the boiler being heated by the waste heat of the main flue of the retort-stack.

Carbonic oxide gas being thus produced in the generator, its further combustion is effected by a second supply of air, which is admitted in the first place by two openings in the crown of the lower arch, one on each side of the slot. These openings communicate with the two rectangular cast-iron pipes, which follow through the setting the course shown in the longitudinal section, and finally deliver the air, in a highly heated state, by the small orifices opening in the sides of the furnace, on a line 4 ft. 6 in. above the top of the slot. The hot air thus meets the carbonic oxide immediately after it rises from the body of fuel, and a most intense combustion ensues, the whole of the setting being filled with flame.

The settings in which these furnaces have been applied are of seven through \square brick retorts, 22 in. by 15 in. and 20 ft. long. Each retort carbonizes 1 ton 4 cwt. of coal per diem in 6 cwt. charges of six hours each, the drawing and charging being by West's machinery. An ordinary furnace for a similar setting, though with smaller retorts, consumes 18 cwt. of coke in 24 hours, or about 20 per cent. of the production, calculating a yield of 4 tons 10 cwt. of coke from 7 tons of coal. The best results obtained with the generator have been a consumption of 12 cwt. of coke per day, or 12 per cent. by weight of the 5 tons of coke yielded from 8 tons of coal carbonized in 24 hours. This result is not always secured, but on an average the saving in fuel by the generator may be taken as being fully 25 per cent. of the old consumption. Besides this there is to be reckoned the economy in wear and tear of retorts, furnaces, &c.; the lessened labour (the distressing task of clinkering being abolished); and the great regularity in carbonization attainable by the new method. The heating of the retorts is under perfect control, and the rapidity at which carbonization can be performed, and consequently the amount of gas made per mouthpiece, is limited chiefly by the danger of stoppages in the ascension-pipes, which occur when the heat is excessive. The fronts of the settings are covered with plates of iron, used to give security to the retort mouthpieces, and there can be no doubt that these plates cause the loss of a considerable amount of heat; on the other hand, they lessen the infiltration of cold air. It is essential that no air, other than that which enters by the proper channels, should find its way into the generator, and therefore the door for the admission of fresh fuel is carefully fitted with a faced joint, and is made to open by falling down, while its own weight keeps it tight when closed.

The ease and silence with which the 32 furnaces in the retort-stack fitted with them are worked is remarkable, the usual naked fireman, toiling with redundant noise over his clinkering and

stoking, is nowhere to be seen; instead thereof a labourer may be observed occasionally letting down a small door, displaying to the view a glowing, though not white-hot furnace, filled with a pale yellow flame, which for the moment appears to have its origin at the open door, and to be caused by the combustion of the entering air. Underneath the charging stage, in the lower regions, nothing can be seen overhead but a range of whitened arches, along the centres of which are gleaming slots, each receiving a number of little jets of steam from an adjoining pipe, while light ashes and dust continually drop from the open slots. A man with a light rod sometimes pricks the refuse when it seems to hang across the slot, but even this is seldom necessary. Such as it is, however, it is the remains and representative of the process of clinkering.

To return to the process of the formation of carbonic oxide, and its final combustion with hot air. It will be seen that a very careful arrangement of draught is necessary in order to ensure the admission of the proper quantity of air both to the slot and to the heating-pipe for the secondary combustion. The size of the slot was arrived at after careful observation and numerous experiments with furnaces of different forms and sizes, and by the determination, by means of a small anemometer, of the velocity of air entering the furnace corresponding with the area of the openings into the main flue as controlled by the dampers. It was found that dampers or regulators for the entrance of air to the slot and to the hot pipe did not answer. They gave much trouble, requiring to be altered with nearly every change of wind, or according to the alterations in the draught of the main flue or chimney. It was therefore decided to abandon the use of regulators, and to construct the air passages in accordance with data obtained from the other end. The damper on the main flue was adjusted to an area of 36 square inches, equal to a draught of 2-10ths of an inch of water, or a velocity of about 10 feet per second. This gave a velocity of about 2.33 feet per second, or a draught of about half a tenth through the slot, which has an area of 50 square inches, and about the same draught and velocity for the cold air entering the square pipes. These pipes are 9 inches by 3 inches, the two together being calculated to have 54 square inches area, so as to allow for an excess of about 10 or 12 per cent. of air over the quantity required for the complete combustion of the carbonic oxide to carbonic acid. As the air is expanded by heat, the carbonic oxide gas is enabled to combine with its equivalent of air in the combustion chamber, without requiring the help of a sharp or cutting draught. The practical results of this arrangement are satisfactory, and in this case theory and practice are both carried out successfully. The quantity of air required is thus determined. Coke containing 93 per cent. of carbon requires 152 cubic feet of air to every pound for its perfect combustion; as one of these furnaces consumes 6 cwt. of coke in 12 hours, it requires through the slot the oxygen contained in 100,000 cubic feet of air in that time, or about $2\frac{1}{2}$ cubic feet per second, which, as we have already seen, is near the velocity for which it was designed.

The steam, as already mentioned, is intended mainly to keep the slot clear of clinker, and to protect the fire-bricks of the lower part of the generator. It also fulfils another and important part in the work of the generator. In reducing the temperature of the lower part of the furnace, it suffers decomposition into its elements, and while the liberated oxygen goes to help the formation of carbonic oxide, the hydrogen burns in the setting with useful effect. The steam thus robs the generator of heat only where it is harmful, to give it up again where it is capable of useful service. The whole of the 32 furnaces are supplied with steam from one boiler situated on the top of the bench, and heated, as before described, with the waste heat of the flues.

It has been already remarked that these settings are not strictly regenerative; the past description of their method of working will render this clear. At the same time it cannot be made out that all the heat imparted to the secondary air in its passage through the cast-iron pipes is diverted from useful work elsewhere. The lower parts of the pipes especially appear only to intercept heat that would otherwise be lost. It is indeed a question whether the situation of the generator is not of such economical advantage that it may compensate for the loss caused by the introduction of cold air into channels bedded in the interior of the setting. The working results are so good that, whatever this loss may be, it cannot be serious.

It is, however, not intended that these settings shall form the last effort in this direction at the South Metropolitan Gas-Works. In a new retort-house now being built, the generators will, like these, be contained in the arches; but the secondary air supply will be heated to the fullest possible extent in a truly regenerative manner by the waste heat of the main flue, which will, for this purpose, be constructed beneath the settings, instead of, as now, above them. As a further testimony to the almost unlimited power of gas-firing, the retorts in this house will be set 12 or 14 in an arch. At present, the generators have such an excess of power that they are moderated by being supplied with from 10 to 20 per cent. of breeze or pan-ashes mixed with the coke. Even this fails to clinker; but from the closeness with which it becomes packed in the furnace, it burns slowly and lessens the evolution of combustible gas. Even in this point—the power of disposing of coke ashes, &c.—the introduction of generator furnaces would be a great convenience in many works; but, on the whole, they must be admitted to offer such advantages that in a few years the old-fashioned direct-acting furnace must become obsolete.

MR. ANDREW GIBB, of Glasgow, has been appointed Manager of the Newry Gas Works by an unanimous vote of the Gas Committee of the Town Commissioners.

Notes.

GAS-MAINS AND LIGHTNING CONDUCTORS.

Professor Silliman writes in a recent number of the *American Gaslight Journal* on the subject of atmospheric electricity and gas-mains; chiefly by way of commentary on Professor Kirchhoff's report to the Berlin gas authorities on the same subject, the substance of which has been already given in this column. The American physicist brings forward two cases of damage to gas-pipes by lightning, as having occurred within his own experience, and although these two examples at first sight appear to contradict Kirchhoff's statement that no injury to gas or water pipes is to be expected from their connection with lightning-rods, a closer examination of Silliman's account shows that they materially support Kirchhoff's opinion. It will be remembered that the German professor advised that in all cases lightning-rods should be well connected to the buried pipes, and that all lines of metallic piping throughout buildings should also be put into good electrical connection with the rods. Silliman shows that great damage has resulted from these conditions having been neglected in the two instances mentioned by him. In the first case, that of a Baptist church in New Haven, a violent electrical discharge was conducted by the lightning-rod from the spire of the church to a point about 20 feet from the ground, when, the earth terminal of the rod being defective, the discharge tore through a brick wall 20 inches thick to a gas-pipe within the building. The discharge then passed along the service-pipe to the street mains without any other effect being immediately apparent. Shortly afterwards, however, it was found that all the lead joints of the 6-inch main in the street had been started, and a heavy leakage caused. The other example was that of a dwelling-house, also in New Haven, which was struck by lightning, and the discharge passed along the service-pipe to the street main, the joints of which were loosened in a similar manner to the foregoing. Strangely enough the house and its occupants escaped damage. Both these instances occurred about eleven years ago, but the same church spire was struck again during the following year, and the wall was perforated in precisely the same manner, but the discharge fused the pipe it selected as its means of exit, and the escaping gas was fired. In this case no injury was done to the street mains. Professor Silliman repeats these observations, as he does not consider that enough notice was taken of them at the time. He considers that had Herr Kirchhoff's suggestions been carried out in these cases, damage would not have occurred.

WOODEN WATER-MAINS.

A reproduction of an ancient system of main-laying, with some slight modifications, may be seen in Switzerland. When the New River water was first of all brought into the City of London by Sir Hugh Myddelton, he employed for his mains the trunks of trees bored out in the direction of their length. An engineer has followed his example, after this considerable interval of time, in the method adopted for carrying the water of a thermal mineral spring between Pfeffer and Ragaz. The water contains small quantities of calcium, magnesium, and sodium in solution, and is of an average temperature of rather over 100° Fahr. The line of pipe, about 7 in. diameter, is 500 mètres long, and cost about 8s. per mètre. Firwood is used for the pipes, which are made in staves tongued together and bound with iron hoops, the whole being carefully tarred on both sides. These wooden pipes are described as being light, insensible to changes of temperature, and perfectly tight. A further advantage in the purpose for which they are used in the present instance is the fact that the water is not cooled in its passage through them. These wood stave pipes are also used in America for water; but the largest examples of them are to be found in Alsace. The pipe which carries the supply for the turbine at the works of Weybel Bros., at Kaiserberg, is 4 ft. 3 in. diameter and about 3 inches thick. The ends of the built pipes are turned to form the joints. The joints are well rammed with dry moss. Iron rings, 14 inches apart, hold the staves together. These pipes cost about 30s. per mètre laid complete, and the coating of tar keeps the wood so well preserved that, in spite of the circulation of the water in the interior and the constant humidity of the exterior, the pipes last perhaps 30 years.

THE GAS-PURIFIER TREATMENT FOR WHOOPING COUGH.

According to the *Journal de l'Eclairage au Gaz*, a controversy has been recently going on in Parisian medical circles respecting the efficacy of inhaling the vapours of gas-purifiers in cases of pronounced whooping cough. Dr. J. Dupont, in the last number of our contemporary, addresses himself to the task of finally settling the question. He states that several years since, a number of medical practitioners strongly advocated the gas-purifier cure for whooping-cough, and, aided by the daily papers, the treatment became so popular in Paris that great inconvenience was caused to the Gas Company by their manufacturing stations being thronged with patients. Soon a reaction set in, and the efficacy of the favourite method of treating this malady was questioned by several independent physicians, until, finally, M. Bouchut, in a clinical lecture delivered with that express purpose, denied that it was efficacious in any case, and asserted that the disease was frequently aggravated instead of cured thereby. Recently M. Henri Roger has declared that, even at best, gaseous inhalations have only a limited effect upon the catarrh, which is merely one of the elements of the malady; they are counter-indicated in cases of accompanying fever, and are noxious when broncho-pulmonary inflammation, which is a frequent complication, is present. Besides, it is a treatment that cannot be applied during all seasons; without incon-

venience in summer, it is dangerous in winter. Accordingly, it is advised that, by the light of the most advanced medical knowledge, inhalation of the vapours of gas-purifiers should never be permitted to those suffering from whooping-cough, as it is quite useless, if not positively harmful, and therefore this painful experience may be dispensed with in the case of young or old sufferers from the distressing malady in question.

SUGGESTED IMPROVEMENTS IN PHOTOMETRY.

As reported in the *Zeitschrift für Anal. Chemie*, Herr A. Töpler employs with some advantage the following arrangement in lieu of the grease spot of Bunsen's photometer screen. Between two pieces of parchment paper, as thin as possible and equally translucent, is laid a moderately thick piece of common paper with a circular hole in its centre, and the three papers are then held between two colourless sheets of glass. The transparent spot allows of an exact observation and adjustment as the grease spot; but the latter, if viewed from a certain angle and caused to disappear between two sources of light, becomes visible again if viewed under another angle—a defect from which Töpler's arrangement is said to be free. Another method of photometry is proposed by Herr J. M. Eder, who states that the separation of mercurous chloride from mixed solutions of mercuric chloride and ammonium oxalate which takes place under the influence of light, is chiefly due to the ultra-violet rays of the spectrum, and is so regular that the quantity of mercurous chloride deposited may be taken as a measure of the intensity of these rays.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

GAS FOR HEATING PURPOSES.

SIR,—I think the time is fast approaching when it will be convenient and profitable to have two sets of mains in the streets—one for illuminating gas, and one for gas to be used for heating purposes only.

By having suitable arrangements in the works, it will be an easy matter to take off into one holder half the gas from common coal, in about one-third of the time required for carbonizing, and the remaining half through a separate condenser, purifier, &c., into another holder, the whole being effected by working sets of valves on the hydraulic main. The first gas would have an illuminating power of 22 to 25 candles, while the other would be practically non-illuminating, and would be exceedingly well adapted for cooking-stoves and heating generally. The illuminating gas would be worth, for practical illuminating effect, nearly double the sum at present charged in London; while the heating gas could be sold at such a low rate (say, 1s. per 1000 cubic feet) as to encourage the use of it for domestic heating and manufacturing purposes.

I am quite aware of all the objections that can be urged against the system, and I admit they are very serious; but the advantages are so obvious that I feel assured the time is not far distant when the idea indicated above will be practically carried out.

Glasgow, Dec. 27, 1880.

WILLIAM WALLACE.

[This letter calls for some comment. It reproduces a mistaken but widespread idea as to the causes that chiefly operate in regulating the price of gas. It may be useful to others besides Dr. Wallace if some of our readers who are working under the best conditions for supplying cheap gas, will publish their experience and opinions on the subject.—Ed. J. G. L.]

THE ENCOURAGEMENT OF GAS CONSUMPTION.

SIR,—In common with all who have at heart the advancement of our industry, I have read with great interest your well-timed articles on "The Encouragement of Gas Consumption." Whilst a powerful press and an ignorant public unite to hail the extinction of gaslight, it is well that this subject should engage our attention.

Seeing the antipathy and suspicion with which the proceedings of gas companies are viewed, both by the public and the press, it should be our first care to remove the causes which have produced these feelings. Foremost among them, it must be admitted, is the fact that for a long period gas companies have been content to exercise the powers of monopolists, instead of the allurements of traders; and on this point the articles mentioned are very instructive, and contain some thoughtful suggestions. One which, to my mind, is most practical and useful, and to which I desire to direct special attention, is the system adopted by the Paris Gas Company, of establishing show-rooms for stoves, burners, and other apparatus designed for the extension of the applications of gas. That the numerous gas exhibitions held of late have done much to diffuse a knowledge of the capabilities of gas, cannot be doubted; but at best their usefulness is limited. A permanent collection of the most reliable burners, stoves, &c., where they can be at any time inspected and compared under ordinary conditions, is a far more useful and satisfactory means of educating consumers of gas in the economy of its combustion; for it must be admitted that much ignorance prevails, even as regards the best methods of burning coal gas for producing light. During the last few years great improvements have been effected in gas-burners; but that they have not been extensively utilized is patent to every one who notices the gas lights used in the majority of houses; old iron burners, with the gas flaring at excessive pressures, are common even in the shop windows of our large towns. While on this subject, might I suggest that, now that the lighting of streets and open spaces has been brought to such a state of perfection, inventors could, with advantage and profit, turn their attention to the illumination of large interiors? It is a lamentable fact, and one that has done much to promote the use of electricity for lighting purposes, that in the method of illuminating our large factories and workshops, as carried into practice, there has not been any considerable improvement since the introduction of gas lighting.

Another way in which a gas company may promote the extended use

of gas, and further their own interests, is by adding to their staff of officers an adviser and instructor of consumers—a person practically acquainted with all that pertains to the consumption of gas, and well informed on the sciences involved in its manufacture and combustion—whose duties should be to advise consumers as to the most advantageous system of lighting in each particular case, and the selection of the most suitable apparatus for individual requirements; to instruct the consumer in the best methods of burning the gas supplied to him, showing him how to obtain the most effective service at a minimum of cost; and to investigate and experiment upon new processes and apparatus introduced for the purpose of extending and cheapening the applications of gas. It cannot be expected that all gas companies can afford to carry out this idea; but many of the larger ones, who are ever ready to take advantage of any improvement in manufacture, might, with equal profit, move in this direction. Certain it is that any such venture will be rewarded by a corresponding increase in the consumption of gas; and it is equally certain that only by adopting a policy founded upon the lines indicated, can the amicable relations between vendor and consumer, which are so desirable, be established, and the unshaken prosperity of gas undertakings be assured.

Dec. 31, 1880.

ETHYLENE.

DANGERS OF ELECTRIC LIGHTING.

SIR,—In your "Note" in the last issue of the JOURNAL, on my letter to the *Bristol Press*, on "Colliery Explosions," there is a slight misapprehension. I did not say gas could be ignited without a spark. So far as I have observed, a spark always passed from the electrified wire before the gas was fired. The wire which caused the explosion in the box was not connected with the coil. I threw a discharge on it, and by simply lying along the coal at the bottom of the vessel, it gave off the sparks by which the mixture was exploded.

Whenever electricity is in high tension, and the wire—uncovered by an insulating substance—passes near bricks, broken wood, mortar (dried), plaster, and such rough surfaces, powerful sparks are given off. A leak in a gas-pipe is bad, but a leak in the insulating covering of a wire charged with electricity in tension will probably produce worse results, should this mode of lighting be tried in dwelling-houses and buildings generally.

Gas-Works, Newport, Mon., Dec. 30, 1880.

THOMAS CANNING.

SIR,—In your last issue of Dec. 28, under the head of "Notes," is an abstract of an account of some experiments by Mr. Canning, on the influence of electrical discharges on explosive mixtures of inflammable gas and air. The concluding sentence of the abstract says: "Mr. Canning quotes the opinion of Mr. W. H. Prece, which he considers has been amply justified by his own observation, that a spark is not always necessary to fire a stream of ordinary gas." A perusal of the whole abstract leads me to believe that Mr. Canning's experiments show that incandescent matter—a substance, whether solid, liquid, or gas, in a state of incandescence—is not essential for the ignition of a jet of inflammable gas. The subject which Mr. Canning has taken in hand is one of national importance, and I, therefore, trust he will pardon me for asking for some particulars of the experiments whereby he has arrived at the inference expressed in the sentence I have just quoted.

Middlesex Hospital, Jan. 1, 1881.

WM. FOSTER, M.A.

[This letter is answered by Mr. Canning's communication given above. The account from which our note was abstracted made no mention of ignition by a visible spark, and the deduction mentioned by Mr. Foster was put forward quite tentatively in order to elicit the fuller explanation now given by Mr. Canning.—Ed. J. G. L.]

DR. ADAMS'S GAS-STOVES.

SIR,—Allow us again to trespass upon your space on the subject of Dr. Adams's gas-stoves.

In your issue of the 30th of November, Mr. Denny Lane challenged the accuracy of the statements made by Dr. Adams concerning his stoves, and his comments were certainly calculated to bring discredit upon the stoves as well as upon those who made or published the statements. In the subsequent correspondence which has taken place, the main feature of Mr. Lane's first letter has been to a great extent lost sight of in a squabble over figures in the third place of decimals. We therefore, in your issue of the 21st of December, suggested that Mr. Lane should experiment with the stoves, giving your readers the benefit of the results he obtained; and thus, by actual figures, rather than by theory, prove or disprove the "exaggerated" assertions with which he found fault. We are not, however, favoured with any reply, and we (and doubtless your other readers also) are "very much in the dark" as to the exact point to which he objects. Does he discredit the actual amount of work done by the stoves, or is it the method of calculating and stating these results with which he disagrees?

We give below the results yielded by a stove in actual use in Glasgow, and which results were taken by the writer during the present winter. The air to be warmed by the stove passes into it by two distinct openings—one at the back, and one at the top. The former has an area of 19,125 square inches, and in this the anemometer registered 230 feet per minute, or 1832 cubic feet per hour. The area of the latter is 28,274 square inches, and here the anemometer registered 171 feet per minute, or 2014 cubic feet per hour; or a total of 3846 cubic feet of air heated per hour. The initial temperature of the air was 58° Fahr., and the temperature of the air leaving the stove was 220° Fahr., or a gain of 162° above the initial temperature. Then it follows that 3846 cubic feet of air heated 162° Fahr. above the initial temperature gives 623,052 of the new units; and as the consumption of gas in the stove was 12 feet per hour, we get 51,921 units per cubic foot of gas, or something rather more than the figures which Mr. Lane declares to be an exaggeration.

This is not a picked experiment which is only to be attained occasionally, but is a fair average of the many tests made by the writers with Glasgow gas. From it your readers will be able to judge whether or not the statements are exaggerated, and we shall be pleased to hear what Mr. Lane will have to say, now that he has all the details before him.

Birmingham, Dec. 31, 1880.

JOHN WRIGHT AND CO.

Legal Intelligence.

BURNLEY BOROUGH POLICE COURT.—WEDNESDAY, DEC. 29.

(Before Messrs. R. HANDSLEY and G. HASLAM.)

RAWLINSON v. CORPORATION OF BURNLEY.

The proceedings in this case, which was reported last week, were instituted by John Rawlinson, now a machine broker, but formerly a mill manager, cotton spinner, and manufacturer, the ground of complaint being that the Corporation had illegally discontinued his supply of gas, under circumstances already detailed.

As on the previous occasion Mr. KNOWLES appeared for the complainant; and the TOWN CLERK (Mr. A. B. Creeke) for the defence.

Mr. HANDSLEY, in giving the decision of the Bench, said: This is an information laid by John Rawlinson against the Corporation of Burnley. Rawlinson complains that the Corporation, without justifiable excuse, cut off and discontinued the supply of gas to his house. It appears that Rawlinson formerly failed, the Corporation being creditors upon his estate, and that the Corporation have a standing regulation that no one who has failed, owing them money, shall afterwards be supplied with gas until he shall have first paid the balance on the old debt, although (as in this case) he may have been released from it by the operation of the Bankruptcy Acts. There is nothing in the Burnley Improvement Act, or in the Gas-Works Clauses Act, 1871 (incorporated with the Improvement Act), which, as it appears to us, authorizes the Corporation to adopt this course. On the contrary, it seems to us that it is compulsory on the Corporation to supply gas to owners and occupiers within the limits of the Improvement Act, when required to do so, subject to one condition—that the party demanding a supply shall, if required by the Corporation, give security for the payment of his account. In the present case no security was demanded; but the gas, after being supplied for some weeks, was suddenly cut off by a servant of the Corporation, without any previous notice of an intention to cut it off being given to the complainant. The evidence shows, however, that it was cut off owing to the standing regulation relative to bankrupts to which I have referred. Such a proceeding is, in our opinion, contrary to the provisions of the Gas-Works Clauses Act, 1871. This Act was passed on the 13th of July, 1871, and enacts (section 3) as follows:—"The provisions of this Act shall apply to every gas undertaking authorized by any special Act hereafter passed." It therefore applies to the Burnley Improvement Act, which was passed on the 24th of July, 1871, or eleven days after. The Gas-Works Clauses Act, 1871, after rendering it compulsory (section 11) on the undertakers—in this case the Corporation of Burnley—to supply gas to owners and occupiers within the limits of the special Act (subject to certain conditions, which, however, do not apply to the present case), further enacts (section 36) that "whenever the undertakers neglect or refuse to give a supply of gas to any owner or occupier of premises within the limits of the special Act entitled to the same"—and in this case the complainant Rawlinson is an occupier so entitled—"they shall be liable to a penalty not exceeding 40s. for each day during which such default continues." We think this case comes within the 36th section of the Gas-Works Clauses Act, 1871. We are also of opinion that it comes within section 198 of the Burnley Improvement Act, which imposes a penalty for the same offence not exceeding £5. We convict the Corporation in a penalty of 40s. and costs, and direct that the penalty be paid to the complainant. Distress in default.

STRATFORD POLICE COURT.—THURSDAY, DEC. 30.

(Before Col. HOWARD and Lieut.-Col. BIRT.)

THE LIABILITY OF INCOMING TENANTS FOR ARREARS OF GAS-RENT.

The West Ham Gas Company answered to a summons charging them with neglecting to supply gas to Mr. T. Procter, of the Tower Hamlets Public House, Forest Gate, who, it appeared, had just taken the place which the outgoing tenant left without paying the Company's bill of more than £20. Under these circumstances, the day after the complainant had taken possession, the Company cut off the supply of gas.

Mr. WILLIS, who appeared for the Company, asked under what Act of Parliament the proceedings were taken.

Mr. ATKINSON (complainant's Solicitor): The 36th and 39th sections of the Gas-Works Clauses Act, 1871.

Mr. WILLIS: I at once take objection that the West Ham Gas Company are not under the provisions of that Act, as the last Act the Company themselves obtained was granted in 1869.

Mr. ATKINSON contended that the 1871 Act did apply to all Companies in whose private Acts the Gas-Works Clauses Act of 1847 was incorporated. He quoted the decision of Justices Blackburn and Lush in the case of the *Commercial Gas Company v. Scott*.

Mr. WILLIS said the Acts of 1847 and 1871 could not be construed together, nor the latter Act be made retrospective so as to apply to the Company, who were working under their own Act of 1869.

Mr. ATKINSON contended that the 1871 Act did apply to the Company; and, further, on the merits of the case, contended that an incoming tenant could not be held responsible for an outgoing tenant's gas bill.

The CHAIRMAN, after looking into the Acts quoted, said he was of opinion that the 1847 and 1871 Acts must be read together as applying to the Company; but would adjourn the question in order to allow the Clerk to look up cases bearing on the point, which was a very important one.

Miscellaneous News.

THE RICHMOND (SURREY) SELECT VESTRY AND THE GAS COMPANY'S BILL.

At the Meeting of the Richmond (Surrey) Select Vestry on Tuesday, the 21st ult.—Lieut.-Col. Sir F. BURDETT, Bart., in the chair—the Committee appointed at the previous meeting "to examine the application of the Richmond Gas Company to Parliament, and report thereon to the Vestry," presented a report, stating that they considered (1) that it was inexpedient to purchase the Company's works; (2) that the illuminating power of the gas should be equal to 16 sperm candles instead of 14 candles as at present, that the price of gas in Richmond should not exceed 8s. 3d. per 1000 feet, and that other provisions should be inserted in the Bill to prevent the recurrence of offensive smells from the works; (3) that the time had arrived when an arrangement more favourable to the ratepayers should be obtained for gas supplied to the public lamps; and (4) that a special meeting of the Vestry and a public meeting of owners and ratepayers, in compliance with the 4th section of the Borough Funds Act, should be convened as early as possible.

Mr. BURT (the Chairman of the Committee), in moving that the report be adopted, and that a special meeting of the Vestry be called for the purpose of determining whether they should or should not oppose the Bill, said their first reason for recommending such a resolution was that the Bill contained no provision for reducing the prices the inhabitants of Richmond were now paying under the Company's Act of 1867. It contained no provision for altering the quality of the gas supplied to the parish, and under these circumstances it appeared to the Committee to be

essential for a fair and proper discussion of this question, that the Vestry, if they found that they were unable to come to terms with the Company, should be in a position to refer it to a Committee of the House of Commons to say whether or not they were entitled to have the alterations he had indicated made. With regard to price, all the London Companies, with one exception, would be charging 3s. or less per 1000 feet from Jan. 1. The Committee considered there was no apparent reason why so large a difference as 9d. per 1000 feet should be charged in Richmond as compared with the Metropolis. They knew the price of house coal was the same at Richmond as in London, and apparently the coals obtained and used by the Company could be obtained on precisely the same terms as in London. Then the expense of the land for enlarging the works could not be so great at Richmond as in London, and a much larger proportionate number of houses would take gas than in London. The Committee thought 3s. 3d. per 1000 feet would be a fair maximum price as compared with the actual charge of 3s. in the Metropolis. As regarded quality, there was no alteration proposed in the Bill. In 1867 there was a great struggle with the Company on this question in Parliament; but there was no alteration in the Bill as to the 14-candle standard, while in London the minimum quality was 16 sperm candles. He looked upon this as a fair matter for discussion, if necessary. Then 10 per cent. was paid on £30,000 of the Company's capital, and for an ordinary commercial venture he did not think this profit was excessive; but when it was remembered that the Company had an exclusive right to supply an article almost universally used, he thought the consumers were entitled to contend to their utmost to have the price reduced as much as possible. So long as there was a monopoly of supply, he thought something considerably less than 10 per cent. ought to be the maximum rate of dividend. He recommended the Vestry to put themselves in a position to fight for this, if necessary; though he sincerely hoped it would not be necessary, as among the Directors of the Company were gentlemen of ability, judgment, and common sense, who had a desire for the prosperity of Richmond. Therefore he was by no means unwilling to believe that, without fighting before a Parliamentary Committee, or taking hostile action, the Vestry would be able to get what they desired. If they did not avail themselves of this opportunity, they would not have another for 20 years to come. It was 13 years since the Company last went to Parliament, when they asked for £30,000 capital; but now they asked for £60,000. Therefore they foresaw that during the next 20 years Richmond was going to increase largely, and in view of this extension, and the necessity of taking advantage of the present opportunity, he moved the adoption of the resolution. He should like to add to it, that the Committee be authorized to communicate with the Directors of the Company, and see if any arrangement could be made to avoid opposition.

Mr. SIMS seconded the motion, and it was unanimously agreed to.

THE COSTS OF THE LAST GAS AGITATION IN EXETER.

At the Meeting of the Exeter Town Council on Wednesday, the 29th ult. —the MAYOR (Mr. W. Pring) in the chair—the Town Clerk stated that he had received two letters from a firm of local Solicitors in reference to certain payments in connection with the promotion of the Exeter Corporation Gas Bill, 1878. The first one contained the following passage:—

Exeter Corporation Gas Bill, 1878.

We are instructed by a ratepayer of this city to apply to the Queen's Bench Division for a writ of *certiorari* to remove into that Division (with a view to its being quashed) an order upon the Borough Treasurer, under which the sum of £150 was paid to you on account of the costs of promoting the above. Will you be good enough to lay this letter before the Town Council, as, unless the £150 is refunded, we shall proceed.

An acknowledgment of the letter was sent, promising that the matter should be referred to the Council, and asking the name of the ratepayer alluded to. In reply, the Solicitors wrote, on Dec. 24, as under:—

We do not see that the name of our client will facilitate the discussion of the matter by the Town Council. Suffice it to say that he is a ratepayer, and that he is acting under the advice of Counsel in the matter. The object in view is to bring home to the Aldermen and Town Councillors composing the majority that they are bound to obey the law.

After some disjointed remarks by several members,

Alderman BUCKINGHAM said it grieved him very much to find that in matters which largely affected the public interest, there were certain men, not only in Exeter but in other towns, who thought it rather clever to try and dig holes wherever they could in the accounts that were presented, although the money laid out might have been spent in a *bonâ fide* manner, and for the benefit of the whole city. With regard to the transactions in which expenses in altogether another matter were incurred, there could have been animating the Council no feeling but that of doing good and preventing imposition; yet certain men had taken upon themselves to question the legality of the payment, and throw the onus and expense upon certain gentlemen who happened to differ from them in politics. It was a most unfortunate thing. It would be most pernicious in its effect, and he should be very sorry to see it continued; but if it did continue, he knew who would suffer. It would be the poor citizens, as in the present case. They were all interested in endeavouring to reduce the price of gas, and he was sorry that the law was such that the Council, acting in this spirit, were not allowed to protect the interests of the city in their endeavour to get the price of gas reduced as low as possible consistent with the cost of production. If this question was to be contested, it ought to be contested with a feeling that the Council had only done their duty, and that they were prepared to stand or fall by the result. He believed that it was the general feeling on the part of the whole Council that they should take the course they did, and it was not a question affecting one side of politics or the other. It was admitted that the question was fairly tried, but if there were any ratepayers so infatuated as to pursue the present course, the Council could not help it. He thought they should endeavour to get the Legislature to sanction these costs, and urged that the more they exposed the weak position in which the Council were placed in this respect, the more likely they would be to get a general Act of Parliament passed giving authority for the course adopted in the case in question. He moved—"That in the event of the threatened action being taken, it be defended."

Mr. MARTYN asked in what position the mover and seconder of the resolution would find themselves. It seemed to him that individual Councillors were now looked upon as responsible. He himself objected to this, as he did not join the Council with any intention of being liable for costs incurred, and should not go any farther if he was individually responsible. He agreed with Alderman Buckingham that the question should be fought out, but he could not agree that the members of the Council should be individually liable for costs.

The TOWN CLERK: I understand Mr. Martyn to ask, if the Council resist the application, who will be liable for the costs?

The MAYOR: And also the position of the mover and seconder.

The TOWN CLERK said of course the persons who instructed him were liable for the expense; and if the order were quashed, the burden would fall upon those who signed it, and costs would follow the result.

Mr. MARTYN said in that case he was not prepared to undertake the responsibility in future, and the citizens must look out for Councillors who would.

Mr. WILKINSON said there was another point to be considered. Supposing they agreed to resist this action, was there any reason for believing

they would have any chance of success? Admitting that the £150 was spent in a *bonâ fide* manner, and with the best intention, it was still a question whether, before they incurred the expense, the Town Council took the proper steps to make it a legal charge. He held that the Council were not altogether powerless with respect to the purchase of the gas-works; but if they did not comply with certain forms, then the charges became illegal, as in the case of the purchase of the gas-works, which was interrupted by a sort of panic. He quite admitted that the ratepayers might have been satisfied with paying the £150 to get rid of the matter, but he did not admit that the Council were doing wrong, at the particular time, in endeavouring to obtain the gas-works on certain terms. The question now was whether they should resist the suggested action; for, if they were to lose the day, it would only make matters worse. It would be better to pay the £150, in some shape, than go to law with the certainty that the decision would be against them. Surely the Town Clerk would not advise them to go to law in that case, as it would only lead to greater expense, and make them appear more ridiculous in the eyes of the public than they were at the present moment. He thought the right course would be to make some arrangement, and compromise, although it might be *infra dig.* to do so. They must remember that, as a public body, the question was whether they were right or wrong. If they had committed an illegal act, it was not right to spend hundreds of pounds additional.

Alderman BUCKINGHAM: I beg to state that the resolution I proposed was on the advice of the Town Clerk. I must throw the responsibility upon him; and I certainly should not advise you to fight with the certainty of being defeated.

The MAYOR: What is the position in which we stand?

The TOWN CLERK: I cannot say more than this—that in my judgment the Council have not committed an illegal act in reference to the £150. I advise the Council to resist the application to be made, and believe that they will resist it successfully.

Mr. PIDSLEY observed that the £150 was spent before it was possible to call the ratepayers together. There must be some expense incurred before this could be done; and, therefore, he thought the money was spent legally.

Alderman HIRTZEL said they had a Committee on purpose to consider parliamentary matters, and this was essentially a subject for that Committee. There were a number of the leading Solicitors in the Council on it, and it occurred to him that if the whole matter were referred to the Parliamentary Committee, it would be the best way to get it considered. Of course, any ratepayer had a right to raise the question that had been agitated, but whether it was for the interests of the citizens to raise it was entirely another matter. If the Council were in the wrong, it was, of course, absurd to incur further costs. But there were members of the Council quite as competent to judge whether the charge was legal or not as any counsel in the land. He moved that the matter be referred to the Parliamentary Committee.

Mr. PIDSLEY seconded this motion.

Mr. ARMSTRONG: Supposing the ratepayer who instructs these Solicitors is a pauper, or a comparatively poor man, who will pay the costs?

The TOWN CLERK replied that he gathered from the letter that the Solicitors had not yet found the ratepayer who would do for their client. He presumed, as Mr. Armstrong had said, that he would be a pauper, or next door to a pauper, as in a previous case. In fact, if he were found to have anything he would not answer the purpose, so that, in the event of the Council being successful, they would still be saddled with costs.

Mr. PACKHAM asked if this was not a parallel case with the former one referred to, where the order on the Treasurer was quashed.

The TOWN CLERK: It is totally different.

The motion to refer the letter to the Parliamentary Committee was then carried by 8 votes to 1.

Mr. HIRTZEL said, in answer to the questions raised, that there were heavy penalties upon solicitors who acted for paupers, or furnished them with funds to fight cases of any kind. If it could be proved, not only civil but criminal proceedings might be taken.

Alderman RICHARDS, after directing attention to the last paragraph of the second letter to the Town Clerk—"Suffice it to say that he is a ratepayer, and that he is acting under the advice of Counsel in the matter"—moved a resolution to the effect that the Solicitors be informed that the steps taken by the Council in reference to the Bill were not undertaken at the instance of the Aldermen or of any section of the Council, but by a vote of the whole body, and with the sanction of the general members; and, further, that the opinion expressed in the letter was disrespectful and uncalled for, reflecting upon the dignity of the Council.

Mr. PIDSLEY thought this resolution out of order. The letter had been referred to the Parliamentary Committee, and was done with.

Alderman RICHARDS said the subject of the letter had been referred, but not the letter, and he therefore claimed a right to move the resolution.

The MAYOR held that the reference to the Committee was with regard to the payment of the £150 specified, whilst Alderman Richards's motion had reference to the tone of the letter.

Alderman RICHARDS: It refers to a particular paragraph.

Mr. PIDSLEY maintained that the Council had really referred the whole letter to the Parliamentary Committee, and that the resolution ought to come up when the report was received.

Alderman RICHARDS stated that he did not at all care whether the matter was dealt with then or after the report came up. He should have pleasure in bringing his proposal up again when the proper time came, if the Council thought it wise not to bring it forward until after the report of the Committee was received.

Mr. FRIEND seconded the proposition; but, so as to be in order, asked the mover of the resolution to add a rider, empowering the Committee to obtain the opinion of some eminent lawyer, as to whether the paragraph in question was not a gross libel upon the members of the Council.

Mr. F. THOMAS thought the matter was getting complicated. He quite agreed that the Council should not pass over any matter affecting their own dignity, and if he recollected aright, when the vote was taken on the gas question there was a large majority on both sides in favour of the course pursued. He thought that if the whole letter was referred, the language used would be considered.

Mr. WILKINSON: Is the rider added?

Alderman RICHARDS said he had no objection to its being added. He did not wish to take up the matter in any carping or vindictive, but in a temperate spirit. His object was not to act hastily, or in a manner unbecoming the Council; but he felt very deeply the language used—not for himself, but for the sake of the whole body. Individually, he should not have cared about the matter, and had the letter been addressed to him he should have treated it with contempt; but he did not think the Council could afford to do so. He was quite willing that the letter should be referred to the Parliamentary Committee, but he thought they should be instructed to report on this portion of it as well as on the other.

Mr. FRIEND said that if the resolution he had seconded was put as it now stood he should move an additional resolution, as he thought there were many in the Council who were desirous of seeing the course he proposed adopted. Those who had so unhappily put their pens to paper had had months of time to consider their words, and therefore it was after due

deliberation, and with what the law reckoned malice, that these observations had been made.

Mr. PINSLEY hoped the whole matter would be referred, saying it must be remembered that the vote in Council, in respect of which the costs in question were incurred, was carried by a very considerable majority of the whole Council, and that, in fact, there were only two or three against it.

The Mayor then put the resolution as follows:—"That the letter of the 24th inst. be referred to the Parliamentary Committee, the latter clause especially, with a view of Counsel's opinion being taken upon it."

After some further observations as to the construction that was to be placed on the words in the letter, the motion was put and lost by 9 votes to 8.

Alderman RICHARDS thereupon gave notice that he would move the resolution at the next meeting of the Council.

THE PROPOSED PURCHASE OF THE LINCOLN GAS-WORKS BY THE CORPORATION.

A Public Meeting of Owners and Ratepayers of Lincoln was held on Friday, the 17th ult., "for the purpose of considering and, if thought fit, of approving of, and consenting to the promotion by the Corporation, in the next session of Parliament, of 'A Bill to give effect to an agreement for the transfer to the Corporation of Lincoln of the Lincoln Gaslight and Coke Company's undertaking; to extend the gas limits; to increase the number of the wards of the city of Lincoln; to confer further powers on the Corporation relative to water, markets, and fairs, and other matters of local government.'"

The Mayor (Mr. B. Cannon), who presided—after the notice convening the meeting had been read—said it was his duty to move the resolution of the evening. The Corporation, by a majority of its members, had determined to promote in Parliament, in the ensuing session, a Bill for different objects which in their wisdom they thought would be for the benefit of the city. "With the great majority of these objects he (the Mayor) agreed; but his views on the principal matter which would be contained in the Bill he need not repeat, as they were well known, the history of the matter being so recent. He, however, felt it due to himself to tell those present that while, as Mayor and as Chairman of the meeting, he moved the resolution, he reserved to himself the right to continue to hold the same views he had before with regard to the matter. He called upon the Town Clerk to read the resolution.

The Town Clerk then read the following resolution:—"That the owners and ratepayers of the city of Lincoln consent to the promotion by the Council of the said city, in the ensuing session of Parliament, of the Bill which will be deposited by them, or on their behalf, intitled 'A Bill to give effect to an agreement for the transfer to the Corporation of Lincoln of the Lincoln Gaslight and Coke Company's undertaking; to extend the gas limits; to increase the number of the wards of the city of Lincoln; to confer further powers on the Corporation relative to water, markets, and fairs, and other matters of local government.'"

Mr. BOURNE seconded the resolution, saying he could not admit for a moment that there existed a shadow of a doubt that the carrying out of the spirit of the resolution would be of great advantage to the city.

Mr. J. HARTLEY said probably all present had read from time to time the discussions that had taken place in the Council with respect to the purchase of the gas-works, and also the notice which had been published in the papers of the intended application to Parliament by the Corporation next session for certain powers. The great question they had to consider that night was the gas question; and about this he moved an amendment to the effect—"That the proposed application to Parliament, by the Corporation, for the transfer of the Lincoln Gaslight and Coke Company's undertaking be rescinded, and that no part of the corporate funds be expended in promoting the same." He asked the Town Clerk what expense they would be put to in promoting the scheme. As it was partly out of the Corporation funds and partly out of the rates, he thought the ratepayers ought to know.

The Town Clerk said it was to come out of the funds which the Company held.

Mr. HARTLEY, continuing, said the Corporation had already, to some extent, made arrangements to purchase the Company's works. His own opinion was that the town ought to have had the benefit of the undertakings of the Gas Company and the Market Company; but in years gone by the Corporation were asleep, and allowed companies to be formed, and it was now too late to enter upon such an expedient as purchasing the works of the Gas Company. He did not blame the Company at all for trying to get their undertaking off their hands under such favourable circumstances. If any of those present had a large business, and had a chance of disposing of it at 10 per cent., he would get rid of it. This was the state of things with the Company. If they succeeded in disposing of their works the city would have to pay 10 per cent. on the original shares for evermore—at any rate, for generations to come. A legacy for ever without any trouble! The rates of the city would have to be charged with it. In five, ten, or fifteen years the electric light would come into general use, and what would be the state of things then? They would have £5000 a year to pay out of the rates for that which was yielding nothing. The Directors of the Gas Company were going on very nicely. It was a grand thing for them; they were to have £2500 for compensation, and this, too, was to come out of the public rates. He did not find fault with them if the citizens were foolish enough to give them this sum; but he did hope the ratepayers would never give them a chance of doing so. The Corporation who had promoted the scheme were not infallible, and he would give some facts to show that they were not always to be trusted in their judgments.

In the city, moreover, the question of underground sewerage, Act upon the ratepayers. He trusted they would find a better way. But, of course, when the question was raised and the connections were put in, the next question was as to the disposal of the sewage. This was a proper question to consider, and to do it the gentlemen of the Corporation thought they must purchase a farm that was anything but a good one—and invest a lot of money, and he believed the interest was very small—2½ per cent. This, he said, was an error of judgment; it was a great mistake thus to expend the town's money, which ought to have been invested in something better. He referred to this matter to show that the gentlemen in the Council did not possess superior judgment to other people, and were liable to make mistakes. The next thing was the purchase of the undertaking of the Water Company. When the Corporation had the undertaking, they made it a successful business; the town much Corporation took to it, he believed it had not yielded on the present profit. This also proved that men were liable to err. The purchase of the gas-works would be a great mistake, seeing that £5000 was staring them in the face, so that gas in a few years would not ratepayers to prevent extent as it was now. This was the time for his amendment, such a calamity, and he would ask them to at present purchase the which provided that the Corporation should gas-works.

Mr. Woodcock seconded the amendment.

Mr. DALE, in regard to the gas clauses in the proposed Bill, said in his opinion the Corporation had "done" the Company. They talked about the £2500 to be paid to the Directors; but they did not mention that the Company had £11,000 in hand. The Corporation, by the purchase of the works, would thus pocket £11,000, and was not this an advantage to the citizens? He moved the following resolution, which he hoped would meet with approval:—"That a Committee of ten citizens be appointed to consider the clauses of the Bill, and confer with the Corporation from time to time on such amendments as may be conducive to the interests of the citizens."

Mr. F. J. CLARKE (the ex-Mayor) said every citizen almost would remember the part he took in opposing the Bill promoted by the Gas Company six or seven years ago—a Bill which he considered would have been a gross injustice to the city and citizens if it had been carried through; and, as he was conversant with the question, it would be well if he gave a slight history of the Company. Some 40 years ago they started, he believed, with a capital of £8000. They went on for many years making 40 per cent. on this £8000—£3200 a year; besides which they spent in mains and works and other things £36,000 more out of profits. They then applied to Parliament for powers to enable them to capitalize £72,000, which they called profits, and adding it to the £8000 made a total of £80,000, upon which they proposed to pay 10 per cent.—a scheme to which he was totally opposed at the time, and he did his part to prevent the Bill passing. He gave these figures because Mr. Hartley had said the Corporation intended to give the Company 10 per cent. for ever on their undertaking, whereas this was not the case. Lord Redesdale said he would only allow them to pay 10 per cent. on the £8000 original capital, which was £800 a year; and he would allow them to capitalize £86,000 out of profits which they had fairly spent, and they could pay 5 per cent. on this amount, so they went to the House of Commons for powers to enable them to pay a dividend of £8000 a year, and they finished off with being allowed to pay £2600 a year, £600 less than they were paying before they went to the House, and for any new capital they might require from time to time they were allowed to divide 7 per cent. He (Mr. Clarke) advised the Corporation then to purchase the gas-works, because it would have been a grand speculation for the city, but he could not make others see it in the same light as himself, and the matter dropped through. Some few months ago the Company expressed their intention to go to Parliament for additional borrowing powers. Some members of the Council, and he as Mayor, thought it was the correct thing for the Corporation to appoint a Committee to get information as to what other towns had done, and to see if it would be advantageous to purchase the gas-works. They requested Mr. Teesdale, their Auditor, to go through the accounts of the Company, and give them a statement, and then they applied to different towns throughout England for information, and asked their advice. In every instance they strongly advised a purchase of the works, and further than this they went to Leicester, where the Corporation took over the gas-works about 15 months ago. The Mayor, ex-Mayor, and the Chairman of the Gas Committee there said, "Whatever you do, get possession of the Gas Company's works; it has been the greatest thing for Leicester that we ever had." At Birmingham, at Nottingham, and at Manchester it was the same thing. Out of profits from the gas-works at Manchester they had paid for the erection of a Town Hall, which had cost a million of money. In place of paying 10 per cent. to the Company, as Mr. Hartley had informed the meeting, they would see Lord Redesdale had reduced the amount to only 5 per cent., with the exception of 10 per cent. on the £8000 of original capital. He (Mr. Clarke) was quite sure, from what he had seen in other towns, that if the works were purchased, it would benefit the citizens, effect a great saving to the ratepayers, and would be bound to be a success. There was the great scare about the electric light. In Hull they had it, and it would cost them three times as much as they were paying for gas. He had statistics to prove it; and further than this, if they looked at the papers they would find that, in face of the electric scare, the value of the London Gas Companies' shares had been gradually going up week after week for months past.

Mr. HUDDLESTON said Mr. Clarke had mentioned Mr. Teesdale as having looked through the accounts of the Company to show what profit had been realized by them. No speaker had mentioned what was read when the Corporation called in a Civil Engineer to look round the works, and see if they were in proper working order. He simply went round and looked, but he (Mr. Huddleston) did not hear, as a practical man, that holes had been dug in the streets to ascertain what was the state of the mains. If he had been called upon to examine it, one of the first things he should have done would have been to look at the state the main-pipes were in. If the Corporation had gone fairly into the question, they would not have boasted about taking £14,000, but would have seen whether the sum they offered would not be condemned in the same way as it was when they took over the Water Company's works. With respect to the pipes that were now laid down, if a fair valuation of them had been taken, he had not the slightest hesitancy in saying that the whole of the £14,000 would be spent in tearing up the streets of the city, and laying fresh pipes. He had very great pleasure in supporting the body of men who started the opposition. It had only been a very small body, but it had brought together one of the largest meetings ever held in the city of Lincoln to oppose a scheme that he was totally averse to.

Alderman MALTBY said he should endeavour to explain the position of the Company from their balance-sheet for 1879. In the first instance the capital account consisted of 320 shares of £25 each, that was £8000, bearing dividend at 10 per cent.—£800; the next were 400 new shares of £50 each—£20,000 at 7 per cent., dividend £1400; the next was called the improvement stock, which consisted of 320 shares of £114 each—£36,480 at 5 per cent.—£1824; then, further, there was some £1800 of 10 per cent. stock, which was entitled to an annual payment of £5024; but when he told them that the net profits of the Company last year—after reducing the price of gas, for six months of the year, at the rate of 5d. per 1000 feet, which made the income £1258 6s. 3d. less than it would otherwise have been—were £6601, of which £5024 was required for dividends, leaving a net balance of £1577, he thought they would agree with him that in the hands of the Corporation this amount could be considerably increased. It would be increased by the saving of the fees of the Directors—£200 per annum; and £40 would be saved by payment to only one Auditor. There was also the dividend to be received from the Consols (£327), which with the £240 saved, made £567. He had shown that the Corporation would be enabled to make £240 in excess of the profits now realized by the Company, and he would go farther than this. He found that during the past year the residuals—tar and ammoniacal liquor—sold for £750; but he, as a chemist, was positively certain that they would go on increasing in value, as there was such an increasing demand for them for many purposes. Already there had been an increase of £862 in the receipts this year over the calculations which had been made, and the profits would undoubtedly be much larger in future than they were now. So much for the position of the Company. Then as to the terms of the purchase; he knew that some people had taken very strong

exception to them. He would first answer the objection which had been raised by Mr. Huddleston, who had called attention to the fact that in Mr. Stevenson's report no remark was made nor anything said as to the condition of the mains in the streets. He (Alderman Maltby) could assure those present that this matter had been fully considered by the Corporation, by Mr. Stevenson, and by a gentleman whom every person in the hall respected, he alluded to Mr. Teague, who had examined many of the pipes in the streets. With regard to the terms of purchase, he contended that a man had a right to get full value for any article he had to sell. Now, the Company were placed in this position: If the present price of gas would not pay maximum dividends, the Directors could charge twice as much as they were now doing, so there were very good reasons for the Bill being accepted by the ratepayers. Reference had been made by previous speakers to the water-works. He was sorry to hear it said that the water-works did not pay at all, for there was a profit of £580 made on them last year. They had an undertaking which had cost £90,000, and while they were paying principal and interest back again every year, they had a profit of £500 or £600 left beyond. When he said that the water-works had cost the citizens only a little over £3000 out of the rates, he thought they would admit that after all the works were not a bad undertaking. He had no disposition to cram the present Bill down the throats of the citizens. Still, he was not going to run back from his opinions, and he contended it would be a grand thing for the citizens to purchase the gas-works. One friend had asked that night why they could not reduce the price of gas. Well, if the Corporation bought the gas-works they could light the streets for nothing, and they would have perhaps 5d. in the pound taken off the rates, which would be much better than a small reduction in the price of gas. He was as anxious as any one for the welfare of the citizens, and more particularly of the working classes; and, believing that the purchase of the gas-works would be a very good thing, and of great benefit to the city, he gave the Bill his support.

Mr. J. C. SMITH said, as a ratepayer, he had as much right to oppose the purchase of the gas-works as his friend Alderman Maltby had to advocate and support it. He was opposed to the purchase—firstly, because he did not think it would work so well as if the concern had a thoroughly organized and systematic directorate. On the one hand, with a directorate they had responsible men who had to appear before the shareholders every half year or year, and if those men, as directors, did not do their duty, the shareholders had their say on it, and they could supplant them at once. On the other hand, it was not so with the Corporation. They unfortunately very often did what they ought not to do, and what was their punishment? It was only the grumbling of a few ratepayers, which did not take any definite form, and by the time the councillor had to appear before his constituents again the matter was very likely forgotten. But it was not so with the Directors of the Company. That which touched a man's pocket was the pounds, shillings, and pence question. Secondly, he was opposed to it because the Corporation were willing to relieve the Shareholders of all risk and responsibility, and were granting them maximum dividends as though they were working the concern themselves. The Corporation would have to guarantee a very large proportion of the holders of the original shares, and he was especially opposed to the purchase when he found out that the guarantee was not to go, say, for 80 years purchase, but for ever. He said they would have to guarantee it for ever, although there was staring them in the face the electric light or any other scientific light that might in future years be brought forward. He did not believe the Corporation, although they had many faults, would, for the sake of getting profit out of the gas supply, in any way try to keep out a brighter and a better light. Then there was another thing. The whole of the discussions on the gas question had been held in committee, instead of being held in the public hall, and the principal report they had to look over was the Engineer's (Mr. Stevenson's) report; and this report every Councillor received only some two hours before he had to go and vote upon a matter of £138,000 purchase. The Council were hurried into giving a vote, being told by the Mayor that if they did not vote then it would be too late, for they would not get the Bill into Parliament; and he (Mr. Smith) hoped it was as far off getting there that night as it ever was. If he had done a very wrong thing—as his brother Councillors, no doubt, thought he had—in stepping over the ordinary etiquette of the minority being bound by the majority, he must say he thought that in ordinary things it was a proper thing; but when it came to a matter of consulting the ratepayers, then he said they had as much right to oppose the Bill as those gentlemen who formed the majority of the Council had to support it.

Mr. HORSPOOL said in the face of the electric light, as it was now progressing, it would not be wise on their part to purchase the gas-works. Consequently he was present to support Mr. Hartley's amendment, that nothing further be done in the matter.

Mr. SHEPPARD remarked that if the ratepayers consented to the Bill, it would simply be putting into the hands of the Corporation power which he did not think any local board ought to possess.

Mr. WYATT said he agreed with those who thought it was right the people should have the water-works in their own hands, and also the lighting of the streets; but he did not know whether now was the right time to buy the gas-works. If he had been in the Council when Mr. Cannon moved that the matter be postponed, he should certainly have gone with him. He was very glad that some years ago the Council acted with great caution in the matter of the sewage. They tried to stave it off for years, and they did so because they thought it was not a wise thing to launch into it all at once; and he thought that if the Council had acted with the same caution in regard to the question of the purchase of the gas-works, they would have done better. He had seen it in several places, and he was sure it would come to him that if the Gas Company thought the electric light would ever be much used they would take a lower price; they would sell their undertaking at what he might term a "job price." He did not think lighting by gas would go out altogether, but they wanted to look at the possibility of such a thing. If the Council purchased the gas-works they would buy the whole thing and the gas plant; and he should like to know whether the gentlemen who had had this matter in hand had ever put to themselves the question, "Can the present gas plant be utilized for other purposes, supposing the electric light comes into general use?" If it could be, the city did not run much risk in paying the £5000 annually for the property; but if they could not utilize it he thought they were running a very great risk. They could not tell what the future might unfold, they might have the electric light and lots of things, but if the electric light did come into use they would find themselves in a very awkward position, having to pay this £5000 a year. His opinion on the matter was that it would not be altogether a bad thing to buy the gas-works, and he did not think it would be altogether a good thing. As a private individual, apart from his connection with the Corporation, he should say wait a while.

Mr. BAINBRIDGE asked the Town Clerk whether or not it was a fact that they had already bought the Company's undertaking, and that the seal of the Corporation had been affixed to the agreement, so that they were not only morally but in a legal way bound to finish their purchase. He wished

to know whether it was not the old, old story, of locking the stable door when the steed was stolen?

Mr. J. T. TWEED (the Town Clerk) said it was perfectly true that an agreement had been sealed with the Company. Before they could go to Parliament it was necessary that there should be an assent on their part with reference to the question; and, therefore, the agreement was not binding unless they gave it their assent and it was confirmed by Parliament. He considered it was the very essence of a town to have the water-works and gas-works in their power. If they had promoted the present Bill 20 years ago the money which the Company had been pocketing (40 per cent.) would have been in their own pockets. He had not heard a single argument advanced to show that the contract and agreement would not be advantageous to them, except that with regard to the electric light. This light might come into vogue, and if it did, by the power of the Act of Parliament, the benefit to be derived from it would be conferred upon them, and they would have the benefit of whatever profit there might be in it. He would impress it upon the citizens to think over the matter before they voted against the Bill, for he was sure if they did vote against it they would regret it on a future occasion, because every clause was to their advantage and interest.

Mr. SMITH asked whether, notwithstanding that the seal of the Corporation had been put to the agreement between them and the Company, providing the vote of the ratepayers in Lincoln did not endorse the agreement, it was of any worth, because he believed the seal was put there subject to the approval of the ratepayers.

Mr. TWEED said he distinctly stated it could not be carried into effect without the approval of Parliament.

The MAYOR: Is the agreement valid against the opposition of the ratepayers?

Mr. TWEED observed that in all probability before Parliament would consent, they would say, "Where is the resolution giving the consent of the ratepayers?"

Mr. FISHER asked the Town Clerk whether if the voice of the ratepayers was against the Bill, anything further would be done.

Mr. TWEED remarked that this was not a legal question. He was not the Corporation, and he could not answer the question.

The MAYOR said it rested with the Corporation.

At the request of the Mayor, the TOWN CLERK then read again the resolution in favour of the sealing of the Bill.

The MAYOR observed that Mr. Hartley's amendment was really negative to the original motion, and with Mr. Hartley's permission he would put it as such.

Mr. HARTLEY having assented thereto,

A vote was taken on the resolution, and as only very few hands were held up in its favour—not a dozen at the outside—and an immense forest appearing against it,

The MAYOR declared the resolution lost, an announcement which was received with loud cheering.

Mr. CLARKE thereupon said he considered the measure far too essential to be decided in the way it had been. He thought that every citizen had a right to vote on the subject, and, therefore, on behalf of his fellow-citizens, and as it was a very important matter, demanded a poll.

Mr. WYATT seconded this motion.

Mr. TWEED, in reply to an inquiry, said the expense of the poll would be paid out of the corporate fund, which was the only fund out of which it could be paid.

A vote of thanks to the Mayor for presiding was then passed, and the meeting terminated.

The following morning a Special Meeting of the Town Council was held for the purpose of affixing the city seal to the petition to Parliament for the Bill.

The TOWN CLERK, having read the petition, said it was absolutely necessary it should be sealed that day if they intended that the Bill should go forward next session, and he must tell them that if the result of the poll which was demanded at the meeting the previous night was against the Bill, as a matter of course it dropped, and there would be an end of it. If the town did not sanction the application of their money for the purposes named in the Bill, the matter would naturally fall through. One of the things which the Council had to show was that the town approved of the Bill, and therefore by sealing the petition they would not override anything that might be done by the citizens, or was done the previous night. If, on the other hand, they did not seal the petition that day, the matter would at once be put an end to, whether the citizens polled in favour of or against the Bill. They would therefore see the importance of sealing the petition.

Mr. CLARKE proposed, and Alderman MALTBY seconded the motion for sealing the petition.

Mr. SMITH said he wished to ask the Town Clerk a question he rather evaded on the previous night. Supposing the petition was sealed, would the Council proceed with the Bill if the voice of the ratepayers was against it?

The TOWN CLERK said he must give the same answer as he gave at the public meeting. He could not tell what the Council would do. If, however, the ratepayers voted against the money from the funds of the Corporation being applied towards the promotion of the Bill, so far as the Council was concerned there was an end to the matter, inasmuch as they would not be able to comply with the Standing Orders, which required that the consent of the ratepayers should be given.

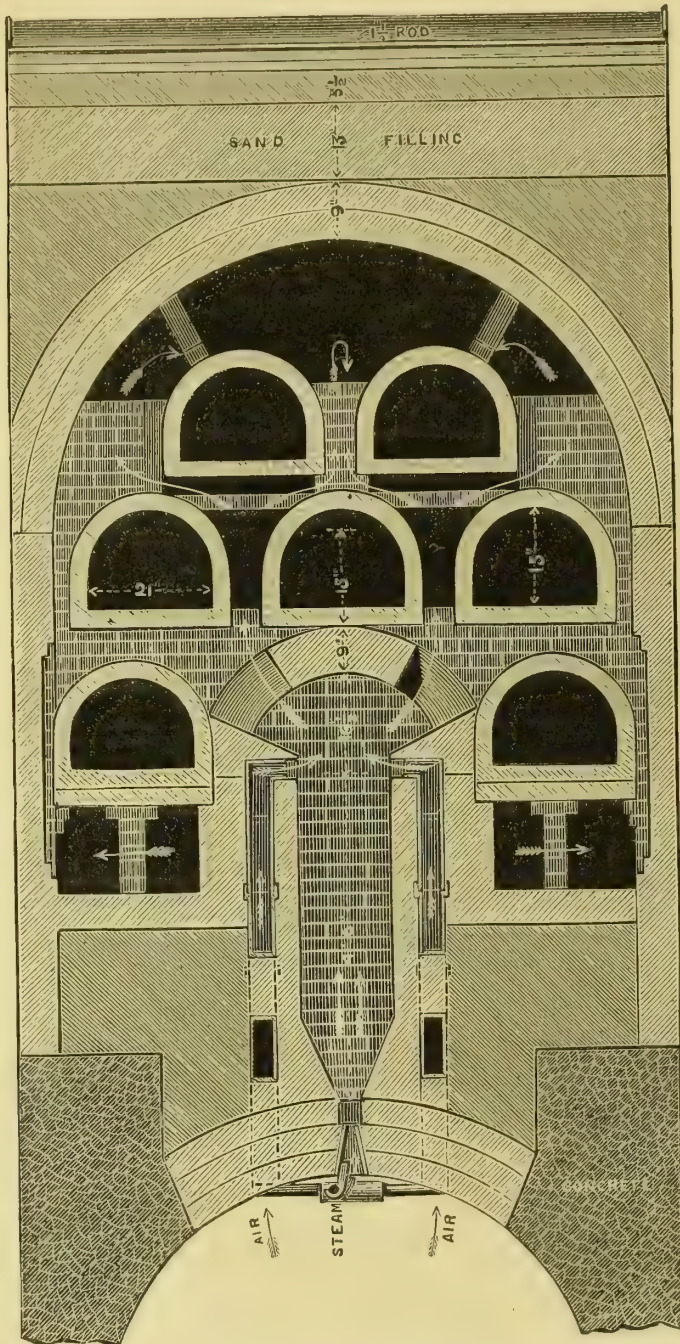
Alderman COTTINGHAM: How can that be the case, when we are sitting representatives of the people, they could not be allowed to spend money out of the public purse to promote or oppose Bills against the wish of the ratepayers.

Mr. WYATT asked if the Bill could not be withdrawn at once by the promoters, as he presumed a poll would not be necessary in that case. A might in the end have to sacrifice the Bill. He suggested that the better the whole question.

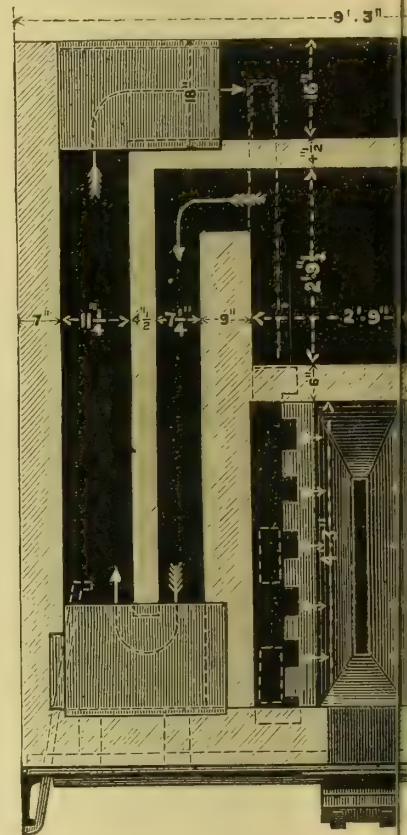
Mr. MARY was very pleased to hear that it was not the intention of the promoters of the Bill to try to carry the gas-works purchase against the wishes of the ratepayers, if the poll was found to be against it; and some further instances he would vote for the petition.

Mayor said a discussion then followed, in the course of which the Council could not be demanded, and in justice to the ratepayers expense connected with the petition. There had been considerable entirely wasted with the petition, and he was advised that it would be had been made to the petition was sealed. After the remarks that to the Bill the Council that, in the event of the poll being adverse hesitation in supporting itself not to proceed with it, he had no

A show of hands was petition. was carried unanimously, and the motion for sealing the petition



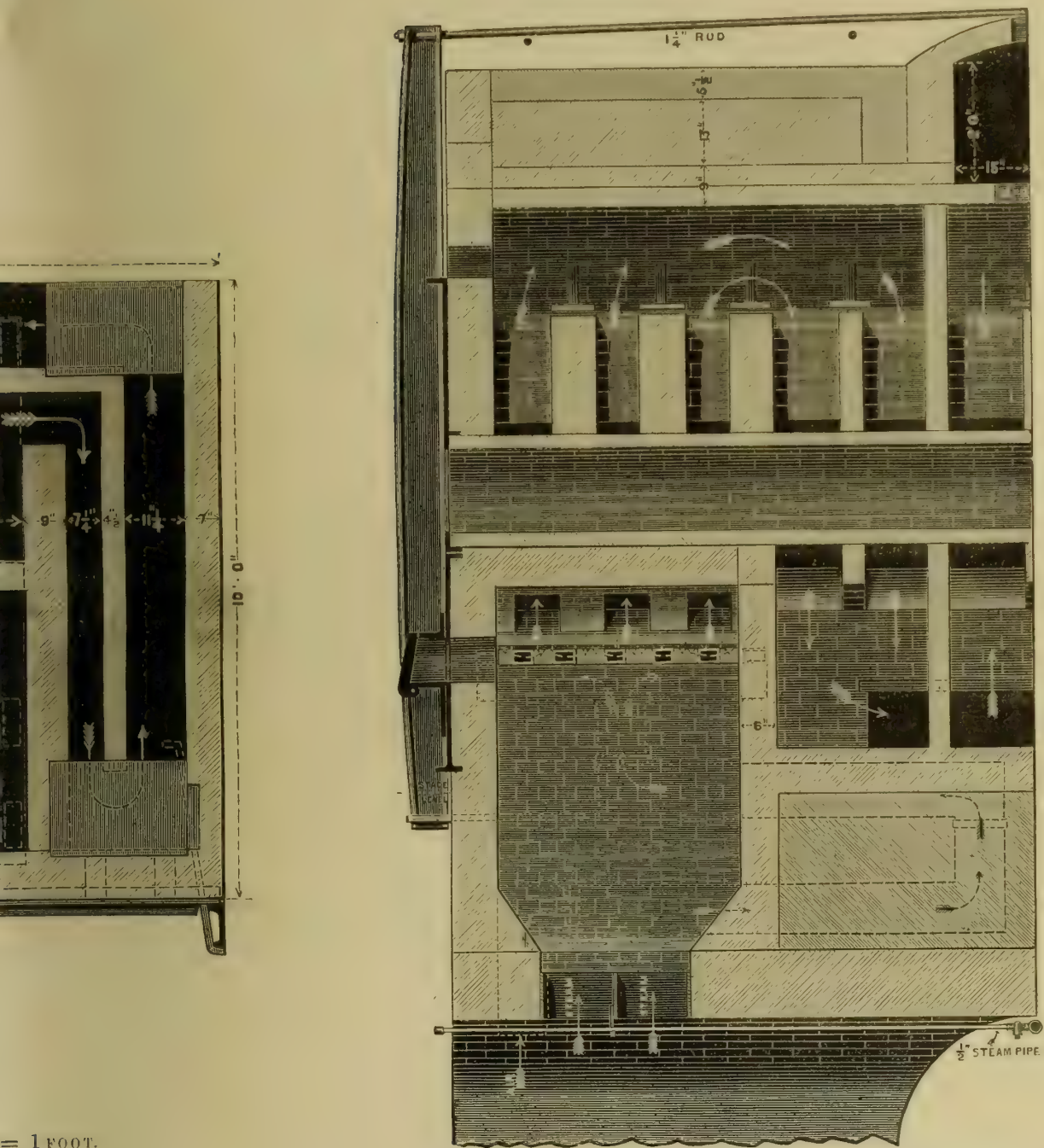
TRANSVERSE SECTION.



HALF PLAN

SCALE— $\frac{3}{8}$ IN

ANY-OLD KENT ROAD WORKS.



HALF LONGITUDINAL SECTION.

GEORGE LIVESSEY, M.Inst.C.E., Engineer.

REGENERATOR FURNACES.

THE GENERAL GAS LIGHTING AND HEATING COMPANY OF BRUSSELS.

The Annual General Meeting of this Company was held in Brussels on Dec. 18, when the usual report on the Company's operations for the year ending the 31st of August last, together with the financial statement, was presented by the Board of Direction, and unanimously adopted.

The report stated that the profit resulting from the working of the several stations of the Company amounted to 1,757,980 frs. (£70,319), and when this sum was compared with that realized in the previous year, the result could not, the Directors thought, fail to be satisfactory to the Shareholders. If, from the 1,996,852 frs. (£79,873) profit made in the year ending Aug. 31, 1879, were deducted the profit earned at the Chemnitz works, which, as stated in last year's report, had been handed over to the Municipal Authorities of that town—and such deduction would be necessary in order that the comparison of the two years might be fairly made—there would remain only 1,621,184 frs. (£64,847), which was less by 136,796 frs. (£5472) than the amount made in the preceding year. If, however, the increase of profit in the year 1878-9 over that of 1877-8 were taken, it would be found that the amount was then only 82,565 frs. (£3303), which was less than the profit of the year 1879-80 by 54,231 frs. (£2169). There was, therefore, a considerable augmentation in the amount of profit earned in the year ending August last, and this, the Directors thought, justified them in regarding as satisfactory the operations of the Company for the period dealt with in the report.

With regard to the sale of the Chemnitz works, the Directors were pleased to find that the deficit caused by the relinquishment of this portion of their undertaking had, as they had anticipated would be the case, been in a great measure compensated for by the interest obtained on the bonds issued by the Municipality in part payment of the purchase-money for the works, as also by an improvement in the revenue earned at the other stations of the Company. This fact, the Directors considered, supported their opinion that without decreasing to any very appreciable extent the total amount of profit made, the sale of the Chemnitz works enabled them to improve the Company's financial position.

In order to provide for any future depreciation of works and plant, the Directors had placed to the sinking fund a sum of 450,000 frs. (£18,000). The works of first establishment carried out during the past year consisted principally of extensions and alterations of the mains. The total amount thus expended was 547,604 frs., apportioned as follows:—

	Frances.	Sterling.
Buildings	167,143	£6,686
Plant and machinery	194,572	7,783
Mains	185,889	7,435
Total	547,604	£21,904

The new works of the Company at Prague had been commenced, and the Directors hoped they would be finished in the course of the current year; while as a proof of the satisfactory progress of the business generally it was stated that a concession for 31 years had been granted to the Company by the Commune of St. Laurent-Blangy-lez-Arras for the lighting of the town.

Coming to the general statistics of the year 1879-80, the report stated that the revenue earned by the Company from the sale of gas had exceeded that of the preceding year. There had been sold 16,957,888 cubic metres (598½ million cubic feet) of gas, against 16,063,762 cubic metres (567 million cubic feet) in the year 1878-9; being an increase of 894,126 cubic metres (31½ million cubic feet), or 5·57 per cent., while in the preceding year the increase had been only 510,253 cubic metres (18 million cubic feet), or 2·87 per cent. The mains had been increased by 17,271 metres (18,883 yards), thus bringing up the entire length to 601,776 metres (657,946 yards).

The working accounts of the several stations showed that 71,566,458 kilos. (about 71,566 tons) of coal had been carbonized, which had produced 20,784,937 cubic metres (733½ million cubic feet) of gas, being at the rate of 29·043 cubic metres for every 100 kilos. (about 10,250 cubic feet per ton) of coal used, against 28·45 cubic metres (about 10,000 cubic feet to the ton) in the previous year. The coke produced amounted to 48,340,730 kilos. (2,863,524 bushels), being at the rate of 67·52 kilos. per 100 kilos. of coal carbonized, or about 33 bushels to the ton, against 31·8 bushels to the ton last year. There were 3,250,271 kilos. (about 715,060 gallons) of tar produced in the distillation of coal, being at the rate of about 9·98 gallons per ton, against 10·27 gallons in the previous year; and there were 65,610 hectolitres (about 1,444,000 gallons), of ammoniacal liquor made, against 57,398 hectolitres (1,263,000 gallons) in the preceding year.

In addition to the expenditure on new works already alluded to, the following amounts had been laid out for the purposes indicated:—

	Frances.	Sterling.
Working plant	593,450	£23,788
Meters, &c., on hire	220,408	8,816
Coal	149,816	5,993
Residual products	58,398	2,336
Materials	43,777	1,751
Total	1,065,849	£42,634

These figures showed a slight increase over those of the previous year.

The profit for the year 1879-80 amounted, as already stated, to 1,757,980 frs. From this was deducted 100,000 frs. (£4000) expended on new mains and gasholders, and 24,000 frs. (£960) set aside as the first instalment of a special sinking fund for the old works at Tournai. The profits in the year 1878-9 (exclusive of the Chemnitz works) having been 1,621,184 frs. (£64,847), there was shown to be an increase in the past year of 136,796 frs. (£5472), which with the 24,000 frs. above referred to made a total of 160,796 frs. (£6432), or about 10 per cent. more than the profit made in the preceding year. Then with the further addition of the balance of 13,828 frs. (£553) brought forward from the previous year's account, and 125,947 frs. (£5038), the amount received by the Company under the arrangement with the Municipality of Chemnitz, there was made up a grand total of 1,897,755 frs. (£75,910) available for division among the Shareholders. From this sum had, however, to be deducted the amount to be placed to the sinking fund, the statutory interest of 4 per cent. upon the reserve, and a few other items, by which it was reduced to 746,403 frs. (£29,856). This sum was apportioned as follows:—

	Frances.	Sterling.
First dividend of 25 frs. per share	583,875	£23,355
15 per cent. on balance, added to reserve	22,305	892
Allocated among chief officers	17,868	715
Second dividend of 5 frs. per share (making 6 per cent.)	116,775	4,671
Total	740,823	£29,633

This left a net balance of 5580 frs. (£223) to be carried forward.

The report of the Directors was, as usual, accompanied by that of the Board of Supervision, who agreed with the amount of dividend recom-

mended, and testified to the accuracy of the accounts presented, which were as follows:—

Dr.—Statement of Assets and Liabilities, Aug. 31, 1880.

	Frances.	Sterling.
To Share capital (23,355 shares)	11,677,500	£467,100
Bond ditto	10,748,000	429,920
Reserve fund	765,054	30,602
Sinking fund	2,525,175	101,007
Unpaid share coupons	6,857	274
Unpaid bond ditto	215,969	8,639
Balance due on Anderlach works	160,347	6,114
Bills payable	8,027	357
Sundry creditors	198,511	7,941
Security deposited by chief officers	395,000	15,800
Dividends = 30 frs. per share	700,650	28,026
Balance carried to profit and loss account	5,580	223
	27,407,570	£1,096,303

Cr.—Statement of Assets and Liabilities.

	Frances.	Sterling.
By General expenses of first establishment	21,788,089	£871,523
Difference between the issue and redemption price of bonds	1,075,391	43,016
	22,863,480	£914,539
Extensions of works and mains	523,694	20,941
	23,387,084	£935,483
Supplies—plant and materials	1,065,849	42,691
Sundry debtors	567,487	22,629
Chemnitz Municipality bonds, 4½ per cent.	1,862,358	74,000
Caution-money deposited at Rimini and Sienna	39,716	1,589
General benefit and relief funds	61,399	2,456
Bills receivable	1,394	56
Miscellaneous funds	37,383	1,496
Security deposited by chief officers	395,000	15,800
	27,407,570	£1,096,303

Dr.—Profit and Loss Account, Aug. 31, 1880.

	Frances.	Sterling.
To General expenses	90,078	£3,603
Bond coupons	556,861	22,274
Bankers' commission, interest, &c.	25,846	1,034
Sinking fund on works of first establishment	450,000	18,000
First dividend of 25 frs. per share	583,875	23,355
Added to reserve fund—		
4 per cent. on amount thereof	28,567	1,143
15 per cent. of profits	22,305	892
Share of profits allocated among chief officers	17,868	715
Second dividend of 5 frs. per share	116,775	4,671
Balance carried forward	5,580	223
	1,897,755	£75,910

Cr.—Profit and Loss Account.

	Frances.	Sterling.
By Balance on Sept. 1, 1879	13,828	£553
Profit on the year's working at the several stations of the Company	1,757,980	70,319
Interest paid by the Municipality of Chemnitz, and bond coupons	109,033	4,361
Profit on realization of Chemnitz bonds	16,914	677
	1,897,755	£75,910

BORDEAUX GAS COMPANY.

The report of the Board of Directors of this Company, for the year ending June 30, 1880, presented at the annual general meeting of Shareholders held towards the close of last year, and unanimously approved, showed that the Company's business had made satisfactory progress during the twelve months reported upon.

The balance of revenue remaining after the payment of the necessary working expenses, salaries and wages, repairs, &c., was 548,037 frs. (£33,921), from which had to be deducted 371,457 frs. (£14,858), to provide the interest and sinking fund on the Company's bonds and obligations, leaving a balance of 476,580 frs. (£19,063). From this had to be deducted 5 per cent. for the statutory reserve, 23,829 frs. (£953); for the share redemption fund, 60,000 frs. (£2400); and the interest at 5 per cent., 150,000 frs. (£6000); making a total of 233,829 frs. (£9353), and leaving a balance remaining of 242,751 frs. (£9710). Deducting the Directors' fees, 24,275 frs., there was left for distribution among the Shareholders a sum of 105,000 frs. (£4200), exclusive of 35,000 frs. (£1400) set aside as the founders' share of profits, and 78,476 frs. to be carried forward. The amount available for distribution allowed of the payment of a dividend of 42 frs. 50 c. (£1 14s.) per share on all the shares, subject, however, to a deduction of 25 frs. for interest at 5 per cent. on certain classes. The amount added to the reserve brought up the total of this fund to 89,125 frs. (£3565). The profits would, the report stated, have been much greater if the Directors had not been compelled to lay in stocks of coal at a time when, owing to the long continuance of severe weather, there was almost a complete stoppage of navigation on the Gironde. These purchases of raw material, effected under unfavourable conditions, pressed heavily upon the manufacturing expenses, not only by the high rate of freight prevailing at the time, but also by the lower yield of gas obtained, and the consequent increased quantity of coke necessary for the purpose of carbonization.

From July 1, 1879, to June 30, 1880, there had been sent out from the Company's works 15,793,363 cubic metres (about 557½ million cubic feet) of gas, which produced a revenue of 2,279,445 frs. (£91,177). Compared with the preceding year, these figures showed an increase of 2,281,105 cubic metres (about 80½ million cubic feet) and 220,487 frs. (£8820). The production of gas had increased at the rate of 16·88 per cent., while the revenue had advanced at the rate of only 10·70 per cent. This difference had arisen from a larger number of leakages from the mains having taken place in the past than in the preceding year, as also from excessive condensation, owing to the low temperature prevailing during the very severe winter of 1879-80.

The number of meters in use on July 1, 1879, was 8548, representing 89,961 burners, inclusive of the meters which were the property of the consumers and those used in the municipal establishments and the theatre. On June 30, 1880, the number had increased to 9033, representing 100,430 burners; so that during the year covered by the report there had been an increase of 485 meters and 10,469 burners, of which number 481 meters and 8787 burners were for the use of private consumers.

During the twelve months ending June 30, 1880, there had been carbonized 58,150,868 kilos. (about 58,150 tons) of coal. Compared with the previous year's working, this showed an increase of 10,201,283 kilos. (about 10,201 tons), or at the rate of 21·27 per cent. The number of retorts had been increased by the erection of several new settings, and thereby the total productive power of the works had been brought up to 78,000 cubic

mètres (about 2½ million cubic feet) per 24 hours. The maximum daily make attained during the year was on the 10th of January last, when nearly 70,000 cubic mètres (close upon 2½ million cubic feet) of gas were produced.

In the matter of storage, the report announced the completion of a new gasholder at La Bastide, by which the storage capacity of the Company's works was increased to 37,500 cubic mètres (about 1,321,000 feet).

Extensions of the mains had been carried out during the year, some 2315 mètres (2530 yards) of new pipes having been laid. Beyond this, 3592 mètres (3927 yards) of old mains had been taken up, and replaced by new ones of larger diameter.

A number of alterations and improvements in the works had been carried out by the Directors in the course of the year, the most important being the enlargement of the retort-houses and the construction of additional benches, the erection of station-meter and purifying houses, and other buildings, the general inspection and repair of mains, the provision of additional material for the public lighting, the completion of the new gasholder already referred to, and the commencement of a second, and the purchase of two station-meters. These works had entailed an expenditure of 683,260 frs. (£27,330), which brought up to 7,617,411 frs. (£304,696) the total amount spent by the Company on works of first establishment.

BEYROUT WATER-WORKS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the London Offices, on Monday, the 20th ult.—E. EASTON, Esq., in the chair.

The MANAGING DIRECTOR (Mr. R. M. Young) having read the notice convening the meeting, the report of the Directors was taken as read. It stated, *inter alia*, that not only had the wooden aqueduct fully answered the purpose required, but also there had not occurred, during the past year, any accident of importance. The machinery and the works generally were reported to be in a satisfactory state. The Directors referred with satisfaction to the growth of revenue, derived through increase of supply to the householders, and from a demand which had arisen for irrigation purposes. The Manager at Beyrout was of opinion that during the current year there would be a further increase of revenue from these sources. Mr. J. E. Cornish, the Company's Resident Engineer, having resigned, Mr. Percy Martindale, C.E., had been appointed in his place. The Directors had every reason to believe that they had selected a gentleman well qualified for the position. The revenue account for the year ending the 30th of September last showed that the amount received and due for water supplied was £6578; the expenses at Beyrout and in London, and "general" expenses, were £11,558, including £8100 for debenture interest (6 per cent. on £135,000); and a debit balance of £4970 on the year's working was carried to the balance-sheet.

The CHAIRMAN, in moving the adoption of the report and accounts, stated that since he last met the Shareholders he had visited Beyrout, had gone carefully over the works, and had looked anxiously into the question of further extending the income of the Company. Speaking as a water-works engineer of some considerable experience, he might say that the only reason why the Company had not been so successful as water companies often were, and ought always to be, was that, as had frequently happened before, too much had been spent on capital account. The works were exceedingly well constructed, and answered their purpose admirably; but they were sufficient to supply a town four or five times the size of Beyrout; and, burdened with this extra capital, the consequence was that the Company had to look forward farther than most water companies, in order to get a return for their money. He, however, could see several ways in which their income could be increased, particularly by extending the use of water for irrigating purposes. Wherever water was applied to the soil in Syria, it had exactly the same marvellous effect as in Egypt, it did not quadruple, but multiplied even by eight or nine times the produce of the land; and there was a considerable quantity of land in the neighbourhood of Beyrout which could be supplied from the Company's works with water for irrigation purposes, by the expenditure of a little capital. It was to this point the Directors alluded when they said in the report that they would like to have a Committee formed at the meeting to confer with the Board as to the best means by which they could carry into effect this idea of his. Weighted as the Company were with their large capital, they did not at present see their way to raising more money to carry out any works of irrigation, or works which would increase their sale of water; but by forming another company, with, perhaps, the same gentlemen as those who were interested in this Company, or those of them who would enter into the matter, they might very easily and with profit carry out the works. What the Shareholders would perhaps suggest to the Committee was that, by means of a subsidiary company, their surplus water, which was very abundant indeed, or a large quantity of it, might be taken, paid for, and used on land in the neighbourhood of Beyrout. Since the publication of the report the Directors had received reports from their Resident Engineer, Manager, and Auditor, and he (the Chairman) thought he might say they were all very satisfactory. The income for the year had increased—the gross income by £1500, and the net income available for the debenture interest by £2000. The reason of the latter being larger than the former was that in this year the Directors had not had to spend the large amount on their works which the tremendous flood of 1878 rendered necessary, and which came into last year's accounts. The accounts, however, showed a steadily increasing business, both for domestic and irrigation purposes, and this would go on. The Manager stated that the water had now become a necessity to those houses which took it, and that this necessity was becoming more recognized every day.

Mr. J. MORRIS (a Director), in seconding the motion, spoke of the importance of extending the Company's operations as suggested, pointing out that their great difficulty was not only that at present the Directors had nothing to give to the Shareholders, but that they were unable to pay their debenture interest, and they would have to wait some time if they waited for the growth of their revenue from merely present sources. What was wanted was, he thought, some pluck and spirit to teach the natives what were the uses of water, and its application to purposes of irrigation; but there was no capital for carrying out these little enterprises which the Directors desired to carry out with the view of increasing the Company's income. In their present circumstances the only way of raising fresh capital was from among themselves, or by means of another company. The interest asked would be prohibitive if they attempted to borrow money. The new company would take the surplus water, and thus the old Company would create their best customer, as it were, the water being supplied to them at a cheaper rate than to the consumers generally. The Company would thus be benefited; but the new people would take the risk as well as the profit arising from the venture. Another matter, as to which the Directors were very anxious, was the extension of their concession, which at present had only 32 years to run. Supposing they could raise some fresh capital, the Directors' idea was to go to the Municipality of Beyrout, point out what they purposed doing, and the benefits that would be conferred on the place by the establishment of mills for grinding corn, and the greater irrigation of the land, as it was to these objects it was proposed to direct attention, and on the strength of this endeavour to

obtain an extension of their concession. If the Municipality consented, as it was hoped they would, they would then go and get the matter confirmed at Constantinople. It was hoped by the raising of this new capital to get the debenture-holders to consent to forego their arrears of interest, and also take a lower rate of interest for two or three years.

A discussion of a conversational character ensued, in the course of which the advantage of the scheme referred to was generally recognized.

The CHAIRMAN, in reply to questions, said the Municipality were the Company's best customer, and paid them very regularly in cash. The potential supply of the Company was about 12,000 cubic mètres, or 2,640,000 gallons, a day, of which not quite one-fourth was consumed.

Mr. MORRIS said the Company could not raise fresh capital except with the consent of the Turkish Government, and this would be difficult to obtain.

The CHAIRMAN stated that the amount required for the plan referred to would be from £15,000 to £20,000; but if the new company had a capital of £50,000 it would certainly be something to talk about. The interest paid on the debentures was 3 per cent. About £8 or £10 an acre would be readily paid for water for irrigating purposes.

Ultimately a resolution was passed appointing a Committee "to confer with the Directors on the application of the Company's water to new purposes, and if approved, and a scheme for raising the new capital can be devised, by means of a new company or otherwise, the necessary steps for carrying the same into effect be at once taken by the Board."

A vote of thanks was then passed to the CHAIRMAN, and the proceedings terminated.

METROPOLIS WATER SUPPLY.

The following are the returns made by Dr. Meymott Tidy, on the Composition and Quality of the Metropolitan Waters in December, 1880:—

[The results are stated in grains per Imperial gallon of 70,000 grains.]

NAMES OF WATER COMPANIES.	Total Solid Matter.	Oxygen required by Organic Matter, &c.	Nitro- gen. — As Nitrates, &c.	Ammo- nia.	Hardness (Clark's Scale).	
					Before Boil- ing.	After Boil- ing.
<i>Thames Water Companies.</i>						
Grand Junction	22.73	0.060	0.177	0.000	16.5	3.7
West Middlesex	22.18	0.081	0.188	0.001	15.4	3.3
Southwark and Vauxhall	22.95	0.060	0.177	0.001	17.6	3.3
Chelsea	22.41	0.064	0.177	0.001	16.5	4.2
Lambeth	23.01	0.060	0.188	0.000	16.5	3.3
<i>Other Companies.</i>						
Kent	30.06	0.000	0.406	0.000	22.4	7.0
New River	23.21	0.052	0.188	0.001	17.6	3.3
East London	23.99	0.086	0.177	0.000	16.5	4.2

Note.—The amount of oxygen required to oxidize the organic matter, nitrates, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOTT TIDY.

GAS EXPLOSION IN GLASGOW.

LOSS OF FIVE LIVES.

At an early hour on New Year's morning a terrible gas explosion occurred in Glasgow, by which five persons were killed, ten people injured, and two houses completely destroyed. The explosion occurred while a number of the families were celebrating the New Year. A large quantity of gas, which is supposed to have come from a broken main-pipe, accumulated underneath the flooring of the ground flat at No. 169, Henderson Street, a comparatively new district in the north-west quarter of Glasgow. William McCulloch, an occupant of one of the houses, was so alarmed by the strong smell of gas that he procured the assistance of two police-constables and a neighbour named Hugh Reid, a gas-fitter, to see where the escape came from. While they were examining near the kitchen the gas exploded in the parlour, and without a moment's warning the windows were blown out, and the partitions of that and the adjoining houses, along with the ceilings and floors of the flat above, were torn down and destroyed. The furniture of the houses was smashed into matchwood, and the inmates thrown down and buried in the debris, while the windows of several tenements on the opposite side of the street were broken. Two explosions of a lighter nature followed. A number of persons set about rescuing those who were unable to extricate themselves; and very soon the bodies of Wm. McCulloch and Hugh Reid were brought out, but life was extinct. The mother of Hugh Reid, who had come from Kilmarnock to visit her son, was afterwards found, and removed to a neighbour's house, but she died on Saturday evening. A little girl, Jeannie, aged four years, was carried out and taken to the Western Infirmary, and she died in the afternoon, while the wife of Hugh Reid, who was only found after she had been embedded in the ruins for nearly eight hours, died on Saturday evening; making in all five deaths. A Mrs. Chapman and two of her daughters came from Perth to see her sister, Mrs. Duncan, who resided on the first flat of the tenement, and all were thrown down and severely hurt, while the other neighbours had an almost miraculous escape. Of Hugh Reid's family all are dead with the exception of Rebecca, a young girl of six years of age, and she is injured. The names of the killed are—Wm. McCulloch, a mason, who leaves a widow and seven children; Hugh Reid; Mrs. Hugh Reid; Jane Reid, daughter of Hugh Reid; Mrs. Reid, sen., mother of Hugh Reid. The injured are—Mrs. Duncan; Mrs. Chapman, and her daughters Ann and Mary; Mrs. McCulloch and her daughter Marion; Rebecca Reid; John and Mrs. Currie; and two police-constables, Henry Hamilton and Dickson McKelvin. The houses are so shaken and torn that they have had to be propped up, and in all between 20 and 24 families have been rendered houseless, and no fewer than eight have lost nearly all their furniture besides.

(BY TELEGRAPH FROM OUR OWN CORRESPONDENT.)

GLASGOW, Monday Afternoon.

The explosion which occurred on Saturday morning has proved seriously fatal. Five persons are already dead, including Reid, the gas-fitter, his wife, mother, and one daughter, four years of age; and another injured person is not likely to survive. An extraordinary destruction of house property has been caused by the explosion, which is alleged to have been due to a great accumulation of gas that had escaped from the street main, owing to subsidence, and became ignited through coming in contact with an open fire or one of the police-constables' lanterns. The fire was not extinguished for some hours after the explosion, owing to the non-arrival of the night attendant from the Corporation Gas Office. A strict inquiry into the circumstances is to be made forthwith.

AMERICAN GASLIGHT ASSOCIATION.

EIGHTH ANNUAL MEETING AT CHICAGO.

[From the "Official Report" in the *American Gaslight Journal*.]

(Continued from Vol. XXXVI., p. 1015.)

At the close of the discussion in reference to the proposal to change the time of meeting of the Association, Mr. WEBER, on the invitation of the President (Mr. W. H. Price), made some remarks on the subject of "Gas Furnaces," and exhibited the plans of some Liegel's generator furnaces he had erected at the works of the Metropolitan Gas Company of New York City. After giving some particulars as to the construction and working of these patented furnaces in different places where they are in use, he concluded his statement by saying that he thought the time was near at hand when all fuel would be converted into gas, and that it would be used in this way to much better advantage as a fuel for heating in gas-works as well as in other industries, because any desired intensity of heat could be attained, which was not the case with furnaces as at present constructed. Another advantage was that any kind of coal, coke, or carbonaceous material could be used. Europe, he said, had not been favoured with the quantity of coal that was wasted in America, and Europeans had therefore been compelled to utilize their material in the best possible way, so as to produce the highest results. He ventured to assert that in five years from the present time every one would have become so thoroughly convinced of the advantages of this system that it would be adopted almost universally.

A short desultory discussion followed Mr. Weber's statement; after which a paper prepared by Mr. EDGERTON was read by the Secretary. It was as follows:—

SELLING GAS ON AN ILLUMINATING BASIS.

It is difficult to speak of gases quantitatively in any other way than by the cubic measure; hence the selection of cubic measure as a basis of price and sale. The invention and introduction of the gas-meter as such a measure were, indeed, steps of vast importance in the advancement of gas lighting. The manufacture of gas could have made but slow progress without it. The meter has been perfected—it is now a most accurate instrument; but, as it became mechanically more perfect, the anomalies of the cubic foot as a basis of price became more apparent. Most of these anomalies, it is true, are only apparent, not real, arising from the rather excusable ignorance of consumers in regard to meters. Others, and unfortunately the most serious, are founded on fact.

The difficulty in regard to meter measurement is that it is based upon quantity alone, and quality is lost sight of. Now, the value of gas is dependent not only upon a combination of quantity and quality, but they are exactly convertible terms. For instance, of 15-candle gas, 5 cubic feet per hour are required to give a 15-candle light, whereas of 80-candle gas but $2\frac{1}{2}$ cubic feet are required to afford a 15-candle light the same length of time.

There is good reason why quality of gas is lost sight of, particularly by the buyer—no ready and accurate means of ascertaining the varying quality of gas exists. The usual apparatus is expensive, and the standard of comparison variable. Different burners give different values to the same gas, and as the quality varies, the burners should vary. Hence gas testing is apparently involved in chaos, and some manufacturers seem to think it their interest to keep it there, because, as they contend, poor gas yields most profit to the manufacturer; and consequently, in their view, it is in the long run best for the consumer.

The only well-grounded reason, however, for a dislike of quality tests is the fear that they will not be carried out; and, above all, the real difficulty of maintaining at all times a uniform standard at the consumer's burner—a difficulty that can hardly be exaggerated. With coal alone, and even with canal added, the fluctuations are really great and uncontrollable. The quality varies with the material, the manufacture, the period of storage, the temperature and pressure of the air. How to meet all these difficulties is indeed a troublesome problem, for certainly the temperature and pressure of the air are things not controllable. And, if all these difficulties can be made to disappear, the inability of the consumer to ascertain quality puts an apparent end to basing a price thereon. It is surely a poor trade where only one party can know of a certainty what he is doing. Therefore any quality basis involves, in reason, the position that the buyer shall be able to ascertain it rightly. Neither can the price be varied from day to day to suit the quality, as can be done in the sale of other articles. The manufacturer in this respect seems to be in an unfortunate position.

Legislation has taken hold of the difficulty, and with about the success we might anticipate. The manufacturer has been discommoded, without any benefit to the consumer. In fact, it is the old story—legislation steps in to adjust differences between buyer and seller, and levies tribute on both, for the benefit of lawyers and supernumeraries. It is true, gas manufacture in this country has had comparative immunity from the attacks of law-makers—not, however, because there is less reason or excuse for interference. When gas is sold upon a correct basis, which shall embrace quality as well as quantity as one of the factors of value, and when an ordinarily intelligent consumer can be provided with means for ascertaining both quantity and quality to his satisfaction, without having to rely on the certificates of inspectors, then, in fact, the business will have a right to be independent of the interference of special laws, and a just public sentiment will not require nor even countenance them.

Having mentioned many of the difficulties in the way of establishing a quality basis for prices—made it appear, perhaps, quite impossible—I propose to put forward a plan which, in the present state of the science of gas manufacture, I believe will meet and overcome all difficulties. I hope it will receive the severest of criticism, that not only objections founded on reason will be urged, but the still greater array founded on prejudice—on conservatism so called.

Before going into the description, it will be best to clear away in advance some of the apparent difficulties, as well as to state a few further reasons in favour of a quality basis. It will not be necessary to argue that a quality basis alone is favourable to plans for extracting the greatest quantity from any given material, and is, therefore, a premium on a low-quality gas, because in all the range of gas-producing materials the greater the cubic measure of the yield of gas, the lower the quality and the faster it will consume, either for a given light or with a given pressure. It is true that with every gas-making material there is a point of yield beyond which the illuminating effect is diminished in a ratio greater than the yield is increased. A quantity basis not only tempts us continually beyond this point, but leads to an excessive degree of ingenuity to deceive ourselves as to its proper location; as, for instance, in the employment for quality tests of a burner which enhances poor gas and depreciates relatively better qualities of gas. A quality basis, on the contrary, will lead us in the direction of better gas, and in this direction lie the greatest economies. If this is not a true proposition, poor gas in England and Scotland would be selling as cheaply, light considered, as rich gas, which is not the case, and never has been.

It is an undeniable fact that the higher the quality of gas, the more advantageously it burns in such burners as consumers, for other reasons than economy of light, are prone to use. I speak of high-pressure batwing

or fishtail burners, as against lower-pressure Argand burners or checked batwings and fishtails. The reasons for this preference are plain enough. An Argand burner has the drawback of a chimney to be cleaned, and besides will not stand the slightest current of air, particularly if the burner is economical of gas. Flat-flame burners of low pressure, though economical of poor gas, compared with high pressure on them, are vacillating, flickering, and prone to smoke. Flat-flame burners at high pressures, on the contrary, give a fixed flame, and are little liable to smoke. Low-pressure burners have for years been the sole stock-in-trade of vendors, and yet but few remain in use, notwithstanding their comparative economy with poor gas.

In regard to the difficulties of testing gas, agreeing upon methods, standards of illuminating power, burners, &c., the troubles all lie in giving a proper illuminating value to different kinds or fluctuating qualities of gas. I do not believe it can be questioned that it is in the power of almost any one to ascertain, with the simplest of apparatus and instruction, whether two different gases are of the same illuminating quality. No question of standard or burners need necessarily intervene. The old durability test, applied with proper apparatus and a little care, will do the business completely. Take, for instance, one of Sugg's "D" Argand burners, and, adjusting it to an accurate meter and governor, turn on the gas to a given height of flame (say 3 inches, as Mr. Sugg advises), and note for a given time the rate of gas consumption. This experiment often repeated, each time turning down and re-adjusting the burners, will demonstrate the accuracy with which such a simple matter as the height of flame can be used to show uniformity of consumption. Dilute the gas employed in this experiment with the smallest percentage of a gas giving no light, and the consumption in a stated time for a 3-inch flame will change—more gas will be required. Again, take a number of single jets, turn them to a uniform height, and note the amount of gas consumed in a given time. The gas remaining the same, the rate of gas consumption will be surprisingly uniform. A change in the quality of the gas, even to the slightest extent, will show in the consumption, the height of flame being maintained. As the gas grows richer, the consumption is less, and *vice versa*. Sugg's Illuminating Power Meter is based upon these facts, but Mr. Sugg has gone farther, and made a scale showing the quality corresponding to different rates of consumption in equal times.

We might anticipate difficulty in adapting one scale to different gases, and indeed there is, unless the difference is provided for by an alteration in the height of flame. Sugg's scale, however, corresponds very closely with results obtained by the use of his Argand burners. For my purpose, I wish only to substantiate that equal heights of flame, in Sugg's Argands and in jets, correspond to equal consumption of gas when the gas is uniformly luminous; and *vice versa*, that equal heights and unequal consumption indicate difference of luminosity.

The difficulties of manufacturing a uniform standard have been mentioned, and appear to be quite insurmountable, if great uniformity is needed. Suppose, however, a gasholder filled with gas below a certain standard, another with gas above the standard, it seems not at all impossible to add of the rich to the poor until the standard is obtained. I am aware that even in the larger works there are, at times, fluctuations during the manufacture, and it would be difficult, if not impossible, to gauge the admission of a rich gas, even of uniform quality, to produce a uniform result. But to a holder containing poor gas, a uniformly rich gas can be added until a certain standard is obtained.

Having cleared away some of the difficulties, I will now describe my plan of making a uniform gas and selling it on an illuminating basis. There is nothing startlingly new in it; if there were, I should not propose it with much confidence. In fact, it is based essentially upon the well-known, the tried, and approved.

Having determined upon the kind of gas to be made, I proceed as follows, and for greater clearness of illustration I will carry out a supposed case. I have made a number of tests of the gas of the Municipal Company in New York, and will take that as a basis to serve for illustration.

I first obtain a 14-candle flame in one of Sugg's new Argands, preferably his "C" burner. Mr. Sugg gives in a table the height of flame required in his "C" burner to afford a 14-candle light; but as his statement is based upon coal gas, it does not quite hold good with the Municipal Company's gas; hence it will be necessary to make a series of tests to ascertain with accuracy the exact height of flame necessary to give a 14-candle light with the gas in question. It is not necessary to note the exact consumption of gas required to maintain the flame, except as a matter of easy control; in fact, a meter on the burner can be dispensed with. Having obtained a 14-candle flame, I place it at a convenient distance from a photometric screen; and at an equal distance, but upon the opposite side of the screen, is placed an ordinary burner of the excavated batwing variety, with the flat of the flame turned at an angle of 45° with the line between the two lights. Gas is turned on to the ordinary burner until an equal light is obtained upon the screen. In regard to the flat-flame burner, it should be chosen of such size as to afford approximately a 14-candle flame, with a pressure of 4-10ths to 5-10ths at the point of ignition. In the case of Municipal gas, it should be a 4-foot excavated lava-tip batwing. It would be found to consume 2.6 cubic feet of gas to afford a 14-candle flame. As this point is a matter of importance, which has to be ascertained once for all, a series of tests must be taken. The batwing should be turned off, and again on, to a point of equal light, many times; at each operation ascertaining, by an accurate meter, the hourly rate of consumption. A mean hourly rate having been ascertained, the third step is to find the height of flame in a suitable Sugg's Argand which a rate of consumption equal to that of the 14-candle consumer's burner will give. It will be best for this purpose to use an Argand a size smaller than the one previously employed to get a 14-candle flame—say burner "B" of Sugg's series. As a check, it will be well to supply a cluster of simple jets, say three to five in number, with an amount of gas equal to that required for the 14-candle flame burner, and to note the height of the jets, the height of all being equalized. The two Argand burners are to be marked with a ring on the chimney of each—that on the larger, "C," indicating the height of flame required to give a 14-candle light; the smaller one, "B," the height of flame afforded by a rate of consumption equal to that of the consumer's batwing when giving a 14-candle jet. The burner "B" thus marked I call the "consumer's test burner." Attached to a governor, it can be used by the consumer to test the registration of his gas-meter, on a plan which will be presently described.

We have now an Argand burner, "C," marked with the height of flame required to make a standard light. We have also a rate of consumption by the meter, corresponding to a given height of flame. In the manufacture we have to see to it that for the given height of flame a uniform consumption rate is maintained from day to day. I believe the simplest way to do this is on a plan first introduced in Waco, Texas, last year. The Argand burner "B" is adapted to an accurate meter and governor, and the standard gas is turned on to a convenient height of flame short of smoking or tailing. The consumption rate having been ascertained, the motion of the gas hand is geared up or down, as the case may be, so that the gas hand of the experimental meter shall revolve in exactly one minute. The standard quality of gas is then turned on until the hands of the minute clock and the gas hand revolve exactly together for a number of minutes.

The height of flame is then marked on the chimney. For convenience it will be best to have the clock hand and the meter hand run concentric, as in Sugg's experimental meter. It is plain, then, that with the height of flame as marked, the hands of the meter and clock will run together, with gas of a proper standard; as the standard varies, the gas hand will gain or lose on the clock.

My plan is to alter the richness of the gas from time to time, by altering the feed of naphtha, so as to keep the hands revolving together. To do this most effectually in large works, the test meter should be located to take the passing gas as near the retorts as possible, and to this end should have a small purifying apparatus connected with it. The changes will thus be more quickly noticeable. The difference in relative purification may cause the test to vary slightly from the standard, and to note this difference, if desired, a duplicate may be made to run on the gas coming from the large meter. There is no difficulty in adjusting the feed of naphtha to produce a given richness of gas; in fact, the feed may be far more delicately regulated than we can obtain indications whereby to regulate it.

Being in a position to produce a practically uniform gas, there is really no great reason why it cannot be sold upon a quality basis. I will shortly describe the means I have found most effectual to accomplish it. The price of gaslight is stated at a definite sum per hour for a 14-candle light. If it is desired to make the new standard easily comparable with coal gas prices, it is only necessary to remember that a 14-candle flame requires fully a consumption rate of 5 cubic feet per hour, in a moderately checked burner. This burner will give a flame somewhat lacking in steadiness, and will approximate the point of smoking; but an economical burner for coal gas, and yet one desirable in other respects, is very hard to find. A compromise between economy and steadiness of flame will have to be made.

The following table will serve to show the cost per hour for a 14-candle flame corresponding to various prices for good coal gas:—

	Dols.	Cents.		Cents.
Gas at . . .	1	00	per 1000 feet affords a light of 14 candles for	$\frac{1}{2}$ per hour.
" . . .	1	50	" . . .	"
" . . .	2	00	" . . .	"
" . . .	2	50	" . . .	"
" . . .	3	00	" . . .	"
" . . .	3	50	" . . .	"
" . . .	4	00	" . . .	"
" . . .	4	50	" . . .	"
" . . .	5	00	" . . .	"

And so on, adding $\frac{1}{2}$ cent per hour for each 50 cents per 1000 cubic feet.

The above comparison is based upon really good coal gas, such as is made at Boston and a few other places I could name. I believe it is based upon a quality above the average.

In the case which I have been following, it is evident that the meters would have to be so arranged as to register 1 cent per hour for each 2.6 cubic feet of gas, to put the price equal to coal gas at 2 dols. per 1000 feet. This would be very easy to do. The above ratio is based upon Municipal gas, as actually found; a slight increase of naphtha would bring the rate of consumption to 2½ cubic feet, which would be a better ratio. It is obvious that the meter registration can be arranged in divers ways to accomplish my purpose. For instance, it might be made to register hours' consumption of a 14-candle power. The dial in this case would be in standard 14-candle hours. Each hour registered would indicate a light of 14 candles for one hour where the consumer's standard burner is used. If a larger burner is used, a slightly greater proportional light would be obtained; if smaller, slightly less. Rich gases, however, give but slight variations in the ratio of light to gas consumed, for varying consumption. If a "standard hour meter" is used, the hours indicated have to be multiplied by the price, just the same as with the cubic foot meter, with this difference—that a standard hour light is a definite amount. Again, the meter may be made to register "candle feet." I borrow this term from Mr. Farmer, only giving an altered meaning to it. An hour's 14-candle light is given by 5 candle feet. For a 14-candle gas, 5 candle feet and 5 cubic feet would measure the same; for any other quality they would differ in cubic measure, but be the same in light-giving power—1000 candle feet would always equal 1000 cubic feet of coal gas in light-giving properties. Between candle feet and cubic feet would be this difference: 5 cubic feet may give a light of 14 candles for an hour; 5 candle feet *must* do it. The candle feet bills would be made out as usual—say, "1000 candle feet, at 2 dols. per 1000 feet," means that the consumer has had 200 hours' consumption of a 14-candle light.

I have spoken of this programme as a proposed plan. It has, however, been carried out for a number of years, and is working more or less successfully in about 40 towns. The methods have been perfected from time to time. The last improvement has been to put the consumer in possession of a certain and accurate test, as above described.* To bring the consumer into friendly understanding with the Company, and make him their advocate and the advocate of the much-abused gas-meter, is indeed a matter of congratulation, if it can be done. The method of doing it is, in my opinion, to furnish him with a means of satisfying himself of the general accuracy of meters, and the uniformity of light. Very few consumers are aware of the present accuracy of meter measurement, because they have no independent means of establishing it.

Now come the objections to the system. The trial already had has developed all the objections likely to arise on the part of the consumer, and in a far stronger light than they can now be viewed. When the system was first introduced it was more difficult to manufacture a uniform standard, for though no new principles of testing have been applied, old ones have been modified and perfected to best suit the emergency. The jet photometer did not answer to rate naphtha gas. We had to go back to the principle of the old duration test of Dr. Fyfe; but instead of using his single jet, it is better to use an assemblage, or one of Sugg's burners. Then we had no means at the start to make the consumer his own judge of quality. He had to rely on comparatively crude tests; but, notwithstanding, I heard of few complaints from the consumer. He was generally satisfied with the statement that such and such a burner gave a 14-candle light. This was, no doubt, owing to the fact that great pains were taken to keep up to, or above the standard promised.

The first town in which I set the meters—Sunbury, Pa.—gave to the official test 39 hours' light for 35 cents. The rate there was to have been 1 cent per hour for a 14-candle light. I attach hereto a copy of the test made at Waco, Texas, during July and August, 1879, showing the degree of uniformity that can be expected. After each filling of the holder at Waco, a test meter, provided with a burner such as described, is set in motion, the clock hand and gas hand together. At the end of ten minutes the fraction of a cubic foot of gas consumed is entered in the accounts. From this is deduced the time required to burn 1 cubic foot of gas, giving a continuous 14-candle flame. The report shows, during July, a mean of 39.01 minutes' duration for 1 cubic foot; highest, 40 minutes; lowest, 38.6 minutes; highest above the mean, 2½ per cent; lowest below the mean, 1 per cent. August shows: highest, 40 minutes; lowest, 38.6; mean,

* The meter was patented, but no extra charge was made for it on that score. It is my intention to patent the above, in connection with the standard light for proving.

39.24; thus differing but 57-100ths of 1 per cent. only from the previous month. When it is remembered that 1 cubic foot supplied in an Argand burner gives a light of 14 candles for a period of 39.24 minutes, the richness of the gas seems quite extraordinary.

In conclusion, I wish to submit the following propositions for discussion, believing that I can substantiate my views of the advisability of manufacturing and selling gas strictly upon an illuminating basis:—1. By a proper use of naphtha or mineral oils gas can be made, either pure or mixed, of great uniformity in regard to illuminating power. 2. To attain this uniformity, a modification of the durability test is most useful, and without a *continuous* test, somewhat as described above, no great uniformity ought to be anticipated. 3. Owing to the great range in quality of gas as manufactured at present, it will be conducive to the interests of the manufacturer, as well as the consumer, to sell gas upon an illuminating basis.

Discussion.

Mr. FORSTALL said the discussion opened by Mr. Edgerton was a very important one. There was no doubt that, theoretically, he was right. Gas should be sold according to its quality, just as any other manufacture. If one were starting gas-works in a new country that had never had anything to do with meters or cubic feet, it was very likely the first idea would be to sell gas according to its illuminating power. But a great many companies were bound by statute to sell gas by cubic feet. This was the case in New Orleans, where the Company were entitled to receive so much per 1000 feet. They could afford to give 15-candle gas for the price charged, but if they made 30-candle gas they could not charge any more. The meters were rated at so many thousand cubic feet; and these considerations would, at the outset, prevent Mr. Edgerton's plan from being carried out in New Orleans.

Mr. HELME said he remembered that some years ago Mr. Edgerton patented the dollar and cent meter he now referred to. It was constructed upon a theory which might perhaps be all right if it could be carried out practically. If he made a uniform high quality of gas, and put on small burners, he certainly obtained a good light for a small amount of gas. But the difficulty came in there, as it did in most places, that small burners closed up, and gas-fitters were always ready to put on new burners whenever they were asked to. The result was that people became dissatisfied in places where they had gone on the basis that a high quality of gas should be sold for a correspondingly increased price. Although the meters were all rated right, yet when they came to figure upon it in some places, it was found that they varied a good deal. People then began to consider there was a great amount of uncertainty on the part of gas companies, and would think they had been cheated, unless there were printed on the backs of the bills full instructions as to how the meters should be read, and how they could themselves tell whether they were using a large or a small quantity of gas. But even if consumers were educated up to this point, they would forget it before the next bills came in. The result was that he did not see any better way than to keep on with the cubic feet meter.

Mr. STARR said he presumed it might be well to have a good meter to register the quantity of the gas, but could not see why a dollar and cent meter should be any better than any other, because the feet measure must be used. It was to the interest of all gas companies to make good gas; which would give more satisfaction than any meter that registered dollars and cents or otherwise. He thought the difficulty would be to find something that would give the test quality of the gas in the meters.

A vote of thanks was then passed to Mr. Edgerton for his paper.

(To be continued.)

RECENT HISTORY OF ELECTRIC LIGHTING.

By Professor HENRY MORTON.

President of the Stevens Institute of Technology, Hoboken, U.S.

[From the New York Sanitary Engineer.]

On the 17th of October, 1878, in fulfilment of a promise made a year before, the present writer read before the American Association of Gas Engineers an address in which (alluding to the reports then resounding in the daily papers as to Mr. Edison's new form of electric lamp) he said, after quoting an account of a similar report current twenty years before in France: "These promising experiments, as we all know, reached no successful results. I would by no means, however, have it inferred that better success can never be attained. On the contrary, there are several very promising directions for experiment, on one of which no doubt Mr. Edison is at present embarked; but the difference between a promising line of experiment and a successful result, as all the world's history teaches us, is often a distance of many years, to say the least." An opinion so little calculated as this to aid in "bearing" gas stocks, naturally excited no little disgust in certain quarters, and I had the pleasure of seeing myself very handsomely abused by those whose approval would have been a very doubtful compliment.

Looking back over the space of two years which has elapsed since those words were uttered, and remembering the events which have transpired in this connection, I feel that I have much more reason to congratulate myself than have those who took an opposite view.

Not only has "the promising line of experiment on which Mr. Edison was then engaged been separated by many years from a successful result," but it has, within this time, been totally abandoned by him for another, which other is, to say the least, still under approval, and the discredit and ridicule which have been cast from all sides have shown how unfortunate and unwise were the reckless and unfounded assertions of the would-be prophets of the Press.

Notwithstanding these drawbacks, however, continual progress has been made in the development of the art of lighting by electricity, and we have to regret that what would otherwise have been a dignified march of advancing science, reflecting nothing but credit upon this country and its inventors, has been degraded to some extent into a carnival rout of grotesque and absurd extravagances.

In recording the progress which has been made in the art of electric lighting, the most important practical results have been achieved by those who have devoted their attention to the application of the electric arc. The great difficulty which presented itself two years ago in this subject was the unsteadiness of the light, its great liability to extinction, and the actual cost of maintaining it. By improvements in the carbon rods, as to their purity of composition and uniformity of structure, a great increase in steadiness has been attained, and by other improvements in the mechanical arrangements of the self-adjusting lamps, this amelioration has been likewise assisted. Among those who have done most for the improvement of the carbon rods I would mention Wallace and Sons, of Ansonia, and among the most marked improvements in electric lamps I would cite those of the Brush Company, of Cleveland.

The economical efficiency of the electric generators or dynamo-electric machines has also been increased, and in this regard the best results, so far as accurate tests which have been published indicate, have been obtained by Mr. Edison, whose machine, as tested by Professors Young and Bracket, shows the very high efficiency of 84.1 per cent. of motive force or energy converted into electric current. The machines of other

inventors appear to be only a few per cent. behind this, if indeed some of them are not found to equal it when accurately measured.

In consequence of these improvements, and of the energy with which the several manufacturers have brought these machines to the notice of those likely to use them, their employment in factories, stores, workshops, and hotels has become very general, and has undoubtedly proved of great advantage and convenience, although instances are not wanting (as, for example, in the great cotton mills at Lowell, Mass.), where the electric lighting was abandoned after a thorough test. There is, however, so wide a field in which this light has manifest advantages over any other means of illumination that we may confidently look for a vast increase in its introduction in all parts of the country.

Turning next to the production of light by incandescence, we find that this branch of the art also has made marked advances. This art had its beginning as early as 1845, when in the patents taken out in England by King, the representative of the American, Mr. Starr, we find described the use of platinum wires and thin rods of carbon, the latter enclosed in a Torricellian, or absolute vacuum. Extensive experiments in the same line were made by Mr. Moses G. Farmer, the widely-known electrician, about the year 1868, and again a little later, by Dr. Isaac Adams, the inventor of the process of nickel plating, now widely used; but the costliness of an electric current derived from a galvanic battery prevented the earlier experimenters from reaching any commercial success, and even with the cheap electricity of to-day, there is still a limit set upon this sort of lighting, by its relatively wasteful expenditure of electric force and consequent costliness. Great progress has, however, been made here also.

Mr. Edison supposed he had solved the problem two years ago, when he had re-invented the earlier methods of Starr, Farmer, and others; but very soon finding, as they had done, the insufficiency of his solution, he attacked the problem afresh with an energy, persistence, and originality of resources worthy of all praise. In the course of his researches he has brought to light a number of astonishing results, and has discovered whole classes of new properties in platinum, and other metals, and lime, magnesia, zirconia, and other substances. Had his enthusiastic friends only claimed for him from time to time what he had actually done, his fame would have been unparalleled as a discoverer, and without blemish. Unfortunately, too many prophecies have been indulged in, and the credit of really great achievements has been overshadowed by the failure of still greater assertions and promises.

After the abandonment of the platinum lamp, Edison next took up the carbon-in-vacuo lamp of Starr, and, as before, his friends shouted "Eureka," at the beginning, and not at the end of his search. The carbon lamp, as first made by him, has met the fate of its predecessors, and has been abandoned by him likewise; but from its ashes have arisen, both in his and other hands, improved descendants, which show much better chances of survival.

Having found it practically impossible to make his paper carbons sufficiently durable when heated to such an intensity as would render them even possibly economical as sources of light, he has ransacked nature for some material which would fill these hard conditions, and in a certain variety of bamboo has found something which he believes will yield him a fine hair-like thread of carbon with which he can obtain the light of 16 candles from a single lamp, at an expense of 3400 foot-pounds of energy per minute. This would represent about nine such lamps, or about 155 candles, per horse power. This is a decided improvement in efficiency over his horseshoe lamps of last year, and with a durability, as is claimed, of six months, will carry his system a long step forward on the road towards success.

Starting, also, with the idea of Starr as to the use of a strip of carbon in a vacuum, Mr. Maxim has proceeded along a different road. In place of searching through nature for a substance which would yield a perfect lamp-carbon on heating, Mr. Maxim has sought to make a perfect carbon strip in his lamp by building it up on any imperfect form as a substratum. To accomplish this he has taken a strip of carbonized paper as his ground-work, and has plated this over with a metallic layer of graphitic carbon, by heating the original carbon strip by a current in an atmosphere of gasoline vapour. Under these circumstances, not only is a sheet-like coating of this peculiar carbon deposited all over the strip, but, if there is a weak spot anywhere in it, the carbon will be first deposited at this point (on account of its getting hotter than the rest), and thus an irregular or defective carbon strip will be repaired and rendered uniform.

By this process two objects are attained. In the first place, a good carbon strip is secured, no matter what imperfections may have existed in the original paper or other carbon foundation. In the second place, the outer surface of the strip is composed of that variety of carbon whose resistance to heat and mechanical injury surpasses all others. All familiar with the material will know that what is technically called "gas carbon" (i.e., the carbon deposited in the outlet of retorts by the decomposition of the issuing gas) of gas is a metal-like substance, the cutting, breaking, or shaping of which is very difficult, on account of its combined hardness and toughness. It very rapidly spoils the best steel files and saws, and to break it with a hammer is almost a hopeless undertaking. I have also known a weighed quantity of it to be placed with the fuel in a cupola furnace where iron was being melted, and to have been taken out again, after some hours, not sensibly diminished in weight. This is the material of which the surfaces of the carbon strips in the Maxim lamps are composed, and should they prove as enduring as is hoped, it is to this that we should naturally credit their resistance.

I have measured a number of these lamps with such results as the following:—

Lamp A.—Resistance cold, 20.4 ohms, and when yielding in its best position the light of 50 standard candles, its resistance was 8.3 ohms. The current required to heat it to this degree was one of 4.07 webers, and the energy expended was therefore about 5850 foot-pounds. This would represent about 5½ such lamps to each horse power of energy of current employed, or an efficiency of about 275 candles per horse power. Taking 70 per cent. of this as the average for all positions, we would have about 192 candles per horse power of current. Now, the amount of actual horse power in the steam-engine required to develop one horse power in the lamps will vary with the dynamo-electric machine, the number of lamps in use, and many other conditions; but we may assume 60 per cent. as a safe allowance, and this would give us about 115 candles per actual horse power from the engine as the efficiency of this lamp when run at 50 candles.

Another lamp (D) whose resistance cold was 115 ohms, when yielding a light of 52 candles required a current of 1.35 webers, and had a resistance of 64 ohms when emitting the above-mentioned amount of light. The electric energy consumed in this case was, therefore, about 5131 foot-pounds per minute, or about 6.4 such lamps to a horse power, or at a rate of 330 candles per horse power of current. Taking 70 per cent. as the average light in all directions, reduces this to 231 candles, and assuming 60 per cent. as the efficiency of the conversion from steam power into electric current in the lamp, brings it to 138 candles per horse power of mechanical force developed in the steam-engine. We see, therefore, in this case also a marked advance upon the state of the art a year ago.

Undoubtedly the advance now made is sufficiently encouraging to

authorize the experiments which are being made to apply these lights on a practical scale in locations where they have peculiar advantages, as, for example, in the vaults of the Safe Deposit Company, New York. When that experiment has been carried on for a few months, we shall know much more than we do now as to the actual running cost of the system, but anything like a general adoption of the same in place of gas is still an affair of the future, about which prediction is premature.

A NEW ARRANGEMENT OF THE BUNSEN PHOTOMETER.

By MONS. E. PELTZER,
Student Engineer at the School of Mines, Liège.

[Translated from the *Revue Universelle des Mines*.]

Among the numerous modifications which the Bunsen photometer has undergone, there is one which recommends itself by its precision and its simplicity. It is that adopted by M. Desaga, of Heidelberg.

Like other Bunsen photometers, the one now under notice consists of a paper screen, in the centre of which is a spot produced by the application to the paper of some wax or stearine, and invisible when the two sides of the screen are equally illuminated. In fact, all light received upon the screen is divided into three portions—viz., reflected light, transmitted light, and the light absorbed by the screen. If these three qualities of light are represented by a , b , c , we shall be able to affirm, as regards the ungreased part of the screen, that—

$$I \text{ (the luminous intensity)} = a + b + c.$$

For the greased part of the screen, that—

$$I = a' + b' + c'$$

Whence—

$$a + b + c = a' + b' + c' \quad (1)$$

Let us suppose now that the screen is illuminated on one of its sides, A, by a light of the intensity of i , and the other side, B, by one of the intensity of i' , the clearness with which the screen will appear to an observer placed on the side A will evidently be—

$$E \text{ (ungreased portion)} = i + a + b$$

$$E' \text{ (greased portion)} = i' + a' + b'$$

If $i = i'$ we shall have—

$$E = i(a + b)$$

$$E' = i(a' + b')$$

And in order that E shall be equal to E' we must have $a + b = a' + b'$.

Now the ungreased portion of the screen absorbs more light than the greased portion. In other words, c is $> c'$, and by virtue of the equation (1) $a + b < a' + b'$. Consequently $E = E'$. This is proved by experience: "Place the screen equidistant between two lights of the same intensity, and the spot will appear brighter than the annular surface."

In order to render $E = E'$, it will be seen that it is sufficient to make $i' = i' > i$, in such a way as to satisfy the equation—

$$i''(a + b) = i(a' + b')$$

which is done by moving towards the screen the light on the side of the observer, or removing the other farther away. Herein lies the cause of the errors in ordinary photometers, the distances of the lights from the screen being no longer comparable.

The new arrangement of the spot photometer is based upon the principle that the comparison of the two lights should always be made on the same side of the screen. The apparatus consists of a horizontal graduated bar, upon which may be placed longitudinally a cylindrical box capable of turning on a vertical axis. The back and sides of the box are opaque, while the front carries the screen. In the inside there is a small gas-jet, supplied with gas by means of an india-rubber tube, and the consumption of gas is regulated by a tap. On the left-hand side of the instrument is the standard light; on the right is the gas-flame of which it is desired to test the illuminating power. The consumption being ascertained by means of a meter, the two elements necessary for the determination of the quality of the gas submitted for examination are furnished.

The examination is conducted as follows:—The lights having been started, the cylindrical box is brought near to the candle, the screen being turned towards the standard light, until it is stopped by a peg fixed at a distance of 20 centimetres (about 8 inches) from the candle. The gas supply to the interior burner is then regulated so as to cause the spot to disappear entirely. The screen then has one uniform tint. This having been done, the box is turned 180°, so that the screen receives the light of the burner under examination. A second trial having been made, to cause the disappearance of the spot without interfering with the interior burner, the distance from the screen to the burner being tested is accurately measured. Taking as a basis the law of the decrease of luminous intensity, the intensity sought is ascertained by means of a fourth proportion; but in order to obviate the necessity for making this calculation for each experiment, the bar is directly graduated into candles. The flame to be compared occupying the zero of the scales, the division is obtained as follows:—If we represent (1) by 1 the illuminating power of the standard burner, the luminous intensity upon the screen at 20 centimetres will be $20^2 \div 1$ for the first position of the box; (2) by X , the luminous intensity; and (3) by x the distance from the screen in the second position, we shall have the equation $1 \div 20^2 = X \div x^2$; whence X is deduced from this calculation. Inversely, if we make X successively equal to 1, 2, or 3 candles, x , the unknown quantity, will be expressed by—

$$\begin{aligned} x &= 20 \sqrt{X} \\ \text{For } X &= 1 \text{ candle, } x = 20 \times 1 = 20 \\ &= 4 \text{ candles, } x = 20 \times 2 = 40 \\ &= 25 \text{ candles, } x = 20 \times 5 = 100 \end{aligned}$$

Therefore, by the aid of this instrument of small dimensions, relatively powerful luminous intensities may be measured. All that is required is the employment of an intermediate light. This might be considered as a source of error, but the fixity of the light is fairly constant during an experiment, the pressure of gas depending upon a regulator.

M. Desaga has recently introduced an improvement in the instrument. It consists in observing the internal face of the screen by means of a small mirror placed at an angle of 45° before a circular opening 8 centimetres (1.1 inch) in diameter, and situated in the upper part of the opaque portion of the box. In this way no inconvenience is felt from the presence of outside lights, which usually tend to interfere with the accuracy of the observations.

In order to render the movement of the box regular upon the bar, the latter may be provided with a rack and pinion, furnished with a handle. A regulating screw is also well adapted for ensuring greater precision.

This instrument, which is easy of manipulation, obviates the use of costly arrangements necessitated by the process of Dumas and Regnault. It also allows observations to be made more easily and with greater rapidity than with other appliances.

The Swindon New Gas Company, Limited, are about to erect tar and ammonia works, and the tender of Mr. T. V. Clarke, of Deptford, has been accepted for them.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

The present having been a week largely devoted to festivity in Scotland, the record of news having special reference to gas and cognate subjects is somewhat meagre. A circumstance has, however, just come to my knowledge, which has given rise to a good deal of speculation as to the ultimate result, and I have little doubt that intense interest will be manifested in the matter by meter makers all over the United Kingdom. The circumstance to which I refer, although bearing directly upon meter makers, has a wider and a deeper range, and should it be decided as I understand the Inspector of Meters here desires, there will be a clearing out of the Augean stable, if I may so describe the accumulation of meters—good, bad, and indifferent—which have been poured upon the market from so many opposite quarters, since the registration of gas was made compulsory. It is hardly necessary for me to tell gas managers that meters are tested for soundness as well as for error; but as every one may not have at hand a copy of the Sales of Gas Act, 1859, I may quote the 13th section, which bears directly upon the question about to be raised, and to which I shall more particularly allude in a few sentences. That section provides—"Firstly, the meter shall be tested for soundness or leakage only, and not for percentage of error, when fixed on a horizontal base, and with gas under a pressure equal to a column of water three inches high, with a light or lights consuming not more than 1-20th part of its measuring capacity per hour marked thereon, nor less than one-half of a cubic foot per hour, for all meters of a measuring capacity not exceeding 100 cubic feet per hour; and not more than 1-40th part of its said measuring capacity per hour for all meters of any greater measuring capacity per hour than 100 cubic feet; and all meters found to work under such test shall be deemed sound meters; and any meter found not to work under such test shall not be stamped." Here is a very plain and simple direction as to the mode in which meters are to be tested, and the section, I may mention, is not qualified in the slightest degree by anything said or enacted in the preceding or subsequent sections; but in Edinburgh the question has been raised (whether it originated here is a matter of some dubiety) as to how meters ought to be tested. There seems to be an impression that all wet meters should have a water seal of 3 inches, and that the only mode of testing such a meter is to unscrew the plug at the bottom, and then subject the meter to the test of 3 inches of pressure. Of course, every man is at liberty to put what he considers a reasonable construction upon the words of the Act, but if the facts are as I have stated them—and I have no reason to doubt their correctness—I fail to see how such a meaning can be twisted out of the section. Indeed, comparatively few of the small meters in actual use could stand such a pressure with the plug unscrewed, and I question very much whether, at the time the Act was passed, there were any meters in the market which could have done so. To me it seems rather to have been the intention of the Legislature to secure that the cases and internal mechanism of the meter should be able to stand a 3-inch pressure without leaking, than that there should have been a seal of water capable of resisting 3 inches of pressure. If the decision of the Magistrates should be that such a seal must be provided, the dry meter makers will be in the way of reaping a golden harvest, always provided that the makers of wet meters will rest content with such a decision, which I greatly doubt.

The subject of the better lighting of the streets of Edinburgh is one to which I gladly revert, because I find that the opinions which I have expressed on more than one occasion in these "Notes" are shared in by a large number of gentlemen who are really anxious to see the capital of the country, so far as the lighting of its public streets is concerned, raised above the level of a mere outlying village. From inquiries which I have made I find that for a long period the town paid one of the Companies for a quantity of gas equal to 0.70 of a cubic foot per lamp per hour, consumed at a pressure of 6-10ths of an inch. More recently this immense volume of gas has been increased to 1.25 cubic feet per hour. In some of the leading thoroughfares this quantity, and even more, is consumed hourly; but if the inhabitants of Princes Street and some other important streets get the benefit of a decent light, those who reside in bye-streets and on the outskirts of the city have to suffer. I thoroughly believe that Edinburgh is a quarter of a century behind other places in this respect. I shall have great pleasure in notifying any improvement which the authorities may hereafter introduce.

I have been informed that Mr. James Henderson, of the Partick and Hillhead Gas Company, has been appointed Manager of the gas-works at Saltcoats; the office having been rendered vacant by the transference of the Manager there to Coatbridge.

The Committee of the Dundee Gas Commission met yesterday, when they had under their consideration the question of the appointment of a successor to Mr. B. M. McCrae, whose demise was alluded to in the JOURNAL of the 28th ult. Reference was made to the loss which the community of Dundee had sustained in the death of Mr. McCrae, and as an indication of the esteem in which he was held by the Corporation a donation of £200 was voted to his widow. It was afterwards agreed that Mr. John McCrae, who, as I mentioned last week, is Manager of the gas-works at Bury St. Edmunds, should be appointed Manager of the works at Dundee at a salary of £500 a year. The Commission, recognizing the additional labour which had been thrown upon Mr. Mitchell through the illness of Mr. McCrae, presented him with the sum of £50.

A firm of dyers in Hawick, Messrs. John Turnbull and Sons, have substituted the electric light for gas. The exhibition of the light on Thursday created some excitement in the town; but here as in many other places in Scotland I could mention, as soon as the novelty has worn off, there will, I have little doubt, be a reaction in favour of gas, which is now sold at a very low rate in Hawick.

An action has been raised, and will shortly engage the attention of the Sheriff of Dumfries, at the instance of Mr. Cruickshank, formerly Manager of the Langholm Gas Company's works, against the Company, the conclusion of the action being for payment of £105 2s. In his statement the pursuer says he was engaged as Manager at a salary of £75 per annum, with free house, coal, and gas. The engagement was a yearly one, and was tacitly renewed for three years; but on the 21st of September last he received a letter from the Secretary of the Company, intimating that they did not require his services after the 22nd of November last. Pursuer claims the sum in question as loss of salary, house-rent, and for injury to his feelings and reputation in respect of the Company having unjustifiably dismissed him.

One of the largest mechanical scrubbers yet constructed on the "brush" principle of Mr. George Anderson, of London, is now being made by Messrs. H. Balfour and Co., of Leven. This scrubber is to have five brushes, each 15 feet long by 4 feet diameter, and is to be capable of extracting all the ammonia from 3 million cubic feet of gas daily. It is to be erected at the Stepney station of the Commercial Gas Company; and has been adopted after a twelvemonth's trial of one passing more than 1½ million cubic feet.

The water question in the town of Elie has not been settled yet. The

inhabitants who were disappointed at the refusal of the Local Authority in the district to move in the matter of a water supply, appealed to the Sheriff. His lordship ordered the appellants to lodge statements, which were to be answered by the Local Authority. At a meeting of this body on Friday, the 24th ult., a motion was made to appoint a Committee to prepare the answers; but an amendment, that the action be not defended, seeing that, from inquiries instituted by the Local Authority themselves, there was a deficiency of water, and that from the analysis obtained the water was unfit for domestic use, was carried. The question will now be further complicated by an appeal to the Board of Supervision on the part of the minority of the Local Authority.

In the town of Kirkcudbright there has been a scarcity of water experienced for many years, especially during the summer months. At a meeting of the Local Authority on the 28th ult., a letter was read from the Town Council of the burgh, asking their views on the question of the water supply. After some discussion a motion was adopted to the effect that the Local Authority consider it desirable that there should be an increase in the supply, but they leave the details of any scheme to the Council to carry out.

As the Stirling Water Bill does not contain a clause extending the compulsory water area to the boundaries of the parliamentary burgh, instructions have been given by certain householders at Newhouse and St. Ninian's to oppose the Bill.

From returns furnished relative to the Edinburgh water supply, it appears that the quantity of water in store is 2,238,237,000 gallons, as compared with 1,535,506,000 gallons at the corresponding date last year. The delivery of water to the city is equal to 39.86 gallons per head per day to a population of 304,300.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*.

A somewhat alarming fire broke out at the Pollokshaws Gas-Works late last Sunday night. There had been a stoppage in one of the condenser pipes, thus causing a considerable escape of gas; and on the workmen proceeding to charge the retorts, the gas became ignited, and an explosion took place. A large volume of flame instantly burst out, and for a few minutes there was a conflagration which had a most alarming appearance. Fortunately, there was a plentiful supply of lime close at hand, by means of which the workmen were enabled to subdue the fire before any great amount of damage was done. It is satisfactory to be able to report that no person was injured.

It has been resolved to fit a Sugg's patent "London" Argand burner, of 50-candle power, into the Perch Lighthouse, which is close to the Harbour of Port-Glasgow, but within the control and surveillance of the Clyde Lighthouses Trustees. I understand that it is to be supplied with gas of the same description as that which is to be used by-and-by in Pintsch's patent gas-lighted buoys, and which is to be made at the Trustees' new works at Port-Glasgow. It is to be hoped that the quality of the gas and the Sugg burner will be mutually suitable for each other, so that the latter may not require to bear the blame of any hitch which may be due to the former.

While speaking of Sugg burners, I may mention a few additional facts by way of showing how they are coming into use in the Clyde district. In the first place I believe I am correct in saying that it has now been resolved to fit one up [at the Cross, Paisley, as I suggested in my letter in last week's JOURNAL. In this case, however, the burner is to be of the flat-flame kind, and of 250-candle power. Two additional Sugg burners and street lamps have been fixed upon by the Greenock Municipal Authorities. These burners are also to be of the flat-flame kind, and of 200-candle power each. One of them is to be brought into use at the large open space at Rue End Street; but of the position of the other I am not certain. The Harbour Trustees of the same port have resolved on placing a Sugg Argand of 300-candle power in the clock tower on the Custom House Quay. Before leaving Greenock, I have still to state that Messrs. Caird and Co., have had two Sugg Argands fitted up in their pattern shop—one of 200-candle power, and one of 80-candle power. They have given so much satisfaction that it is not unlikely that more burners of the same kind will be required on the premises. In the meantime, it is worthy of notice that Messrs. Caird and Co. have an experiment in hand with the electric light in their foundry—the dynamo-electric machine which they have in use being a 16-light "Brush." It is stated that the firm intend to get another machine of the same description and power for extending the electric system of lighting into the fitting shop and boiler shed. The Harbour Trustees are at present "touched" with electric lighting notions, and with a view of something being done in this direction at the harbours, a deputation of that body, along with their Engineer and Clerk, visited Messrs. Caird and Co.'s works last Tuesday afternoon, to satisfy themselves as to the possibility of going and doing likewise. I had almost omitted to mention that four 60-candle Sugg Argands have just been placed on Craigmore Pier, near Rothesay, at the instigation of Mr. Mortimer Evans, C.E., of Glasgow—a gentleman who was one of the Committee of Jurors on Electric Lighting, &c., at the exhibition recently held in Glasgow.

On Thursday evening, the *employés* of the Partick, Hillhead, and Maryhill Gas Company met in the offices of the Company for the purpose of showing their respect for Mr. James Henderson, Assistant Manager, who has lately been appointed to fill the vacant managership at the Saltcoats Gas-Works. Mr. Hugh Crawford, on behalf of his fellow-*employés*, presented Mr. Henderson with a token of regard in the shape of a marble timepiece, together with a brooch for Mrs. Henderson; and in referring to their guest's many estimable qualities, stated that he had been in the service of the Company almost from its commencement.

There is some probability, if not even a moral certainty, that the professional services of Mr. William Smith, Engineer of the Corporation Gas-Works, Darlington, will be called into requisition in connection with the new gas-works which are to be erected at Hawick, in accordance with the recent decision of a special meeting of the Shareholders. Mr. Smith is a gentleman of large experience. Formerly he was the Manager of the old gas-works at Maryhill; subsequently he was the Manager of the gas-works at Coatbridge; and I believe that the works at Darlington, which he manages with so much credit to himself, were erected according to his plans and under his personal superintendence.

The Glasgow pig iron warrant market has been strong this week, and an enormous amount of business has been done at daily advancing prices. The close on Friday was—buyers, 53s. 1d. cash and 53s. 3d. one month, sellers asking 1d. per ton higher.

No change of any importance has arisen in the local coal trade, everything being very quiet.

GENERAL TRADE SUMMARY FOR MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The year 1880 cannot be allowed to pass away without making reference to the prosperity which it has brought with it in connection with the staple trades of this district. It will be seen that from its commencement

the coal, iron, and steel trades have gradually improved, and at its close the present state of those industries is most highly satisfactory, giving ample employment, although wages are considered still very low. Orders for unfinished iron are plentiful, and an increased demand continues to flow in from various parts of the globe. The demand for finished iron and steel is much on the increase, causing the mills to be regularly kept in motion; therefore it can be looked forward to with confidence that better and brighter prospects are near at hand for the present year. There is also a decided improvement in the steam and house coal, and coke trade of the district, with a tendency to advanced prices. Great activity reigns throughout the entire locality in the principal centres of industry, and every effort has to be made in connection with the forges and mills, in order to keep up with the present requirements. At Cyfarthfa and Dowlais, present operations are on a very extensive scale, and it is pleasant to witness such activity. Rhymney and Tredegar are not behind hand in sharing with the orders arriving, and at these important establishments a decided improvement is noticeable. Tin-plate bars are turned out on a large scale, and there is also a great amount of bar iron. A very extensive order has come to hand here for steel ingots for shipment to the United States, and a portion of it is now being sent away *via* Liverpool.

The various collieries are being well developed. The output has much increased with what is consumed at the works, and the quantity sent out of the district during last month and the present exceeds any previous month in the year. Both in the house and steam coal trade it is admitted throughout the valleys of Monmouthshire and the adjoining county that the trade is at present in a much more healthy condition. The manufacture of coke is on the increase, and many additional ovens are now being erected on improved principles in various parts of the district. The shipment of coal at Newport during the year 1880 amounted to 1,884,739 tons, and in 1879 the quantity of coal shipped was 1,810,993 tons. The shipments in iron for the past year amounted to 222,402 tons, and 122,201 tons were shipped in 1879.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week there has been very little business doing in either the coal or the iron trade of this district. The pits in a great many cases have been stopped for several days for the New Year's holidays, and many of the iron-works have also been closed for stock-taking. So far as anything has been doing, prices nominally are without change. For domestic coals there is a fair inquiry, the best qualities fetching about 8s. 6d. to 9s. per ton at the pit; seconds, 7s. to 7s. 6d.; and common house coal, 6s. to 6s. 6d. per ton. Common round coals, for iron-making and steam purposes, which have been only in limited request, are to be bought at about 5s. to 5s. 6d. per ton at the pit. For engine classes of fuel there has been rather a pressure, in anticipation of the holidays and the closing of the pits. Many colliery proprietors have been unable to meet the demands made upon them, and prices are firm at about 8s. 6d. per ton for good qualities at the pit's mouth. Burgy, which is not much inquired for, ranges from 4s. to 4s. 6d. per ton at the pit. In the iron trade there have been some inquiries for forward delivery, and sellers who are willing to contract up to the end of June next at about current rates have been able to do a fair amount of business. Sales to a moderate extent have also been made in Lancashire pig iron for the next three months at present prices, which, for delivery into the Manchester district, are quoted at 46s. 6d. to 47s. 6d., less 2½ per cent. for forge and foundry qualities respectively. In the finished iron trade there has been little or nothing doing, and prices remain at about £5 15s. to £6 per ton for Lancashire bars delivered into the Manchester district.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Owing to the Christmas holidays, but little work has been done either at the pits or iron-works of this district for the past week. At many of the latter alterations and improvements have been in hand, but Monday saw a renewal of business operations generally, and most of the leading firms start the new year with a fair proportion of orders on their books, both as regards the coal and iron trades. The somewhat improved demand for coal is sustained, and prices are firm, without alteration. The colliery proprietors of the Cannock Chase district are well employed, the demand being greatest for best deep coal for household consumption. Several contract orders are said to be now in the market, and others already concluded date from the commencement of the new year, so that many of the pits will be fairly active. Furnace fuel, as also gas-making coal, is steadily inquired after. In both the coal and iron trades business transactions have been somewhat limited for the past two or three weeks, as purchasers are anxious to await the result of the quarterly meetings. These take place during the week, and though it is not considered probable that any important alteration will be made from existing rates, still business negotiations will be more successfully carried out afterwards. The prices now existing of list iron will doubtless remain the same for the present quarter. Buyers of heavy lots prefer, however, to await the ironmasters' final decision. As it is, finished iron transactions have been slower than otherwise during the past week. Sheets, hoops, and common bars were in most demand. Puddled iron was in a little more active request, and pigs of the better and commoner qualities sold fairly well. The export trade remains steady. The returns of the examiners of the books of the twelve selected firms have been published, and show that the average price obtained for bar iron during the three months ending November last was £6 15s. 6½d. per ton, and the wages rate for puddling throughout the current quarter will be 7s. 3d. per ton. This is a reduction of 3d. per ton on puddlers' wages, and 2½ per cent. on those of mill men. The average selling price of bar iron during the preceding quarter was £6 19s. 8d. The result of the Arbitrator's award on the recent appeal of the ironworkers against the masters deducting freightage discounts and commission from the selling price of iron for the regulation of wages under the sliding scale is, that the award given in June last be still adhered to, and no modification be at present made.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Throughout Yorkshire the Christmas and New Year's holidays have greatly interfered with trade. Many of the iron-works have been almost wholly set down since my last notice. The most activity is observable with regard to the make of pig iron, the furnaces being kept fully going. Very few of the foundries seem to improve the tone of their trade. In manufactured iron the mills have a prospect of being kept fairly at work in the make of bar, sheet, and merchant iron.

The coal trade has of late undergone a striking change so far as household qualities are concerned. Only a fortnight ago the demand was very fair, and merchants were not able to employ their own, but had to hire waggons from other sources. During the past week or more business has not only been quiet, but merchants have actually countermanded orders, notwithstanding the fact that the pits have been closed more than half their time, and the same will doubtless be the case during the present week. The state of trade in the West Riding holds fairly up, but lengthy stoppages have been made owing to the holidays.

The position of the steam coal trade is just now only moderate. The export season having to a great extent closed, prices of hard and other classes of coal are very moderate. Some of the pits in the South and West Riding are sending a fair tonnage to Hull and Grimsby; but, as might be expected, this is falling off. Good supplies of gas coal were laid in prior to the holidays, by the various companies whose contracts are placed with the district firms, so that the stoppages of work have not interfered with business. There still continues to be a good demand for locomotive coal, chiefly for engine purposes for the various railway companies. The demand for small coal and engine fuel is not so good as it was, and a less tonnage is being sent to Lancashire and other markets.

The coke trade is weaker than it was a short time ago, and the production is falling off. This is the case at several of the largest places in the South Yorkshire district, including North Gawber Hall Colliery, where the pits are standing, and supplies of slack have to be drawn from Sharlestone and Whitwood in the West Riding, as well as from Hoyland Silkstone, Monkton Main, and other large pits in South Yorkshire. The chief of what is produced is forwarded to North Lincolnshire, where the iron trade is very fair indeed, and where a large proportion of South Yorkshire coke is now used for smelting purposes.

The Employers' Liability Act, which came into operation on the 1st inst., is creating the greatest possible interest in both parts of the coal-field. The owners are desirous of making some arrangement with the men, but the officials of the Unions persuade the latter not to allow the Act to be interfered with. At the Monkton Main Colliery and several other places the men have agreed to join a system of insurance, and as many of them are not in the Unions, more are sure to do so.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coals were again hindered last week through a short supply of steam tonnage, occasioned by the bad weather which prevailed in the North Sea. They were therefore hardly up to an average, and work did not get on so well at the collieries as in some of the other weeks in December. The shipments of coals and coke from the Tyne Dock—the great bulk of the coals having been wrought in the county of Durham, and most of the latter gas—have been 4½ million tons in 1880, showing a considerable increase upon 1879. The contracting business for gas coals is developing; but the prices are comparatively unchanged, except in some instances, wherein 9d. per ton will show the advance. Numerous contracts have been entered upon for the supply of coke over the next six months. In the latter part of 1879 and in the beginning of 1880 speculative operations went on amongst merchants on Newcastle Quay for the purchase of coke for forward delivery. They expected that the market price would rise; but instead of doing so it took the opposite course. Under these circumstances, many of the buyers attempted to get rid of their bargains in various ways. By putting them into the market and shipping upon consignment, prices were pulled down; but some got out of their engagements, and one or two firms failed, bringing two well-known coke and fire-brick houses down with them. This winter coke makers have declined to enter upon speculative transactions with middle men. The business transacted in December was, therefore, for *bona fide* delivery to the consumers. Upon all sorts of best qualities of coke, an advance—possibly not a large one—has been established; whereas in second-class coke, what may be described as a somewhat scrambling business is transacted, without any advance in prices. A short trade is done in steam coals.

The freighting business of last week favoured shippers. Gas coal rates to London did not exceed 4s. per ton by steamers. They were lower for Dublin and other ports. Sailing coasting freights also fell fully 6d. per ton upon the business which was transacted. What little freighting was entered for the delivery of bricks and that class of material in London river was represented by 7s. 6d. per ton above, and 7s. below the bridges.

There is very little business afloat for gas or water pipes at the present time. The most important foundries on the Tyne are very busy making large castings, mainly for the local engine and shipbuilding works. The malleable iron trade of the North has a very promising appearance for 1881. The fire-brick trade is unaltered from last week. It is neither better nor worse than it usually is in the depth of winter. Some few small contracts for second-class bricks have been made at somewhat lowish prices; but manufacturers generally are not doing much forward business. They are inclined to hold back until further on in the season. Chemicals are a very dull sale. What few contracts have been made for ash show that manufacturers are not hopeful of a strong upward tendency of prices in the spring of the year. The timber trade is in a better position for this year. The spring shipments of wood from Quebec will be short of an average.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.—The annual meeting of this Company was held on the 16th ult.—Mr. R. Oades in the chair. The Secretary (Mr. J. A. Engall) read the notice convening the meeting; after which, on the motion of Mr. Riddell, seconded by Mr. Walker, the report of the Directors was adopted. It was as follows:—

As intimated in the report of last year, the Directors reduced the price charged for gas from 1s. 9d. to 4s. 3d. per 1000 cubic feet, and as a result of this reduction, the receipts from the sale of gas fell below those of the previous year by £253 17s. 9d. The increased sums received from the sale of coke, tar, ammoniacal liquor, and the other residual products of gas manufacture, almost made up the deficiency above mentioned, so that the total income of the Company for the past year nearly equalled that of the year 1878-79—the most profitable year in the history of the Company.

The great difficulty with the Directors is now to meet the great demand for gas, owing chiefly to the limited storage; and the Directors have, therefore, purchased 1½ acres of the adjoining land, upon which it is proposed to erect an additional gasholder, coal store, and retort-houses. To meet the cost of these works, as also the provision and laying of enlarged mains through a considerable portion of the district, the Directors (as the Shareholders are aware) have decided to apply to the Board of Trade for powers to raise additional capital, not exceeding £20,000. The matter is in the hands of the Company's Solicitor, and it is hoped that the application will be confirmed in the next session of Parliament.

The Directors recommend that a dividend of £2 10s. per share (the full limit authorized by the Company's Act) shall be paid free of income-tax on Jan. 1.

It was then resolved to allow £200 to the Directors for their services during the year ended Sept. 30 last; and to declare the dividend recommended in the report. The retiring Directors (Messrs. W. C. Saunders, R. Winkworth, and L. Paine) were re-elected, and a vote of thanks passed to the Chairman for presiding. Votes of thanks to the Secretary for his services during the past year; to Mr. T. Webb, the Manager, for his services in the interest of the Company during the past year; and to Mr. James Harris, for acting as Chairman of the Company during the past year, were also carried unanimously.

THE PRICE OF GAS AT WHITEFIELD.—A meeting of the ratepayers of Whitefield, convened by the Chairman of the Local Board in compliance with a requisition, was held last Wednesday evening to consider the best means of obtaining a reduction in the price of gas supplied by the Radcliffe and Pilkington Gas Company, or of procuring a supply from another source. Mr. J. R. Warwick, Honorary Secretary of a Committee formed at Prestwich with the view of attaining the same end as that now sought at

Whitefield, narrated the course of proceedings there; after which, a resolution was passed to the effect that steps should be taken to carry out the object of the meeting, and a Committee was appointed to look into the matter in the interest of the gas consumers.

A NEW PURIFIER-HOUSE AT THE BOLTON CORPORATION GAS-WORKS.—A new purifier-house is in course of construction in connection with the gas-works of the Bolton Corporation. It will contain when finished six cast-iron purifiers, each 22 feet long and 5 feet deep, with wrought-iron covers, each weighing about 5 tons. There is separate lifting apparatus for each pair of purifiers. Four of the vessels will be for working with oxide of iron, and two for lime. The purifiers are to be erected on the second floor—the basement being reserved for the revivification of the oxide—and they will be worked by one of Messrs. C. and W. Walker's patent centre-valves. The whole of the connections in the house are to be 20 inches in diameter, and the full working capacity will be equal to 1½ million cubic feet of gas per day. The building will be of a substantial yet handsome design, and when complete will, it is said, be the largest purifier-house in Lancashire out of Manchester.

BRISTOL PUBLIC LIGHTING.—At the meeting of the Bristol Sanitary Authority, on Thursday, the 23rd ult., a letter from the Secretary of the Bristol United Gaslight Company (Mr. H. H. Townsend), in reference to the charge for gas supplied to the public lamps, was read and referred to a Committee without discussion. It will be remembered that the Public Lighting Committee declined to recommend the Council to accept the tender of the Company (dated Sept. 22 last) for lighting the public lamps, and requested that the prices might be reduced. Mr. Townsend stated that the Directors had given the matter "their due consideration, and they fail to see any just grounds upon which the Sanitary Authority ask for a further reduction in price." The letter then continued: "The tender in question included an offer for the performance of the whole service of supplying gas, lighting, extinguishing, cleaning, repairing, and painting the public lamps in the borough of Bristol, at prices which, for the number of lamps in use (4304), would have amounted to a total annual charge of £14,042 15s., as against the charge under the just expired contract of £14,117 4s., thus showing a substantial diminution on the former contract. The very low price at which gas is now supplied to the general consumer, as well as to the public lamps, will not admit of a wide deviation of price to any class in particular, and the tender your Committee have rejected was calculated at 1d. per 1000 feet less than the lowest price paid by any other consumer. The Directors, while regretting that the Committee of the Sanitary Authority cannot perceive that the tender of the Company was (as they themselves believe it to be) a just and equitable one, do not

think it desirable to prolong a controversy between two public bodies on a matter the limits of which are of necessity within very narrow bounds; and, therefore, with a view to bring to an end the question of difference, and with no other feeling than that of conciliation, will consent to a reduction of ½d. per 1000 feet on the gas consumed by the public lamps, all other conditions in their tender of the 22nd of September remaining unaltered. This concession will bring the price of gas below that charged in the former contract, and will effect a reduction on the whole annual charge of £243 13s. 6d. I am to add that the price herein tendered is the lowest to which the Directors can consent, and should the Sanitary Authority decline to accept the present offer, the Directors will be quite prepared to meet any proceeding the Sanitary Authority may be advised to adopt." The prices for several sized lamps will, under this offer, be as follows:—

For 1-foot burners	£1 6 8 per annum.
" 2½-feet "	2 1 11 "
" 4 " "	2 17 2 "
" 5 " "	3 7 4 "
" 7 " "	4 7 8 "

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 5417.—THOMPSON, W. P., Liverpool, "Improvements in fluid motors or meters, or apparatus for utilising the power of and measuring the quantity of water or other fluid flowing through pipes or other conduits." A communication. Dec. 24, 1880.
- 5431.—ANDREWS, A., jun., Kilmarnock, N.B., "Improvements in and connected with motive power engines, also applicable to water-meters." Dec. 24, 1880.
- 5456.—WALLER, G., Southwark, London, "Improvements in rotary pumps, specially applicable as gas exhausters." Dec. 28, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2001.—URQUHART, J., Manchester, "Improvements in meters or apparatus employed in measuring the flow of fluids." May 15, 1880.
[* * The above was accidentally omitted from our notices at the time the patent was sealed—Nov. 13, 1880.]
- 2666.—DAVEY, G. W., Barking, Essex, "Improvements in the distillation of coal tar and in the apparatus employed therein." June 29, 1880.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Dec. 29, 1880.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company	Notting Hill	18.0	16.6	17.2	18.7	14.3	16.2	0.0	0.0	0.0	None.	In excess
	Camden Town	17.6	17.1	17.4	15.2	13.0	13.9	0.1	0.0	0.0	"	"
	Dalston	17.6	17.0	17.4	16.8	14.1	15.2	0.3	0.2	0.2	"	"
	Bow	17.0	16.6	16.9	15.1	13.8	14.3	0.2	0.0	0.0	"	"
	Chelsea	17.5	16.7	17.0	16.8	11.3	14.7	0.2	0.0	0.0	"	"
	Kingsland Road	21.5	20.8	21.1	20.2	18.7	19.5	0.0	0.0	0.0	"	"
South Metropolitan Gas Company	Peckham	17.5	17.0	17.1	12.0	8.8	10.1	0.5	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.9	17.0	17.6	15.5	13.8	14.8	0.2	0.0	0.1	"	"
	St. George-in-the-East	18.0	17.5	17.8	12.0	6.2	8.2	0.3	0.0	0.1	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

Share List of Gas and Water Companies.

Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.
59000	10	GAS COMPANIES.	£ s. d.	£ s. d.	£	6200	5	GAS COMPANIES.	£ s. d.	£ s. d.	£	5000000	10	GAS COMPANIES.	£ s. d.	£ s. d.	£
10000	20	Alliance and Dublin	10 0 0	10 0 0	154-163	300000	100	Georgetown, Guiana	5 0 0	7 0 0	41-42	1305000	10	South Metropoln.	100 0 0	11 15 0	200-205
5000	20	Anglo-Romano	20 0 0	9 10 0	21-23	115000	100	Glasgow Corpora- tion Gas	100 0 0	9 0 0	223-228	12000	5	Do., "B"	100 0 0	..	177-182
1000	20	Bahia (Limited).	20 0 0	6 0 0	15-16	..	100	Do., do.	100 0 0	6 15 0	164-169	2864	10	Tottenham & Ed- monton	5 0 0	10 0 0	84-9
1500	20	Do., 1st pref.	20 0 0	10 0 0	25-27	..	100	Grimby Gas, A.	100 0 0	..	186-190	1500	10	Do., do.	6 0 0	7 0 0	7-8
40000	5	Do., 2nd pref.	20 0 0	7 10 0	20-22	7800	10	Hampton Court	10 0 0	10 0 0	16-17	1500	10	Wandsw. & Putney	10 0 0	10 0 0	144-15
10000	5	Bombay (Limited).	5 0 0	7 10 0	54-6	5000	10	Hong Kong (Lim.)	10 0 0	10 0 0	15-16	1500	10	Do., do.	10 0 0	7 10 0	124-134
5000	10	Do., fourth issue.	4 0 0	7 0 0	1 pm.	2800000	100	Hornsey	10 0 0	10 0 0	154-164	4000	10	Do., do.	10 0 0	7 0 0	114-12
22970	..	Bournemouth	10 0 0	9 0 0	134-143	..	100	Imperl. Continental	100 0 0	10 p.c. & 18487d	2 p.c. bonus	26000	5	West Ham	5 0 0	10 0 0	94-10
500000	..	Brentford	100 0 0	5 0 0	152-156	..	100	..	..	..	..	10000	5	Do., do.	3 0 0	..	64-7
5400	20	Do., 5 per ct. pref.	100 0 0	5 0 0	100-105	..	100	Kingston	10 0 0	8 0 0	114-124	2400	5	Do., do.	10 0 0	10 0 0	14-16
5000	20	Brighton	20 0 0	10 0 0	36-38	3500	10	Lea Bridge	10 0 0	8 0 0	183-185	..	..	West Kent	10 0 0	10 0 0	..
14000	20	Brighton and Hove	20 0 0	10 0 0	34-36	561000	100	Liverpool United	100 0 0	10 0 0	140-142	..	..	Woolwich, Plumstd. and Charlton	5 0 0	12 5 0	8-10
7282	20	British (Limited).	20 0 0	10 0 0	33-34	1691000	100	Do., B, per cent.	100 0 0	7 0 0	175-180	..	..	..	..	..	..
1500	10	Cagliari (Limited).	20 0 0	8 0 0	19	3900000	Sk.	London	100 0 0	10 0 0	128-133	..	..	..	..	..	..
550000	Sk.	Colney Hatch	10 0 0	5 0 0	9-11	1500000	Sk.	Do., 1st pref.	100 0 0	6 0 0	30-32	..	..	..	..	..	..
105180	Sk.	Commercial	100 0 0	11 5 0	185-188	7622	25	Do., A shares	25 0 0	6 0 0	..	..	..	..	..	..	..
20000	20	Do., new stock.	100 0 0	8 5 0	141-146	266132	Sk.	Do., Debenture stock	100 0 0	5 l. & 6 l.	..	..	..	..	..	..	..
23000	20	Continental Union.	20 0 0	7 0 0	214-22	15000	5	Malta and Mediter- ranean (Limited).	5 0 0	3 0 0	2-24	615600	100	Chelsea	100 0 0	6 10 0	204-9 xd
10000	20	Do., new	14 0 0	7 0 0	par. 1 pm.	6000	5	Do., preference.	5 0 0	7 10 0	5-54	1624700	100	East London	100 0 0	6 10 0	205-10 xd
750000	Sk.	Do., preference.	20 0 0	7 0 0	24-25	20000	32	Mauritius (Limited)	2 5 0	1 2 6	14-14 dis	50	Grand Junction	50 0 0	7 10 0	115-120	
1250000	Sk.	Crystal Palace Dis- trict	100 0 0	10 0 0	172-177	30000	10	Monte Video (Lim.)	20 0 0	6 0 0	164-174	6160	25	Do., 4 shares	25 0 0	7 10 0	57-60
500000	Sk.	Do., 7 per cent.	100 0 0	7 0 0	128-132	8000	5	Nichteroy, Brazil (Limited)	10 0 0	6 0 0	5-6	781800	100	Do., new ditto; max. div., 7½ p. c.	25 0 0	7 10 0	40-45
25000	6	Do., preference.	100 0 0	6 0 0	119-123	30000	5	Oriental (Calcutta).	5 0 0	9 0 0	62-74	5551800	100	Kent	100 0 0	9 0 0	280-290
7100	25	Do., ordin. 7 p. c.	1 10 0	7 0 0	1 pm.	10000	5	Do., new shares	4 0 0	9 0 0	11-13 pm	3261500	100	Lambeth	100 0 0	7 0 0	202-8 xd
23400	10	Edinburgh	25 0 0	10 0 0	50-51	3000	10	Ottoman (Limited).	5 0 0	3 0 0	2-24	442	100	Do., max., 7½ p. c.	100 0 0	7 0 0	178-183
12000	10	European (Limited)	10 0 0	11 0 0	19-20	10000	5	Pará (Limited)	10 0 0	5 0 0	64-7	442	100	New River	100 0 0	..	375-385
33400	10	Do., new shares.	5 0 0	11 0 0	34-44 pm	3000	10	Richmond (Surrey)	10 0 0	10 0 0	17-18	442	100	Do., do.	85 0 0	10 3 8	290-300
4814400	Sk.	Do., new shares	5 0 0	11 0 0	34-44 pm	37500	20	Do., new	20 0 0	10 0 0	24-26	442	100	Do., deb. sk., 4 p. c.	100 0 0	4 0 0	106-10
50000	10	Gaslight & Coke A.	100 0 0	11 0 0	176-178	135000	100	Rio de Janeiro (Limited)	20 0 0	10 0 0	197-198	442	100	Southwark & Vauxh.	100 0 0	7 10 0	218-229
100000	Sk.	Do., 5th issue	10 0 0	5 0 0	164-174	99700	100	Shanghai	32 10 0	12 0 0	..	442	100	Do., pref. stock.	100 0 0	5 0 0	125-133
2000000	Sk.	Do., B.	100 0 0	4 0 0	75-78	10597	5	Sheffield, A.	100 0 0	10 0 0	195-197	442	100	Do., D shares.	100 0 0	7 10 0	173-170
3000000	..	Do., C. 10 per cent. preference.	100 0 0	10 0 0	212-217	2000	5	Do., C	100 0 0	10 0 0	52-61	1265000	100	West Middlesex	61 0 0	10 0 0	165-178
1650000	..	Do., do. do.	100 0 0	10 0 0	212-217	..	..	Singapore (Lim.)	5 0 0	8 0 0	53-61	15073	61	..	..	..	..
300000	..	Do., E do. do.	100 0 0	10 0 0	212-217	..	..	Do., preference	5 0 0	7 10 0	53-61	..	..	..	..	..	..
600000	..	Do., F 5 do. do.	100 0 0	5 0 0	102-107
13600000	..	Do., G 7½ do. do.	100 0 0	7 10 0	152-157
	..	Do., H	100 0 0	7 0 0	132-137

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NOTICE TO SUBSCRIBERS,

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The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to the PUBLISHER, as above.

TO CORRESPONDENTS.

A. K.—Will take an opportunity, in an early number, of noticing the results to which you call attention in your letter of the 5th inst.

RECEIVED.—"Metropolitan Rating: A Summary of the Appeals heard before the Court of General Assessment Sessions, Westminster, from 1871 to 1880, with a Synopsis of the Valuation (Metropolis) Act, 1869." By Edward Ryde and Arthur Lyon Ryde. Third Edition. London: Crosby Lockwood and Co.; 1881.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 11, 1881.

FOG AND SMOKE PREVENTION.

THE climax of the movement against the fog and smoke nuisance in the Metropolis must be considered as having been reached on Friday last, when a Mansion House meeting on the subject was held under the presidency of the Lord Mayor, and attended by a number of prominent public men, including the Right Hon. G. Shaw-Lefevre, Her Majesty's First Commissioner of Works. It would appear from the fact that not a few gentlemen, whose time is otherwise well occupied, made it their business to attend such a gathering, that some-

thing serious is really to be done in the matter, but the record of the proceedings of Friday scarcely bears out such a favourable anticipation. Several very voluminous resolutions were passed with ready unanimity on the part of the meeting, and they all condemned in good set terms the present system of using bituminous coal in factories and private houses, whereby the atmosphere of our towns is permanently defiled, and fogs, when they occur from natural causes, are rendered additionally objectionable. One resolution had a distinctly practical object, in so far as it affirmed the desirability of holding at South Kensington an exhibition of smoke-consuming apparatus, and other appliances for producing heat for domestic purposes without smoke. This is very well as a testimony to the desire felt by a number of persons to learn how they may help themselves in diminishing the amount of the nuisance which at present they may individually be in the habit of producing. It, however, points to the serious fact that no all-sufficient remedy for an acknowledged evil is yet known, and that consequently people continue to load the air with smoke from their household fires because they cannot help doing so, and no man can instruct them in a better way. Herein lies the gist of the whole difficulty—if we would do better, we know not how to proceed.

It is all very good to say that the habit of burning a smoky fuel, in a manner calculated to cause it to yield as much smoke as possible, is nothing more than a habit, and a very bad one, which can and ought to be broken. Such national practices are not formed and persisted in without reason. However much we may admire a different state of things, it is impossible to overlook the great fact that bituminous coal is by far the cheapest and handiest fuel to the great majority of the dwellers in this country, and that cheap grates and stoves, which can alone be used by the poorer classes—that is to say, by the great bulk of the people—will not burn this fuel smokelessly. The case is so different with furnace fires used for manufacturing purposes, that the latter can only be mentioned here in order to point out wherein lies the difficulty of regulating domestic fires, as may be done with furnaces. The community have an indisputable right to insist that no man, for the sake of his own private gain, shall inflict his trade refuse, aerial or otherwise, upon his neighbours. Yet even this principle is so difficult of universal application, that we are obliged in some cases to content ourselves with the compromise of compelling manufacturers engaged in noxious, but necessary trades, to carry on their work in localities where the nuisance may be as little injurious as possible. It is only the absolute necessity for such trades that prevents the imposition, upon the processes involved, of restrictions which would extinguish them altogether. Now, it will be generally conceded that a poor man's fire is a necessity of life to him, and if he can only afford to buy a smoky fuel, and burn it in the rude structure of broken bricks and rusty bars that can be dignified by the name of a grate, he must be allowed to warm himself thereat until we can tell him how to get a cheaper coal and burn it in a more economical way. This part of the question is at once its most serious and most hopeless side. At the Mansion House meeting, Dr. A. Carpenter maintained that it was in the interest of the poor that he wished to see coal smoke dispelled, or rather prevented, by repressive legislation. The end is certainly to be desired, but can it be possible that he, or those who think with him, have attempted to realize the meaning of legal restrictions on coal fires in dwelling-houses? It is not the fault of the poor that they have to huddle together in smoky quarters of dingy towns the prevailing dirt of which they increase by every fire they make. They would probably prefer cosy cottages with wood fires and allotment gardens; and a philanthropy that only starts the wish to see them revelling in clear air and sunshine, and has no better advice to give towards its realization than the imposition of a chimney-tax, is not worth much.

It is useful to note that the practical politician present at the Mansion House meeting, in the person of Mr. G. Shaw-Lefevre, very properly scouted the idea of repressive legislation in this matter. He knows too well how difficult it is to frame laws the necessity for which exists and is generally admitted, to look with favour or even patience on projects for penalizing a common commercial and social custom. He plainly laid down the principle that if any improvement in the atmosphere of our large towns is to be expected, it will be due simply to the influence wielded in that direction by individuals, to their example in not conforming to the common error, and to the self-interest of the community at large. In all these points we can cordially agree with him. If science and invention are, with any hope of success, to be directed to the suppression of smoke, it will be largely due to an enlight-

ened state of public opinion, to which their efforts may confidently appeal for recognition; and, above all, to the promptings of self-interest, which will lead people to adopt the thing which pays them best. Manufactories must be separately considered. For their sins of commission, in the matter of smoke, there is a remedy; and we may reasonably call upon our governing authorities to see that it is stringently applied. But there must be some great advance in science, or some notable revulsion in commerce, to say nothing of social economy, before the same can be said of dwelling-houses.

Mr. Shaw-Lefevre's references to gas were not so happy as his political allusions. He is a statesman, but no engineer. For this he is not to be blamed; but he should recognize the fact, and not commit himself to loose opinions on pseudo-scientific questions. In advocating the general introduction of water gas for heating, when coal gas is displaced by electricity, it must be said that he tried to prejudge the future in a manner slightly unbecoming a practical politician. We cannot pretend to discuss this part of the question further than to say that either with or without gas lighting we do not desire to see carbonic oxide largely introduced into town residences. There are extant quite enough facilities for murder and suicide, without the addition of that poison in a handy form, and the inhabitants of New York are beginning to awake to this view of their position, and to doubt the transcendent advantages of the heating medium apparently held in such high estimation by the First Commissioner of Works.

But to return to the proceedings of the meeting. This, then, is the present state of the process of clearing the sky of England [from its baleful coal smoke: An exhibition of apparatus calculated to effect this end is to be held at an early date, if sufficient funds can be brought together; and we are then to be informed how far present knowledge will carry us in the desired direction, or, what is far more probable, how many attempts have been made to touch the fringe of the subject, and how few to deal with it on fundamental principles as it exists. Gas cooking and heating stoves will form, as may be supposed, no mean feature of the show; but what there will be of more general adaptability there are, as yet, no sure grounds for prediction. We scarcely need remark that we hope good may result from the present agitation, but it must be confessed that we look for it chiefly in the form of an awakened public feeling; for the time is not ripe for any great organic change in our urban existence, such as alone can bring about a smokeless Metropolis in a smokeless land.

THE GAS SUPPLY OF PARIS.

Gas matters are just now exciting much attention in Paris. We have, from time to time, noticed the successive phases of the agitation for cheaper gas in that capital, and while fully sympathizing with the popular demand, we have not held the Gas Company responsible for the existing state of things. It is generally known that the lighting of Continental towns is almost invariably made subject to a "concession" by the Municipal Authorities, which has all the force, for practical purposes, of an Act of Parliament with us. Indeed, in some respects a concession generally confers more exclusive powers than a modern Act, but with the great distinction, among others, that it is invariably granted only for a determinate time, at the expiration of which it must either be renewed on terms more or less in the power of the Municipality to dictate, or it may be stipulated at first that the undertaking is to become public property on a certain date. It is evident that under conditions such as these a price for gas must be fixed which will, at least, allow a sufficient margin for the redemption of the capital sunk in the undertaking, and also for making necessary extensions out of revenue, besides paying as high a dividend as may be considered reasonable in view of the risk incurred. But beyond this the Municipal Authorities, when granting a concession, generally insert other provisions with a view to their own profit, such as the rate at which gas is to be supplied to the public lamps, and, in many cases, reserving the right to a share of the undertakers' profits. The more promising the concession, the more exacting are the grantors thereof, as is only natural. In the case of Paris the concession granted to the present Company is particularly stringent in many of its provisions, and by it the Company are compelled to contribute all kinds of taxes, rates, and dues to the Municipality, and also to pay into the public treasury half of their profits over a fixed proportion. Moreover, after a certain time the undertaking becomes the property of the City.

It will therefore be seen that there are no inducements what-

ever for the Company to voluntarily reduce the price of gas. The price fixed by the last convention with the authorities was 6s. 6d. per 1000 cubic feet—an enormous value for such a consumption as that of Paris. It is indeed provided that the consumers are to participate in any improvements that may be made in the manufacture, if sufficiently important to notably cheapen the cost of production; but this is at best a forlorn hope for the public. No compensation is possible in case of the price of coal and other materials being enhanced, this risk being borne by the Company. Therefore, on an impartial review of the situation, we do not see how the citizens of Paris can obtain cheap gas, or participate in the advantages of any extension of the Gas Company's operations while the present concession remains in force. It has been said to be easier to cause a revolution than to carry out a reform in France, else it would appear that the easiest way out of the difficulty would be for the Municipality to commute their contributions from the Company into a kind of rent-charge; to give the latter additional stability for their property by altering the liability to surrender into the obligation to sell on a fair valuation; and then to leave the Company face to face with their consumers under regulations such as those that have worked so well in this country. The late Municipal Council managed to leave the settlement of the whole question to their successors, who were last Sunday elected; it would be well if the new body were to treat the subject on general principles, and begin by appointing a Commission to inquire into the best conditions under which the gas supply of the capital can be carried on, with special instructions to extend their investigations to contemporary examples in neighbouring countries.

THE ELECTRIC LIGHT IN LIVERPOOL.

THE manner in which the Corporation of Liverpool intend to avail themselves of their power to light by electricity the streets and public places of the city has been at length settled, at least to the extent of the first considerable "experiment" in the most important thoroughfares. Advertisements requesting tenders for the proposed lighting having been inserted in all the leading newspapers, local and otherwise, the Corporation eventually found themselves in possession of two proposals—from Messrs. Siemens Bros. and the British Electric Light Company respectively—to which their choice was necessarily confined. Messrs. Siemens Bros. asked £5800 for lighting the selected district from sunset to sunrise for a period of twelve months, with an extra allowance of £2250 for fixing and removing their apparatus. The British Electric Light Company offered to do the work, in their own way, for the same period, for £2895 10s. The latter tender was accepted by the City Council at their meeting on Wednesday last, and the contractors are to be ready to light up by the 1st of March. The price to be given for the electric lighting is nearly twice as much as is now paid to the Gas Company for the present service, which includes several Sugg's and Bray's powerful burners, and a number of four feet per hour ordinary street lamps. The City Engineer, in his report on the electric lighting proposals, remarks that if the necessity for increased illumination is to be taken for granted, the sixty 2000-candle electric lamps proposed to be fixed by the British Electric Light Company will, in terms of illuminating power, be considerably cheaper than gas. This is certainly one way of putting it, but it is not exactly the right way. In the first place we all know that talk of thousands of candle power comes very readily from electric lighting contractors, when they know perfectly well that their lamps will never be put into a photometer and tested to a tenth part of a candle, in the same manner as gas is examined daily. Would the contractors for supplying Liverpool with lamps of 2000-candle power consent to a fine whenever their light fails to yield this power, or even half of it? Again, the proposed 60 lamps are to supplant 245 gas-lamps, and we are grievously mistaken if it is not found that some portion of the roadway lying midway between these new lights will be no better illuminated than it would have been had the same value been given for the more closely-placed gas lamps. This, however, is a matter that must be left to experience to decide, for it may be supposed the Corporation will take steps to assure themselves that they are getting the full value for their money.

A striking peculiarity of the electric light, often remarked in other cases, is brought prominently forward in the Engineer's report. The difference between lighting the allotted district from sunset to midnight, and between sunset and sunrise, is only about £160 for the year. In other words, it only costs this amount to keep the generating machinery and carbons going for the few extra hours per night; but, of

course, at the same time the full amount of illumination must be kept up, for with electricity there is no medium—it is either in full blaze or nowhere. This fact illustrates the unmanageableness of the arc-light, and at the same time suggests what might be done with gas if the cost of brilliant lighting is to be incurred only during the few hours of darkness in which it is really required, and no more than the ordinary lamps are kept alight for the benefit of the police patrol and the night cab driver. As Mr. Clement Dunscombe, the City Engineer, remarks, the illuminating power of the proposed electric lights will, on the contractors' own valuation, be, in a sense, considerably cheaper than that supplied by gas in the same thoroughfares; but it may be suggested that the power of a lighting medium expressed in the gross, and its power of illuminating other objects, are very different things. If the Corporation of Liverpool are content to trust the lighting of their streets to a string of light-beacons of the height of three-storey houses, they will find out what this difference means, and may eventually learn that fifty or even twenty candle power, in close proximity to the object desired to be seen by its aid, is quite as useful as a light of ten times the reputed power a hundred yards off, and carefully hoisted up out of the way.

GAS-WORKS BLUNDERS AT LEEK.

AN example of amateur gas engineering has been furnished during the past year at the Leek Gas-Works. The Improvement Commissioners, in whose hands is the charge of the gas supply of this Staffordshire town, had occasion to extend their works by the addition of a gasholder and tank. The former was placed in good hands, but the construction of the latter was entrusted to the lowest of a number of competing contractors, and he happened to be a local man. The supervision of the work was committed to the Town Surveyor, and under these conditions the work went on until it was considered ready for the holder. No suspicion that everything was not in perfect order appears to have been entertained by the trustful Commissioners until Mr. Bennett, the Chairman of the Horseley Company, inspected the place where the holder was to be erected. This gentleman electrified the Commissioners by declining to put a holder into the tank; in fact, the walls were altogether out of shape, the plan of the tank presented no regular figure known to geometers, and it had to be entirely reconstructed from the foundations before it could be pronounced even safe. It afterwards transpired that the contractor, in the course of his execution of the work, had run up extras in all directions, which had been freely passed by the Surveyor, so that considerably more than the cost of two tanks has been incurred by the Commissioners because of their determination to save the expense of calling in a competent professional adviser from the first. It is the same old story that has been told many times over in similar circumstances. There was probably no information obtainable about the nature of the subsoil, or if this was known it was devoid of meaning to those who had not sufficient skill to profit by it, and the builder did not know how to proceed without efficient superintendence. The Manager of the gas-works declined to have anything to do with the work, and he was amply justified in so doing if he knew nothing about it. It would have been many hundred pounds to the advantage of the ratepayers of Leek if everybody else had been as honest. There is nothing to be done now but to pay the bill, with a thanksgiving that matters have turned out no worse, and resolve to go to work in another way next time.

THE PROPOSED AMALGAMATION AT BRIGHTON.

BRIGHTON is at present one of the very few towns in the kingdom wherein a divided system of gas supply remains in operation. As we have already noticed, however, steps are being taken to terminate this state of things by an amalgamation of the two existing Companies. The Corporation do not intend to remain unmindful of these arrangements, but will formally oppose the Bill of the amalgamating Company, in order to obtain the insertion of clauses designed in the interest of the consumers. This, of course, points to the imposition of the sliding scale, to which no objection need be made. It is satisfactory to see that, with one or two unimportant exceptions, the Brighton Town Council are well content to allow the simulated "opposition" of the two Companies to expire, in view of a fresh organization equipped with really effective regulations. It has long been evident that the proceedings of the two Brighton Companies are marked with such harmony that the advancement of the more favourably situated undertaking is hampered by the necessity of accommodating itself to the capabilities of its

neighbour. Consequently there has not been the ghost of competition between the two Companies for a long time; and the third, which was at one period expected to set a pattern before them both, died young, with its early promise unfulfilled. The union of the two old rivals is, in fact, to be also the funeral ceremony of their younger enemy. It may be expected, on the whole, that the Bill to be settled during the present year will be the best thing that could possibly be done for the gas consumers of Brighton, who will be better served with one Company than they could have been by three.

DR. WILLIAMSON'S report on the quality of the gas supplied to the Metropolis during the last quarter of the past year will be found in another column, and shows that all the Companies kept well within their statutory regulations as to purity, while the illuminating power of the gas was in most instances nearly a candle above the legal minimum. Gas manufacture must be considered as having attained considerable exactitude, and the testing arrangements must also be credited with working well, when we see such results as those chronicled by Dr. Williamson regularly produced. It may be hoped that not the least benefit to be derived from a regular weekly publication of the testings from which these returns are compiled will be a more general recognition of the fact that the production and examination of the London gas are equally well managed.

GOOD prices were obtained for the £30,000 worth of South Metropolitan stock sold by auction on Friday last. There was much competition for the portion of "B" stock offered for sale, prices ranging from £182 10s. to £180 for each £100 stock. The "C" stock excited some interest, as being the first of its class put into the market, and there was some surprise evinced when the first lot of this stock fell to a single bid of £200. It was soon evident, however, that the enterprising purchaser had truly gauged the value of the stock, for several further allotments sold at the same price. These favourable terms were not maintained to the last, for some of this class of stock was sold at £190. The "B" stock bears $11\frac{1}{2}$ per cent. dividend, and the "C" stock is expected to pay at the rate of 12 per cent. for the present half year; but as these dividends will only accrue from the 1st inst., and cannot be paid until September next, both classes of stock must be considered to have realized a good average value, when it is found that the proceeds of the sale amounted altogether to £55,544 10s.

Water and Sanitary Affairs.

WE are glad to find, from an announcement in the monthly organ of the Society of Public Analysts, that the Council of that Society are moving in the right direction with respect to methods of water analysis. It is announced that "nearly all the public analysts in England have agreed to join in working out the idea evolved by the Water Committee, consisting of Messrs. Muter, Dupré, Blyth, Hehner, Dyer, Heisch, and Wigner." Analyses of the drinking water in various districts of England will thus be obtained every month, and be duly published. We may accordingly hope to know a little more than we do at present as to the relative merits of the metropolitan and the provincial water supply. One object kept in view by the Council of the Society referred to, is that of arriving at the real value of certain disputed points, especially the signification of the presence of nitrates in the water of any particular district. It appears that the Water Committee had great difficulty in settling which of the rival processes should be adopted in dealing with organic impurity, and in deciding how the results were to be calculated. As a process, they have decided in favour of a combination of the "albumenoid ammonia" and "oxygen consumed" processes. For the numerical basis they have had the good sense to adopt grains per gallon. It is rightly observed that "the metrical system has never become acclimatized in Great Britain." Sir John Herschel never believed in the metrical system, but contended for the "ounce, foot, and half pint," as not only practical, but as being scientifically preferable to the French system. But, independently of the metrical question, the public have lately been perplexed with parts per 100,000 and parts per 1,000,000, neither of which has any distinct meaning to the unscientific reader, whereas parts per 70,000, being grains per gallon, could be readily appreciated. Unfortunately, we have no distinct guarantee at present that Dr. Frankland and Professor Wanklyn will fall in with the popular demand. Complete unanimity will still be wanting, especially with regard to the

process. Dr. Frankland is not likely to give up his elaborate mode of operating, but he might at least express the results at "per gallon." Connected with this we have Lieut.-Col. Bolton's appeal for "a practical standard of quality," to be considered and determined by the highest authorities connected with the medical and chemical professions, and which, when adopted, would have to be observed by the Water Companies. We might thus have reports on water as on gas, showing whether or not the supply conformed with the standard.

Our readers may remember that at the last meeting of the Lambeth Vestry a somewhat significant decision was arrived at on the subject of the Metropolitan Water Supply. On that occasion a Special Committee presented a report containing twelve resolutions, the first of which was—"That, in the opinion of the Committee, all the benefits hoped for from the transfer of the Water Companies' undertakings to a public authority might be secured by placing the Companies under improved regulations, with greater control on the part of the Local Authorities." Opposition was offered to this proposal by Mr. W. T. Wiseman, who moved an amendment, declaring that no legislation would be satisfactory to the water consumers unless it secured "a representative water authority, based on the direct representation of the ratepayers." The amendment was lost, and the resolution of the Committee was adopted. Thus far disappointed, Mr. Wiseman returns to the combat next Thursday, when the remaining eleven resolutions of the Committee's report have to be dealt with. On this occasion Mr. Wiseman's tactics will be comprised in a resolution proposing that the Vestry shall do nothing more at present with respect to the question of the water supply, except to elect two delegates to attend the meetings at St. Martin's-in-the-Fields, such delegates to report to the Vestry on the provisions of the Government Water Bill as soon as they have had an opportunity of examining that measure. Apparently there is no great harm in the first part of this resolution; but it would be manifestly absurd to leave the consideration of the Bill to the wisdom of a Committee of two, even though one of the *par nobile fratrum* should happen to be no less an authority than Mr. Wiseman himself. In order to fortify his position on the water question, this gentleman has issued a printed document containing some extraordinary statements, one of the most startling being a letter from Dr. D. W. Sargent, sen., of Brixton Road, as to the quality of the water supplied by the Thames Companies. The phraseology of this letter is not very perspicuous, but is made up of a catalogue of horrors, said to constitute the Metropolitan Water Supply. That mortal man can drink so vile a compound and yet survive, is a mystery which we should think only Dr. Sargent himself can explain. Leaving this peculiar letter to the lovers of the horrible, we hasten to acknowledge one grain of sense for which we are indebted to Mr. Wiseman. It is to be found at the foot of his manifesto, where, speaking of the expenditure of the Water Companies, he says: "Some reduction in legal expenses is very desirable." In that particular the Directors and Shareholders are quite in agreement with this demonstrative Vestryman, though perhaps it is the only point of union between him and them.

There is one passage in the printed statement issued by Mr. Wiseman, which calls for rather more serious attention than we accord to the greater part of it. We allude to the full text of the letter addressed to that gentleman by Professor Thorold Rogers, M.P. for Southwark, on the subject of the Metropolitan Water Supply. It appears that there was a little mistake in the rendering of this letter as given in the public reports of the recent proceedings of the Lambeth Vestry. Instead of saying that Parliament was "not to be bullied by any Company or Companies, however strong and however important," we now observe that the final word was "insolent." Language such as this, coming from a member of the late Select Committee, is so extraordinary that we think Professor Rogers should be called upon to explain what it means. He also states that "the Water Companies would have been glad to have prevented our reporting." We should like to know what warrant Professor Rogers thinks he has for making so strange an assertion. Certainly, the Companies offered no obstruction to the Committee, nor are we aware that the Chairman, or any member of the Committee, accused the Companies at the time of acting in any way improperly. Professor Rogers might at least employ the language of courtesy, whatever may be his opinion as to the best mode of dealing with the Water Supply of the Metropolis.

It will be seen, in another part of our columns, that the Birmingham Corporation are in a flourishing state with their

water-works. The demand for water is increasing so as to render it necessary to decide on the construction of two storage reservoirs at Shustoke, having a collective capacity of 400 million gallons, to be completed within three years; but the water rental has so increased that, after making provision for the cost of the new works, there will be an annual surplus of about £5000. The reserve fund already amounts to £40,000, and is to be left to accumulate at compound interest, with perhaps occasional contributions from revenue, until it reaches the statutory limit of £50,000, when the interest is to overflow into the borough fund. Being thus well secured, the Corporation have decided that the £5000 surplus shall be devoted to a reduction of water rents. Objection was taken to the manner in which it was proposed the reduction should be made, as it afforded no relief to 26,000 houses occupied exclusively by the working classes; but an amendment to refer the recommendation back to the Committee failed to find support. When they get richer, the Corporation promise to consider the whole class of water rents.

The Lower Thames Valley Main Sewerage Board have at last arrived at some kind of decision as to their future course with respect to the drainage of their district. They have held two long debates on the subject, and various resolutions have been rejected or withdrawn, the final conclusion being practically a re-opening of the whole question. Thus they have resolved that Mr. T. Hawksley be engaged to advise the Board on the best way of dealing with the sewage of the joint district, with an understanding that he is not to have a claim to carry out any recommendation he may make. Kingston, which strongly opposed the Molesey scheme, is equally opposed to the West Kent project, and is in favour of chemical treatment, to be carried out by dividing the district into four or five groups, each having its own works. But over all there falls the shadow of the Local Government Board, an authority which refuses to let Kingston run alone, and which evidently intends to maintain the unity of the Joint Board. In addition, the Local Government Board have shown their preference for the diversion of the sewage into the West Kent system, as devised by Sir J. Bazalgette. In opposition to this scheme it is argued, by the Mayor of Kingston and others, that no one knows how far the estimated cost may fall short of the reality. Fear is also expressed that at some future time the West Kent outlet will be pronounced a nuisance. On this point we may observe that while some such objection would very likely be made in the course of time, it is certain that before the West Kent outfall can be condemned there must be an interdict against the outfalls of the Metropolitan drainage. Should such a crisis ever come, it would be easier to deodorize the sewage in the neighbourhood of the West Kent outfall than by sections in the Lower Thames Valley. Should it be required for the sewage to be carried farther off, this again would be rendered easier of accomplishment by the fact that the outfall was already a long way down the river. There is, in fact, much to be said in favour of the West Kent scheme, and we cannot conceive that any other will give satisfaction to the Local Government Board. The reference to Mr. Hawksley looks like a lamentable waste of time and money. If he differs from Sir J. Bazalgette, who is to decide between them? If he agrees, it will so far be satisfactory; but time will have been lost.

MR. ROBERT MAIN—who has been with Messrs. R. Laidlaw and Son for the past 17 years, and has in recent times represented the firm throughout Scotland, the North of England, and Ireland—was entertained at a complimentary dinner last Friday, on the occasion of his retiring from the position to join the Argyll Ironmongery Company, of Glasgow. Mr. Robert Laidlaw and Mr. John Thomson, on the part of the firm, expressed their hearty good wishes for Mr. Main's future prosperity.

FIRE AT THE DUMBARTON GAS-WORKS.—Last Friday afternoon a fire broke out in the Dumbarton Corporation Gas-Works, caused by the snapping of one of the flange-joints of the hydraulic main, allowing a quantity of tar and liquor to run away into the chimney-stack, where the former, after a time, burnt itself out. Some alarm was caused by the conflagration; but, fortunately, through the energetic action taken by the Manager (Mr. J. M'Gilchrist), no great damage was done, nor was there the slightest interruption in the gas supply to the town.

THE GAS SUPPLY OF TEWKESBURY.—The Tewkesbury Local Board of Health having, some short time since, appointed a Committee to confer with the Directors of the Gas Company on the subject of the price charged for gas supplied to the public lamps, the Committee reported, at the meeting of the Board on the 1st inst., that the Company had agreed to lower the price from 5s. to 4s. 6d. per 1000 feet, with a discount of 2½ per cent., and to reduce the annual rent of the lamps and pillars from £17 to £12, the Board to keep them in repair. The Committee also reported—"That, having again carefully considered the question of the purchase of the gas-works by the Corporation, we are of opinion that the price required for them (£18,750) is excessive, and desire the instructions of the Board what offer (if any) should be at present made for them." It was resolved that the Town Clerk should write and ask if the Company would accept £15,000, and bear all the expense of conveyance.

THE ST. JOHN AND ROCKWELL CONDENSER AND CARBURETTER.

In these stirring times of electric lighting rivalry, gas companies and all corporate bodies having the manufacture and supply of gas in their hands will do well to see that, by the adoption of every possible improvement which practical skill and ingenuity may devise for reducing cost and improving quality, they may maintain the supremacy of gas for heating and lighting purposes. Gas engineers and managers have never been more energetic than at the present time. The stimulus afforded, since its establishment in 1863, by the British Association of Gas Managers, has been augmented by the more recent formation of branches of the parent stock in several centres or districts, and at the more frequent meetings of these District Associations all the details of manufacture and supply are discussed and sifted with commendable skill.

What can be done in the way of improved street lighting has been shown in a striking manner by Mr. Hunt, at Birmingham, in the large open space in the vicinity of the Town Hall and new Municipal Buildings, the whole being a *tout ensemble* of which the town may be proud; and very shortly Mr. Sugg is expected to give a practical illustration, in the City of London, of what street lighting may and ought to be. Thus, in these two conspicuous cases, it will be made manifest that the semi-darkness complained of as being due to the feeble power of gas, may be economically and effectually dispelled, without the proffered aid of electricity, to the advantage of proprietors of gas undertakings and at the least cost to the ratepayers.

As regards further economy in the process of manufacture, the apparatus invented by Mr. St. John—an illustrated description of which has already appeared in our columns*—bids fair to become an important aid, increasing as it does, by a fixed quantity, the amount of lighting power, or, what amounts to the same thing, enabling the manager of a gas-works to take out from a given weight of coals a larger quantity of gas, without reducing the illuminating power. Nor is this all. It has been found in practical working—where the method has been in constant action nearly two years, operating on about 250 million feet of gas per annum—that the formation of naphthaline is entirely avoided; and this of itself should lead practical men to look into the merits of the invention.

The apparatus has been spoken of as a "washer;" and so it is, in part, but it is not calculated, nor intended, to take the place of the washer, which will still be required as part of the plant that may include this appliance. It is, indeed, a condenser and carburetter—cooling the gas very gradually as it comes from the hydraulic main, and experience so far goes to prove that the effect of its action is to enrich the gas.

It is only to be expected that the invention will be regarded with mistrust, mainly on account of the novel form of the apparatus, and the imperfection of our present knowledge of the principles on which it works. But it is difficult to ignore the logic of the facts that are accumulating in its favour; and the question is one that should be examined alike in the interest of the producer and the consumer of gas. The results said to have been realized should also be tested, and this, we understand, may be done at the Rochdale Corporation Gas-Works. The saving in the cost of production at these works has amounted to something over 3d. per 1000 feet of gas made, of an illuminating power equal to that previously supplied—namely, 18·50 candles. The only change needed in the plant was to cut off, and throw out of action, the then-existing condenser, which was nearly new, the gas being made to pass through the fresh apparatus, and then through a single scrubber. The effect produced was to put the rich light-giving hydrocarbons just where they are wanted, and that is in the gas, and their value into the gas rental; instead of wasting some of them in the tar-tank, where their value is comparatively infinitesimal, and leaving the remainder to float until arrested in the form of naphthaline.

These economic results may, it is asserted, be secured without any increase of expense in manipulation, wear and tear, or outlay of capital; but on this point we shall have something further to say as soon as the apparatus now in course of erection at Birmingham, as well as that for which a contract has already been entered into with the Liverpool United Gas Company, shall have been in operation long enough to admit of statistics being given in reference to the working results.

THE FURTHER WANDERINGS OF THE HERMIT OF WESTMINSTER.

MR. ROBERT PAULSON SPICE, who is so frequently mentioned in these pages in his public capacity, is, in respect of his private life, pleased to call himself a Hermit. If this gentleman deserves the name, and may be taken as a fair representative of the ancient class to whom it was originally applied, and if his Westminster "cell" is at all like such places used to be,† why then we shall consider that the late Thomas Ingoldsby, Esq., was the only true historian of monkish times, and that all other hagiologists are humbugs. But in one respect the Hermit of Westminster is more deserving of the name and renown of a Palmer of old, for he is fond of making extensive pilgrimages in foreign lands; although he has the advantage of his prototypes in being able, and willing, to let his friends partake as fully as possible of the pleasures he finds on his travels, by telling them all about his experiences of men and cities. The Hermit is a most industrious scribe, and, being of an observant nature, he is continually finding things which he, in accordance

with Captain Cuttle's advice, makes notes of. When he gets home again his notes are generally put into shape, and printed for the perusal of his many friends. In truth, the practice is not without its advantages even to the traveller. It is so much better, when asked how one liked Venice or Vienna, to offer the querist a neat little pamphlet, giving an entertaining account of one's journey, than not to say anything, and thereby gain the credit of being a Cookist of a particularly unobservant turn, or, on the other hand, to waste time in continually fighting one's battles o'er again. The Hermit's last production is a narrative of his travels in Italy and Germany during the spring and autumn of last year. He is a good companion, able to take his readers pleasantly and naturally through the towns and countries he sees in his way, and his comments on such matters as hotels, incidents of the road, &c., are calculated to be distinctly useful to any one who may be disposed to follow in his steps. The Hermit may be trusted to know what constitutes comfortable living, and therefore what he praises may be believed in without further testimony. The Hermit's observations on men and manners, political and social, are shrewd and very much to the point, as we can fully testify from experience of many of the circumstances mentioned by him; and while gladly noticing that he does not mention gas in the course of his wanderings—his success in divesting himself of "the shop" when "on pleasure bent" being complete—he gives abundant evidence, open and implied, that

"In spite of all temptations
To belong to other nations,
He remains an Englishman."

THE AMMONIACAL SODA PROCESS.*

THOSE who are interested in the ammoniacal soda process, by some modification of which the purification of gas in close vessels, and the utilization of some of its most troublesome impurities have been repeatedly attempted, will do well to consult the important treatise on Sulphuric Acid and Alkali by Dr. G. Lunge. In the third volume of this work,† which has recently appeared, will be found a chapter wholly devoted to an historical, descriptive, and critical account of the process, from its earliest foreshadowing, in 1838, by Dyer and Hemming, to Solvay's latest communication on the subject, dated 1878. Briefly stated, the principle upon which the process rests is "the conversion of ammonium carbonate and common salt in solution, into sodium bicarbonate and ammonium chloride." The way in which the process bears upon the purification of gas is to be found in the fact that ammonia, sulphuretted hydrogen, and carbonic acid gas are all found associated with crude gas, and in the ammoniacal liquor condensed therefrom; and it is possible, by suitably arranged apparatus, and by the addition of one or two fresh elements, to cause these substances to so act and re-act upon each other that the gas may be entirely freed from their undesirable company, and, at the same time, they may be made available for commercial use. That this end is worthy of an effort to attain will be granted by gas producer and chemical manufacturer alike, when it is seen that the carbonic acid of crude coal gas, which is one of the greatest enemies to the illuminating power of the pure article, and which, even when removed by the ordinary process of lime purification, is entirely lost, is capable of yielding from 70 lbs. to 84 lbs. of purest soda ash per ton of coal carbonized, the value of which in many districts would go some distance in defraying the cost of the coal. It might have been wished that Dr. Lunge had gone into this part of his subject rather more deeply. He fully describes Wallace and Claus's process, as well as Gerlach's method, but he has scarcely taken enough trouble to indicate the points necessary to be observed in the theoretical solution of the question. It may, of course, be said that Dr. Lunge has been compelled to devote the major portion of his space to the description of actual industries, and has therefore had small opportunities for dealing at length with a scheme which has so far been fuller of promise than of performance. But still the importance of the matter, involving as it does the possibility of bringing into useful service thousands of tons of material now wasted, and affecting some of the most important manufactures of the world, might, in our opinion, have been better recognized by Dr. Lunge. It is not to be expected that the author would be able to tell us exactly how to do it. He probably wishes to know himself. But in the interests of gas manufacture we may be permitted to feel aggrieved that the great possibilities of the conservative purification of coal gas have in the present work been so lightly touched upon by one who might well have done so much better. The importance of the soda manufacture, and even of the ammoniacal process, as ordinarily practised, are fully recognized by Dr. Lunge, but he has failed to point out how yet another residual product of gas-works may at any time be expected to rise into prominence.

PRESENTATION TO MR. J. WILSON, OF SALTCOATS.—Last Wednesday a presentation of a purse of sovereigns was made to Mr. John Wilson, who has recently been appointed Manager of the Coatbridge Gas-Works, having for the past 4½ years held a similar position at Saltcoats. Much regret at his removal was expressed by those present, and many were the friends who wished him success in his new sphere.

* "A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches." By George Lunge, Ph. D., F.C.S. Vol. III. London: John Van Voorst.

† The first volume of Dr. Lunge's treatise was noticed in the JOURNAL for July 1, 1879 (Vol. XXXIV., p. 13). The second volume, dealing with the manufacture of sulphate of soda, hydrochloric acid, and soda, in the processes for which our readers are not specially interested, appeared in May last year. The third volume, completing the work, is the one now under review.

* See JOURNAL, Vol. XXXIV., p. 901.

† We notice that, in the little pamphlet before us, the last illustration, styled "The Town Residence of the Hermit of Westminster," bears a striking resemblance to the Westminster Palace Hotel.

Notes.

ANOTHER HOT AIR GAS-LAMP.

A novel form of gas-lamp has been invented by M. Clamond, of Paris, on the principle of supplying hot air to the flame, in combination with the principle of the lime light. The air necessary for supporting combustion is caused to pass downwards through a tube, which contains cylindrical pieces of refractory material so arranged as to break up the current of air, and cause it to strike repeatedly against the sides of the tube. This tube is in one arrangement heated, from without, by a number of horizontally directed gas-jets, issuing from several specially constructed burners that surround it. By this means the air is brought to a high temperature before it leaves the tube and mingles with the gas supplied to the burner. The flame is thus made intensely hot, and is then directed downwards upon a cylinder of lime or other suitable material, thereupon creating a brilliant white light from the incandescence of the material. Solid carbonaceous matter, such as powdered coal, coke, or charcoal, may also be used for heating the air and supplying gas. In this case the air tube is placed centrally within a funnel-shaped vessel containing the carbonaceous powder, and provided with air chambers for causing combustion of the powder. The carbonic acid gas produced by this combustion is caused to pass through the mass of incandescent powder, and thus becomes converted into carbonic oxide, which, in its turn, is burnt by the aid of the heated air, and its flame directed upon the lime cylinder, as before described. The inventor also claims an improvement in the formation of the refractory material which he uses in his lamps. Instead of the customary plain block of lime, he arranges a number of small sticks of lime projecting from a block of fire-clay, the whole, for convenience of carriage and safety of handling, being enclosed in a pasteboard "cartridge." When required for use this cartridge is placed beneath the flame, and the casing is thereupon immediately burnt off, the rods being at once rendered incandescent.

LEAD FOR ACID PANS.

Much trouble and loss are occasionally caused to manufacturers of chemical products, such as sulphate of ammonia, &c., wherein sulphuric acid is employed, by the failure of the lead lining of the pans and other receptacles exposed to the action of the acid. A valuable paper on this subject was read, and an instructive discussion thereon took place, at a recent meeting of the Philosophical Society of Glasgow, when many facts transpired respecting the endurance of different qualities of sheet lead, when maintained in contact with strong acid at ordinary temperatures. Although, as might have been expected, the most striking effects were produced by acid highly concentrated, as for export, the same action would be exerted by weaker acid, though it would naturally be spread over a longer period. It appears that pure lead is freely acted upon by sulphuric acid at ordinary temperatures, with the attendant evolution of hydrogen, while the presence of a fractional proportion of antimony, not exceeding 0.75 per cent., makes lead less scorable, and therefore more suitable for chemical purposes, than when it is absolutely pure. The liability of lead pans to give way in patches was observed to be difficult to satisfactorily account for. It may sometimes be due to the presence of zinc, or to a little dross being accidentally rolled out with the sheet. Either cause would be sufficient to account for the partial destruction of a sheet of lead. The latter is, perhaps, the best explanation of the fact that a pan sometimes corrodes readily, while another, of an identical brand of lead, and indeed containing pieces from the same roll, remains entirely uncorroded. From experiments made, the results of which were recounted at the meeting, samples of lead exposed for one month to strong acid lost weight in proportions ranging from over 25 per cent. to as little as 6 per cent., the most durable being far from the purest in quality. Some samples of hard lead were found to stand better than the softer kinds; but, on the other hand, they were liable to crack from expansion and contraction. The result of the discussion was apparently that though the destructive effect of sulphuric acid on pure lead may be taken as proved, and that a slight addition of antimony is as beneficial as the presence of zinc is deleterious, the best composition of sheet lead for chemical use is still to be discovered.

A GENERAL SYSTEM OF HEATING BY WATER AT HIGH PRESSURE.

The Prall Union Heating Company is the title of an American trading company, formed for the purpose of carrying out the Prall system of supplying heat and power to dwelling-houses by means of pipes circulating water heated to about 376° Fahr., and, consequently, at a pressure of about 170 lbs. per square inch above the atmosphere. It is claimed that in being transmitted a mile through boxed pipes buried underground, the temperature of the water does not fall more than 1°, so that a constant temperature of 375° can always be maintained in the pipes of a cooking-range, this heat being quite sufficient for all culinary purposes. The warming of houses and apartments can be effected either by air currents circulating round hot-water coils, or by means of steam radiators, the hot water being converted into steam in small converting chambers. In the practical extension of the system, it is proposed to establish central boiler stations, each to serve districts of about one square mile. The pipes to convey the water from the stations to the houses served, and back again, are to be laid together in one trench, and connected so as to allow of a forced circulation being imparted to the water, since it is evident that the friction in the pipes would be very great, and the small loss of head permitted would be quite insufficient to create a current. The return pipe conveys to the generator all the water not drawn off for domestic or other uses,

thereby saving all the heat not available for heating purposes or otherwise. The alleged advantages of this system over steam heating supplied by similar means, are the smaller size and lesser cost of the mains and services, and the diminished loss of heat by conduction and condensation referable to the smaller pipes, and also the saving of fuel by the return of all the unused condensed water to the boiler. At the trial station already established in New York, about 3000 feet of pipe have been laid, through which the water is driven at such velocity that no portion of it is away from the boiler more than 15 minutes. This gives an average velocity of 3.3 feet per second throughout the circulating system. It is estimated that two or three cubic feet of water per hour will suffice for heating an ordinary city house, and that the cost to consumers will be much less than with any other system of heating. In reference to the project, the *Scientific American*, from which these particulars are taken, is of opinion than something more than experimental trials on a small scale, conducted under the personal supervision of the Company's Engineers, will be necessary before the system can be pronounced a practical success. The whole scheme bristles with difficulties, which will instantly be suggested in the minds of any one accustomed to pipe work as at present practised; and there are doubtless many who would hesitate to introduce into their houses such an unruly servant as water of the explosive force represented by an indicated pressure of 170 lbs. per square inch, which the slightest failure in a pipe or any subsidiary fitting would at once set free.

AN ELECTRIC PHOTOMETRICAL UNIT.

In a recent number of the *Journal für Gasbeleuchtung*, Herr L. Schwendler revives the idea of a constant photometrical unit formed by platinum rendered incandescent by an electric current. He makes a loop of platinum foil, 2 mm. wide, 36.28 mm. long, and 0.017 mm. thick, weighing 0.0264 gramme, and giving a constant resistance of 0.143 unit at 66° Fahr. Through this loop a constant current of 6.15 webers is passed, and the result is a light equal to 0.69 standard sperm candle; or, stated in another way, 1 candle is equal to 1.44 platinum light. This proportion is said to be constant with reference to an average candle. It is essential that the platinum unit should be protected from currents of air, and be used in a suitable glass chimney or shade, the farther half of which—i.e., the part behind the platinum when fixed on the scale for observation—is blackened in order to prevent reflection. The whole arrangement of the unit-light is said to be extremely simple. The circuit includes, besides the platinum loop, a sensitive galvanometer of small resistance, a simple rheostat for regulating the current, and the battery, which may be of any constant form with low internal resistance, comprising several elements connected in series. The rheostat consists of an oblong block of hard wood, on which a groove is cut in the form of a long and narrow loop. The groove is filled with quicksilver connected by its ends with the circuit, which offers a certain resistance to the passage of the current. Its resistance is controllable by means of a moveable metallic bridge, capable of cutting off the current from the whole or any part of the thread of quicksilver, according to the position in which it is placed in connection with the two sides of the loop, towards its beginning or end. Constancy, regularity, and reliability are urged as the advantages of a light-unit of this description.

Communicated Article.

OBSERVATIONS ON GLASS AS AN OBSTRUCTOR AND REFLECTOR OF ARTIFICIAL LIGHT.

By Mr. F. W. HARTLEY, A.I.C.E.

FIRST ARTICLE.

In the JOURNAL for Feb. 28, 1860, there appeared an interesting letter from Mr. W. King, of the Liverpool United Gas Company, containing the results that he obtained in certain experiments with burners and glass globes or shades, and with a sample of sheet glass. The particulars given were as follows:—

	Loss of Light.
Clear glass [globe or moon]	10.57 per cent.
Ground glass—entire surface ground	29.48 "
Smooth opal	52.83 "
Ground opal	55.85 "
Ditto, ornamented with printed figures, the figures intervening between the burner and the photo-meter screen	73.98 "
Common window glass	9.34 "

Mr. A. H. Wood, of Hastings, at a later date, I believe, also made experiments in the same direction as Mr. King had done, and the statements of his results, as given in Mr. T. Newbigging's "Hand-book for Gas Engineers and Managers," are reproduced below:—

	Loss of Light.
Clear glass globe	about 12 per cent.
Clear globe with slightly-ground flowers	24 "
Globes of about the usual pattern	35 "
Globes ground all over	40 "
Opal globes	60 "
Painted opal globes	64 "
Common window glass	9 "

As far as I am aware, the statements of these two gentlemen embrace all the published facts upon this subject. It will be observed that there are considerable discrepancies between the results arrived at by the two experimenters; while both fail to give the diameters of the globes or moons operated with, the kind of burner employed, and the intensity or power of the unshaded or unscreened flame. I apprehend also that the determinations were based on the amount of light obstructed in a horizontal line coinciding, nearly or quite,

with the central horizontal axes of the moons themselves. Results obtained under such a condition might be sufficiently near to truth in the days when moons with openings only $2\frac{1}{2}$ inches in diameter at the bottom were universal (and even now, with the general run of Argand moons), but not when, as is at present the case, moons are used with the bottom openings 4 to 5 inches in diameter, and much light, therefore, is reflected downwards through such openings. The value of this reflected light will be shown at the latter part of this article.

I have called attention to the discrepancies in the quoted statements. Mr. King says the loss with a globe ground all over is 29.48 per cent.; Mr. Wood, that the loss is as much as 40 per cent.; while with opal globes Mr. King's loss is 52.83, and Mr. Wood's 60 per cent. Truly Mr. Wood says "about" in each instance. That in such an investigation as is in question discrepancies should arise in results realized by two competent experimenters—working it may be on somewhat different lines, and with, it may also be, inconstant standards of different intensities—can be no great matter of surprise, and in no sense reflects discredit upon either. I have only mentioned the matter in order to show that the data at present accepted can scarcely be so exact as is to be desired.

During the past year, while working very much with Mr. Methven's standard, or light unit, an old scheme—and I think a French one—for the estimation of the power of flames of high intensity by the aid of a standard of low intensity, revived itself in my mind—namely, the reduction of the intensity of the powerful light by introducing between it and the photometer disc a series of transparent or semi-transparent plates of glass, the obstructive power of which for various distances and intensities of light had been determined. To successfully and readily apply such a system it was necessary to ascertain whether the obstructive power of glass plates varied in any regular ratio with their distances from a flame and with the intensity of the latter. After a number of experiments I was elated with the prospect of success, for the results obtained seemed to indicate that the resistance was proportionate to the cube root of the distance of the glass screen from the flame, *plus or minus* (I forget which, for I have lost my first notes) a constant difference. As, however, I was fully sensible of the fact that Dame Nature is chary in giving the discovery of a general principle or law, however simple, to any one of her children, until after he has proved himself a very slave to her, I doubted the possibility of her being so suddenly generous to me, and continued my inquiries with greater care. I was speedily disillusioned as regards the discovery of a "law," but the subject of inquiry had grown so interesting that I resolved to pursue it with humbler aims in view, although my project for a photometer was apparently shattered.

My experimental observations may be conveniently arranged under five headings; namely, the effects obtained with—

1. Clear sheet and plate glass.
2. Ground sheet and opal glass.
3. Globes and half globes as obstructors and reflectors of horizontal light.
4. Globes with elevated or overhead lights.
5. Reflectors, &c., with elevated or overhead lights.

Throughout the whole series of experiments Methven's light unit was employed as the standard of comparison; and, without its aid, it would have been impossible for me to make the tests with sufficient rapidity and certainty. In order, however, to avoid the risk of any error whatever, and although with each set of experiments every care was taken to ensure a regular rate of consumption with the opposing burner, the constancy of the light given was verified by direct comparison with the Methven unit at very short intervals—intermediately, in fact, between almost every trial with screens and globes. The experiments extended over several months, being made when circumstances permitted; many were repeated a number of times, and the results always agreed within one or two per cent., although the illuminating power of the gas used on various occasions differed to the extent of more than $1\frac{1}{2}$ candles. In the first and second series the gas was adjusted to give a light of 13.5 and of 17.5 candles; these being deemed the extremes likely to be experienced in practice with the Argand.

CLEAR GLASS SERIES.

TABLE No. 1 (12-oz. Sheet).

Light by Argand . . .	13.4	13.4	13.4	13.4	13.4	13.4	13.4	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	10	11	11	12	12	12	12	per cent.
Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	12	13	13	15	15	17	17	per cent.

Other samples of sheet glass gave similar results, and it is needless, therefore, to tabulate them. The following, however, are of interest (Table No. 2). D is plate glass of the best quality, 5-16ths inch thick; No. 2 is 17-oz. sheet; E is 21-oz. cast glass, such as is used for gratings, coal-hole plates, &c.; and F is a corrugated plate with fine lines.

TABLE No. 2.

Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.
Glass D at	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	8	12	13	13	13	13	13	per cent.
Glass No. 2, (17-oz.), loss	11	13	14	15	16	16	16	per cent.
Glass E (21-oz.), loss .	13	13	15	18	18	15	16	per cent.
Glass F (30-oz.), loss .	19	19	20	20	23	27	27	per cent.

Very common sheet, loss 11 per cent.

It will be observed from the preceding tables that the loss with clear glass tends to be constant for any distance over 8 inches from the flame, that the percentage of loss increases as the light is increased in power, and that for equal intensity of light the thick plate, D,

obstructs less light than ordinary sheet. This, no doubt, is to be attributed to the superior quality of the glass, the perfect parallelism of its surfaces, and their highly polished condition. Sheet E gives somewhat irregular results. This is due to its peculiar rough and indented surfaces, which may be likened to those of a plate of iron which has been roughly hammered over with a hammer having a slightly convex face, about $1\frac{1}{2}$ inches in diameter. These hollows curiously resolve the light into bars or streaks of unequal intensity, which effect increases as the glass is receded from the light, and renders photometric estimations difficult. Some part of the irregularities of the preceding and following tables are due to the fact that I have limited the statements of percentage loss to *whole numbers*. Hence some are slightly greater and some slightly less than were obtained in the experiments. I feel, however, that it would be little less than an affectation of refinement to carry the results of such experiments into decimal places.

GROUND GLASS SERIES.

TABLE No. 3 (16-oz. Sheet).

Light by Argand . . .	13.5	13.5	13.5	13.5	13.5	13.5	13.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	26	51	54	58	61	62	62	per cent.

Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	24	38	41	44	47	51	51	per cent.

TABLE No. 4 (27-oz. Sheet).

Light by Argand . . .	13.5	13.5	13.5	13.5	13.5	13.5	13.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	32	57	61	64	66	68	68	per cent.

Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	34*	48	49	52	55	55	55	per cent.

TABLE No. 5 (24-oz. Sheet).

Light by Argand . . .	13.5	13.5	13.5	13.5	13.5	13.5	13.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	35	58	62	65	68	68	68	per cent.

Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.
Glass screen at . . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
Loss of light	39*	48	50	55	58	60	60	per cent.

From Tables Nos. 3, 4, and 5, it will be seen that the percentage loss tends to be constant at distances of 15 inches and upwards from the burner, or at nearly twice the distance found for clear glass; while, contrary to what ensues with clear glass, the *percentage loss* diminishes as the light increases in power, the absolute loss of light being, however, greatest with the most powerful light. At $3\frac{1}{2}$ inches distance the effects of the 27-oz. and 24-oz. sheets (Tables Nos. 4, 5) are somewhat exceptional, for with the strongest light a higher percentage loss is manifested than with the weaker light. These figures are, therefore, marked with asterisks. In the trials recorded in Tables Nos. 3, 4, and 5, the *ground* sides of the glass sheets were presented to the burner; but a circumstance led me to suspect that a difference would be found if the smooth instead of the rough side were presented to the flame. With the light from the Argand equal to 17.5 candles, the 16-oz. sheet (Table No. 3) was alternately presented smooth and rough to the flame at $3\frac{1}{2}$ inches distance. The loss with the smooth side to the flame was 22 per cent., and with the rough 24 per cent. The same course was adopted with the 27-oz. sheet, and the losses were—for smooth, 30 per cent.; for rough, 34 per cent. With the 24-oz. ground sheet the experiments were carried completely through, and are given in the following table:—

TABLE No. 6 (24-oz. Sheet).

Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.
Distance of screen . .	$3\frac{1}{2}$	8	10	12	15	18	20	inches.
from flame								
Rough side to flame, } loss	39	48	50	58	60	60	60	per cent.
Smooth side to do., loss	30	44	49	52	57	57	58	"

Another screen of 17-oz. ground sheet gave at $3\frac{1}{2}$ inches distance—loss for smooth side, 30 per cent.; for rough side, 36 per cent.; and at 8 inches the loss for smooth was 44, and for rough 45 per cent. *A priori* such results would not, perhaps, be looked for; but that they must be true, a moment's reflection will show. Plain sheet (Table No. 2) at $3\frac{1}{2}$ inches distance cuts off 11 per cent. of the light. The 16-oz. ground glass in Table No. 3, with the same power of light, cuts off 24 per cent.; and if, as may fairly be done, the obstructive power of the clear parts of the glasses be taken as equal, there remains 13 per cent. as the obstructive power of the ground surface. Hence the 17.5-candle power would be reduced to 17.27 before reaching the clear portion of the ground glass, while with the smooth surface to the flame the power would be 17.31 when the ground surface was reached. This, however, is far from being sufficient to account for the differences actually found, and therefore it must be assumed that reflection, refraction, and dispersion operate, and are really the major causes of the better effects given when the smooth surfaces are presented to the flame.

Before putting the sheet glass aside, a few experiments were made to ascertain the effect of sheet glass as a reflector. The sheets used were of the same size, one was placed $3\frac{1}{2}$ inches in front of, and the other at the same distance behind the flame, which was of 17.5-candle power. Clear glass behind produced 3 per cent. difference, as will be shown in my second article. The loss with 16-oz. ground sheet (Table No. 3) with ground glass behind was reduced from 24 to 22 per cent.; with 27-oz. (Table No. 4) ground sheet, with opal glass behind, the loss was reduced from 34 to 21 per cent.; so that the value of the reflected light was 2 and 13 per cent. respectively.

A sample of sheet glass 0.07 inch thick, lightly flashed on one side with opal, gave the same result with either flashed or plain side to the flame. This fact seems to support the hypothesis already men-

tioned in relation to the refractive and dispersive powers of ground glass. The flashed opal glass was found to operate in the same way as ground glass with respect to obstruction—viz., that it causes a diminishing percentage of loss of light as the power of the flame is increased.

OPAL GLASS.

TABLE No. 7 (Flashed Opal Glass).

Light by Argand . . .	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	candles.
Screen at . . .	3½	8	10	12	15	18	20	inches.	
Loss of light . . .	72	92	96	96	—	—	—	per cent.	
Light by Argand . . .	17.5	17.5	17.5	17.5	17.5	17.5	17.5	candles.	
Screen at . . .	3½	8	10	12	15	18	20	inches.	
Loss of light . . .	66	86	88	88	—	—	—	per cent.	

A sheet of 21-oz. opal glass, such as is used for the tops of lanterns, at 3½ inches from an Argand flame giving the light of 19 sperm candles, obstructed 96 per cent. of the light, and at 8 inches distance more than 99 per cent. An analogous result had been obtained with another sheet of the 21-oz. A sheet of 15-oz. opal at 3½ inches distance from a 19-candle power flame cut off nearly 88 per cent. of the light, and at 8 inches distance 97 per cent. In order to simulate the effects which are produced when a burner is used in a lantern, a screen of clear sheet glass was placed in front of the burner, and the intensity of the light was thereby reduced from 19 to 17 candles. The opal sheet of 21-oz. was next placed at 7 inches behind the flame, when it was found that the reflected rays exactly compensated for the loss caused by the clear glass in front; the power of the horizontal light being as with the unscreened burner—19 candles. The more transparent 15-oz. produced nearly as good an effect—raising the 17 candles power to about 18½ candles. At 4½ inches distance behind the flame the reflection raised the power from 17 to 20 candles, and at 3½ inches to nearly 22 candles.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

DR. ADAMS'S GAS-STOVES.*

SIR,—If Mr. Wright's experiments on Dr. Adams's gas-stoves be corroborated by independent observers, no one can be more gratified than I shall be at finding that the heating power of gas is so much higher than I was led to believe from the statements of some of the best authorities. I have no interest save the interest of truth, and the desire that the consumption of gas for heating purposes should be increased. At the same time I must be excused from accepting as conclusive the experiments recorded by Mr. Wright. In the first place, experiments with an anemometer are very subject to error, and Mr. Wright does not say which of the many forms of this instrument he employed, or give any details whatever of his tests. Next, I cannot accept experiments which also proved that Dr. Adams's stove was from 8 to 14 times more efficient with a given quality of gas than the best of its predecessors. This statement has been disowned by Dr. Adams, and left unnoticed by Mr. Wright, although published by him, and as I am quite satisfied the statement is both incorrect and unfair to other manufacturers, I cannot accept statements made in the same breath by the "sole authorized maker" of the stove.

I may say that I have one of the stoves in question; but I have not made any quantitative experiments with it. Its use was discontinued in the office in which it was fixed, on account of the very unpleasant smell caused by it. I do not, however, condemn it on this account, as I have found in other cases a disagreeable smell was caused with new stoves, from some oil or varnish adhering to the iron. When I have more leisure I will arrange a test more complete than one that can be given by any anemometer. I fear, however, that any test made by me, if unfavourable to the stove, may be discredited; as people may suppose I have a prejudice against it. Meanwhile, I would suggest that the stove be placed in the hands of Mr. Vernon Harcourt, Mr. Keates, or any other gentleman of reputation, who has practice in accurate experimental investigation; and I repeat that I shall be sincerely gratified if he can assure us all that a cubic foot of gas can develop a quantity of heat so much greater than previous authorities have attributed to it, and that Dr. Adams has invented a stove from 8 to 14 times more economical than "the best hitherto made."

I may observe that the original statement which I commented on did not specify cannel gas as the combustible used, and appearing in a Birmingham paper it was only natural to suppose that ordinary gas was referred to. Neither does Mr. Wright state that, in the tests made with the stoves of other makers, he or Dr. Adams employed the same gas as that used in Glasgow. Neither is the illuminating power or chemical composition of the gas in both cases given.

Cork, Jan. 6, 1881.

DENNY LANE.

Legal Intelligence.

COURT OF SESSION, FIRST DIVISION.—MONDAY, JAN. 3.

(Before Lords CRAIGHILL and CURRIEHILL.)

VALUATION OF THE DUNDEE CORPORATION GAS-WORKS.

A Lands Valuation Appeal Court was held this day, at which an important question affecting the owners of gas undertakings was raised—viz., whether a Corporation carrying on business as manufacturers of gas are entitled to a deduction from the valuation of the Assessor, under the Valuation of Lands and Heritages (Scotland) Act, of 15 per cent. on two-thirds of the working expenses, in the name of tenant's profits; or, alternatively, to certain deductions in the name of expenditure. The Corporation of Dundee acquired the gas-works in that town in 1868 for the sum of £8500 in annuities, which, at 20 years' purchase would give £170,000. The Acts under which the Corporation acquired the works and carry on business provide (*inter alia*) that the Corporation shall not make any

profit from the undertaking. The Assessor under the Valuation Act fixed the value of the works as follows:—

Gas-works, East Dock Street . . .	£9,983	0	0
Mains, pipes, and drains . . .	2,731	0	0
Gasholders, Peebles Lane, Lochce . . .	573	0	0
Mains and pipes . . .	1,544	0	0

Total, with £76 added for landward parish . . . £14,907 0 0

The Gas Commissioners disputed this valuation, and proposed that it should be as follows:—

Gas-works, East Dock Street . . .	£7,314	0	0
Mains, pipes, and drains . . .	2,004	0	0
Gasholders, Peebles Lane, Lochce . . .	418	0	0
Mains, pipes, and drains . . .	126	0	0

Total . . . £10,862 0 0

Against the valuation as fixed by the Assessor the Gas Commissioners appealed to the Magistrates, and they maintained in the Inferior Court that, in addition to the deduction allowed by the Assessor, they were entitled to a deduction of 15 per cent. on two-thirds of the admitted working expenses of the undertaking in the name of tenant's profits, and on the ground that the works could only be assessed on the principle of what a hypothetical tenant would give, and that no tenant would embark his capital and skill without getting something above ordinary interest upon capital; or, alternatively, that they were entitled to other deductions, in respect of expenditure and otherwise, over and beyond what the Assessor had allowed. On the other hand, the Assessor contended that he had disallowed the item of deduction claimed in the name of tenant's profits, amounting to £4011, as being wrong in principle and contrary to law, and that, although it might be right to allow the tenant's profits in the case of a public or private company, whose first object was to make profits, such a deduction should not be allowed in the case of a corporation, who, by their constitution, were prohibited from making profits. In this case a hypothetical tenant was not allowed. He also maintained that, according to the other or alternative view, the appellants were allowed every deduction to which they were entitled for repairs or otherwise, and they were not entitled to the additional deductions claimed by them.

The following is a detailed statement, by the Assessor, of the revenue account of the Gas Commission for the year ending April 30, 1880:—

Receipts.

	Total.	Allowed.
Gaslight accounts . . .	£50,179 1 3	£50,179 1 3
Meter-rents . . .	2,408 4 9	—
Chemical products . . .	4,137 10 9	4,137 10 9
Coke . . .	1,034 16 9	1,034 16 9
	£57,759 13 6	£55,351 8 9

Expenditure.

	Total.	Allowed.
Coal . . .	£31,867 4 2	£31,867 4 2
Purifying . . .	692 5 0	692 5 0
Main-pipes . . .	355 12 4	355 12 4
Service-pipes . . .	535 5 11	535 5 11
Repairs of buildings . . .	671 13 1	—
Gas apparatus . . .	665 16 1	665 16 1
Retorts and settings . . .	1,408 10 1	1,408 10 1
Meter repairs . . .	1,050 0 1	—
Refuse . . .	315 4 3	315 4 3
Assessments . . .	1,739 6 2	1,302 15 9
Rents . . .	322 6 4	—
Salaries . . .	2,543 9 8	2,353 9 8
Stationery . . .	187 13 8	187 13 8
General expenses . . .	318 14 2	318 14 2
Annuities . . .	8,322 13 0	—
Interest on mortgages . . .	4,096 7 10	—
" loans . . .	776 6 1	—
" bank, &c. . .	81 9 4	81 9 4
" gas deposits . . .	30 7 6	30 7 6
Expenses of loans . . .	150 0 0	—
Sinking fund . . .	2,200 0 0	—
Contingent fund . . .	540 0 0	—
	£58,830 4 9	£40,114 7 11
Allow overcharged last year . . .	—	229 9 2
Insurance premiums . . .	—	100 0 0

Assessable value of works . . . £40,443 17 1

14,907 11 8

£55,351 8 9

Evidence having been given in support of the appeal, the Magistrates decided unanimously that the deduction of 15 per cent. claimed as tenant's profits was not, under the circumstances, allowable, and, by a majority of 10 to 2, disallowed any deduction for repairs or for renewals. The Court, however, unanimously allowed a deduction of 4½ per cent. interest on the sum of £15,000 held by them as an amount of capital necessary to carry on the concern as traders, such annual deduction amounting to £687.

The Gas Commissioners appealed to the Supreme Court against this decision, because (1) the Assessor had made up his valuation on the principle of income and expenditure, and yet did not allow to the hypothetical tenant anything for tenant's profits; 15 per cent. on two-thirds of the working expenses, £40,443 17s. 1d., should be allowed, and £3969 should be deducted. (2) Assuming that the present is not a case for tenant's profits, the Assessor had not allowed, by way of deduction, £671 13s. 1d. for ordinary repairs of buildings; and the full salaries disbursed in management being £2543 9s. 8d., the Assessor only allowed £2353 9s. 8d., having omitted to make deduction for the salary of the Clerk of the Commissioners and of the Auditor of the Commissioners. Further, in this view the following allowances should also be made:—(3) An allowance for insurance. The Commissioners are their own insurers—in other words, they do not insure their buildings or plant, and thus have no expenditure in this respect. The amount should be taken at not less than upon £20,000, which at 6s. 6d. per £100 represents £65. (4) The ordinary repairs made by the Commissioners to their mains and service-pipes and other portions of their plant *only* are allowed for; but as the Commissioners' plant consists (*inter alia*) of gasholders, main-pipes, service-pipes, and temporary buildings, and as the life of gasholders, however well they may be kept in repair, is only equal to 30 years, that of the mains to 40 years, the services to 15 years, and the buildings to 50 years, such fair sums should be allowed annually as may be necessary to keep the works in a proper condition to earn their income, although these sums may not actually be expended in any particular year. Otherwise, at the end of the periods mentioned the Commissioners' works would be exhausted, and new capital would require to be borrowed for providing new works, and thereby all assessments for the past period would truly have been made, not on annual income or revenue, but likewise on capital. The present value of the gasholders is £20,000; of the mains, £30,000; of the services, £5000; and of the buildings, £15,000—in all, £70,000. In addition to the money expended on ordinary repairs, which should be allowed for, a sum

* In the letter, on this subject, that appeared in our pages last week, for "19,125" and "28,274" square inches in the third paragraph, read "19,125" and "28,274" respectively.—Ed. J. G. L.

equal to at least 2½ per cent. on the £70,000 should be reckoned for on this head. (5.) The Commissioners require to borrow money to enable them to conduct their business, as the receipts from gas and other products cannot be collected in time to pay for the coals and other material required to carry on the works. A sum of £15,000 at least, being equal to about three months' revenue or expenditure, should be allowed on this head, at 5 per cent. To put it briefly, the Commissioners claim according to the first view—namely, tenant's profits—a deduction of £3969, and according to the second view—for repairs, &c.—a deduction of £3426 13s. 1d.

In answer the Assessor stated that, in valuing the gas-works, he adhered to the principle adopted many years ago both in Dundee and in other towns in Scotland. This principle was to take as a basis of the valuation the gross revenue of the undertaking for the previous year, and after deducting the expenditure necessary to earn the revenue, to enter the balance as the annual value in the valuation roll. They had been told that hitherto a large sum, in addition to the expenditure shown in the revenue accounts, had been allowed as tenant's profits; but, after carefully considering the matter, and ascertaining what was done in other towns, he had decided that to grant such a deduction was wrong in principle and contrary to law. He thought it might be quite right to allow tenant's profits in the case of a public or a private Company, whose first object was to make profits, but such a deduction should not be allowed in the case of a corporation, who were entirely prohibited by their constitution from making profits at all. If they had a surplus in any year, then it could only be applied to the improvement of their works, the payment of their debts, or in the reduction of the price charged for their gas in the following year. In attempting to ascertain how much of a yearly rent a supposed tenant would give for such works, they had to suppose that, in addition to the ordinary expenditure for keeping up the works, and the necessary outlay in the manufacture of gas, he would require to provide a sum for interest on his capital as well as for his own labour and work. The result would only be to increase the revenue by £4000, or such other sum as was considered a fair profit to the tenant; but the net revenue—namely, the sum to be entered in the valuation roll—would be left the same as before.

The SOLICITOR-GENERAL and Mr. MACKINTOSH appeared for the Gas Commissioners; Mr. CROLE, Solicitor for the Inland Revenue, watched the case in the interests of the Crown.

Mr. MACKINTOSH said the Commissioners, under their Acts, were charged with the duty of manufacturing and supplying gas within the town of Dundee. The question raised by the appeal was as to the sum at which the heritable portion of the gas-works should be entered in the valuation roll. The Assessor proposed £14,907 11s. 8d.; but the Commissioners contended that from this sum there ought to be a deduction, in the first place, of £3969 in respect of tenant's profits; and, in the second, of £3426 for repairs, &c. The question which their lordships had to determine was whether the Commissioners were entitled to either or both of these deductions. It should be kept in view that the two claims were not necessarily inconsistent with each other, and that there were views of law on which both sets of deductions might be claimed. On the first point their lordships had to determine whether, looking to the character of the undertaking, an allowance for tenant's profits was not a legitimate allowance. It was a matter of concession on both sides that the Commissioners were not at liberty to make profit by consumers. They were bound to supply gas, so to speak, at prime cost. Before dealing with the question as one of principle, he (Mr. Mackintosh) would state how the authorities stood. The question, so far as the authorities in the Court were concerned, could hardly be said to have been determined. In the case of the Clyde Navigation Trustees, a deduction had been made of 20 per cent. for maintenance and of 20 per cent. for tenant's profits; but the Court expressed an opinion that this had been done "because the Assessor had done so without the suggestion of any doubt or difficulty. It is not to be understood, therefore, that these matters may not in future be open for inquiry, if it should be required or thought necessary." The Clyde Trustees were a statutory corporation not entitled to make profit out of their undertaking, and were just in the same position as the Dundee Gas Commissioners. It was only fair to say, however, that while this decision had to a large extent ruled the practice of the Courts in Scotland, there was in England the case of the *Mersey Docks Board v. The Overseers of Liverpool*, tried in 1878, in which the Court of Queen's Bench decided that tenant's profits were not allowable in the case of a public board. But there was an element of distinction between that and the present case, and it was, he submitted, very material. All that the Mersey Docks Board had to do was to levy rates, so that the hypothetical tenant was not and could not have been in any respect a trader. In the case of the Dundee Gas Commissioners, their functions were not confined to the mere levying of rates; they were bound to manufacture and supply gas, and to incur all the risks connected with trade. In the Mersey Docks case a tenant might be found who would be satisfied with a commission by way of remuneration; but this could not be the case here, if a lease of the subject-matter was to be assumed at all. A tenant would require more than a commission for collection; he would require tenant's profits. But it was for the Court to say how far the Mersey Docks case was an authority on the point where a corporation were not merely collectors but manufacturers. Apart from the Mersey Docks case there were two other views on which it was said that tenant's profits could not be claimed as a deduction. In the first place it was said no profit could be charged—that tenant's profits in a case like this were a legal impossibility. In a sense this was true, and it was important to see what that meant. It appeared to him that it meant no more than this—that gas makers were so restricted in regard to the price of gas which they had to charge, that no margin was left, beyond what was required for paying their interest; in other words that a corporation were only to make both ends meet by keeping the concern in their hands and managing it themselves, undertaking all the risks, in place of letting the works to a tenant. He was willing to take the example of a proprietor of farm land who, in order to make ends meet, managed one of the farms himself. In such a case the proprietor would be entitled to a deduction by way of tenant's profits. All that was meant by saying gas corporations were not entitled to make profits was that they were entitled only to charge the public such a sum as would meet the annuities on their heritable debt. They had borrowed the sum necessary for the purchase of the undertaking, and their only outgoings consisted, apart from the expense of manufacture, in the sums which they paid to their creditors in the shape of annuities.

Lord CRAIGHILL: And supplying themselves with gas at prime cost.

Mr. MACKINTOSH: And the community.

Lord CRAIGHILL: The community are owners. Corporations are prohibited from making profits because the constitution of the corporation was that the community should be supplied with gas, not at a profit on the manufacture, but at prime cost.

Mr. MACKINTOSH: That is, that the Commissioners are bound to divide the tenant's profits among their customers; but all that is meant by saying that the Commissioners are not at liberty to make tenant's profits is this—that the price to which they are limited is such as barely leaves them enough money to pay their expenses and the interest on their debt. This

does not make it a legal impossibility for the Court to apportion the Commissioners' revenue into tenant's profits on the one hand, and into rent on the other, for the purpose of valuation.

Lord CRAIGHILL: Assuming that the Commissioners let the works to a tenant, I presume they would not be let at a less rent than would pay the interest on mortgages and annuities. In such a case, would the rent the tenant would be expected to offer be the annual value, one year with another?

Mr. MACKINTOSH said this was what he was coming to. If the works were let to a tenant who only gave such rent as would meet interest, the Commissioners would be left with a deficit, as they could not, considering the restrictions by which they were surrounded, expect to obtain from a tenant such a rent as would enable them to pay the full amount of their outgoings. Here was an undertaking with certain statutory privileges, and, on the other hand, with certain statutory restrictions. There was a monopoly of supplying gas, and a limitation as to the price to be charged. A tenant in such circumstances would not pay over to the Commissioners the full revenue which he derived from the lease of such an undertaking, even after deducting the expense of collection. The value of the works was the sum which a tenant would pay for them.

Lord CRAIGHILL: You are leaving out of consideration that the rate-payers are the owners of the works. You do not regard this as an element in determining the value of the heritable subjects belonging to the community.

Mr. MACKINTOSH said that in this question it would be an element in his favour. Suppose these deductions were allowed, the only persons who would suffer would be the community. They were gaining on the one side what they were losing on the other.

Lord CRAIGHILL: If a man sets up a private gas-works for his own accommodation, and does not draw a farthing from the sale of his gas, would that be a gas-works which could not be valued?

Mr. MACKINTOSH: Certainly. The Assessor would consider what these gas-works would let for, for the purpose of supplying a private establishment. In valuing them he would not take the gross revenue, but would consider what a hypothetical tenant would give for the concern, and, taking the revenue and expenditure, would make a deduction for tenant's profits, in the view that these proprietors were themselves the owners of the subject-matter.

Lord CRAIGHILL: If you have power to let to a tenant, must it not be implied that you have power to let to him on such terms as will enable him, out of the rates levied, to reward himself for his trouble in carrying on the undertaking?

Mr. MACKINTOSH: The Act does not contemplate levying rates.

Lord CRAIGHILL: And it does not contemplate levying profits.

Mr. MACKINTOSH pointed out that the Valuation Act contemplated profits.

Lord CRAIGHILL: If the works are let at a less sum than pays their annual burdens, the Commissioners would fail in their duty.

Mr. MACKINTOSH said this might be an excellent reason for their managing their own works, but none the less should they have a deduction in the way of tenant's profits. But assuming the case of a hypothetical tenant, was the Assessor to blow hot and cold—to approve and reprobate? Was he entitled to bring in a hypothetical tenant when it suited his purpose, and leave him out when it suited his purpose? If they were to discard the notion of a tenant, and take the balance of receipts and expenditure, was the balance not to be struck on ordinary commercial principles? If he was not to have the benefit of an assumed tenant, was he not entitled to have credit in his balance for every item of expenditure? This brought him to the questions raised under the second set of deductions. The learned Counsel then dealt at some length with the sums omitted by the Assessor, and pointed out the anomaly of allowing a deduction for gas apparatus, and not for the stone and lime of the buildings. If, he said, these lasted longer than the pipes and ironwork, the question was merely one of degree. He also argued that as the Commissioners were their own insurers, they were entitled to a deduction in this respect.

The SOLICITOR-GENERAL was also heard in support of the contentions of the Gas Commissioners. Dealing mainly with the second set of deductions, he said that it was plain when they were driven from the criterion of a hypothetical tenant, and the notion of profit which was a condition of this part of the argument, then they must apply the ordinary mercantile principle, and keep the plant up to the standard. Ordinary repairs were one of those things which were requisite for this purpose; so also were the services of a clerk and an auditor. But the works might perish in two ways—from neglect of repairs, and from conflagrations; and it was the duty of the Commissioners to insure against these, as well as to make the repairs necessary to keep the works in order. Indeed, without attention to repairs, the works would soon be in such a condition as to be unable to earn revenue. He therefore claimed deduction in respect of these items, and of others in the same category to which he referred.

The COURT afterwards intimated that they would take time to consider their judgment, as the question was one of great importance not only to the parties here concerned but to other corporations, and certainly it had never before been so formally presented for decision.

WORCESTER QUARTER SESSIONS.—TUESDAY, JAN. 4.

(Before Mr. G. W. HASTINGS, M.P., Vice-Chairman, and a Bench of Justices.)

THE DUDLEY GAS COMPANY AND THEIR ACCOUNTS.

At the sitting of the Court this day, Mr. GODSON applied, on behalf of the Corporation of Dudley, for the appointment of an accountant, or some other competent person not being a gas manager, to examine the accounts of the Dudley New Gaslight Company. He handed in a petition from the Mayor of Dudley and Alderman George Bagott (Chairman of the Streets and Sanitary Committee) in support of the application, and called the following evidence, which explains the purport of the petition:—

Mr. Henry Money Wainwright, Solicitor, and Mayor of Dudley, said he was one of the petitioners, and a gas consumer. Alderman Bagott, the other petitioner, was a Justice of the Peace, and Chairman of the Streets and Sanitary Committee. The Corporation of Dudley were large consumers of gas, having burnt in the past year some £1742 worth. The Gas Company were incorporated by an Act of Parliament passed in 1821, and this continued in force until 1853, when they obtained another Act repealing the Act of 1821, and defining the area, which was the borough of Dudley and the suburbs thereof. They also came under the Gas-Works Clauses Act, 1871. In 1853 their capital was £36,000, which, according to their own showing, had been entirely exhausted. Witness had inspected the accounts of the Company, but from them it was impossible to ascertain the position of the undertaking. Up to 1878 the accounts furnished to the public were not in the form prescribed by the Act of 1871. They did not contain the capital account nor other details which were necessary. In 1879 the Town Clerk applied, and an account was rendered. This was the first account the Corporation had received, made out in accordance with the Act of 1871. The Company had a reserve fund to a small extent, besides a contingent and depreciation fund. If the reserve fund had been properly and fully kept up, then the surplus

income beyond a stipulated amount ought to have been divided among the consumers. The Company were entitled to raise this fund to £6000. They had spent on works £68,000 that ought to have been provided out of capital, but £17,000 of it was called a depreciation and contingent fund, which ought to have been applied in the diminution of the price charged to the consumers for gas. Instead of raising the reserve fund to £6000, the Company had not done so, but had applied only a few hundred pounds per annum, so that the fund now amounted to about £5000. It was impossible under the present system of keeping the accounts to know exactly how matters stood.

Mr. O. SMITH, who appeared for the Company, said he could not go on with the case, as the Company's Manager was then serving on the grand jury. He hoped, therefore, the matter would be adjourned.

The CHAIRMAN expressed his willingness to grant an adjournment; but Mr. GODSON said the Company were going to Parliament for additional capital, and by this means the mouths of their opponents would be closed. Their accounts were drawn for the purpose of defeating inquiry; therefore he must resist any procrastination.

Mr. SMITH said this was simply a dispute as to the form of the accounts to which the Corporation were entitled, and these proceedings were merely vexatious, as the matter was now in one of the Superior Courts, awaiting decision.

Mr. GODSON said it was not the Corporation who were going to a Superior Court. The Corporation had obtained a decision in their favour, and the Company were going to the Queen's Bench on appeal. It was likely some time must elapse before the decision in the Queen's Bench was obtained, so that in the meantime the Company would go before a Committee of the House of Commons, and obtain their Act authorizing the raising of further capital.

The CHAIRMAN said the Court would have to assemble on the 15th inst. for other business, and he and others would undertake to hear this case, if the parties would agree to adjourn it till then. This would allow Mr. Smith ample time to have his witnesses ready, and to be instructed.

Mr. GODSON said if the Company would in the meantime allow the Corporation to go into the accounts, to enable them to put the matter properly before a Committee of the House of Commons, it might prevent the parties coming again to the Court.

Mr. SMITH said the accounts as furnished had been sufficient for 20 years past, but all of a sudden the Company were taken by surprise by this application. The petitioners would be in no way prejudiced by the matter being postponed.

As the Counsel could not agree to a postponement, further evidence was given by Mr. Wainwright, and after he had been cross-examined the Court ordered that Mr. Hipkins, the Auditor to the Corporation, should examine the accounts of the Company.

CHARGES OF STEALING GAS.—At the Worship Street Police Court, on Monday last week, a man named John Russ, a brushmaker, carrying on business at No. 163, Kingsland Road, who had been apprehended on a warrant, was charged with having stolen about 500 feet of gas, value 1s. 8d., belonging to The Gaslight and Coke Company. The evidence of Alfred Exell, a meter examiner in the employ of the Company, showed that on the 28th of December he went to the prisoner's house to look at the state of the meter, and then found that the meter was disconnected at both inlet and outlet joints. To the main cock had been attached a piece of india-rubber tubing fixed by a brass joint. The tubing was made to connect the main with the ordinary pipes throughout the house, so that the gas did not pass through the meter. The witness found that two jets of gas were then burning in the parlour. Edward Poulton, an inspector in the same service, said that when he received information of the matter he at once went to the house and saw the prisoner, who had not been spoken to by the other witness. He looked at the meter, which was then connected, but the prisoner when requested produced the brass connection and piece of tubing, and showed witness how it was arranged. He also admitted that he had done it. The inspector added that there were no means of telling the quantity of gas consumed; but the house was provided with 14 gas-jets, and there were also two gas-stoves. Mr. Hannay, the presiding Magistrate, fully committed the prisoner for trial at the next Middlesex Sessions.—The same day, at Manchester, John Taylor, of 59, Boundary Street West, was convicted at the City Police Court, for laying a pipe to communicate with a pipe belonging to the Corporation, without their consent, and was fined £5 and costs, or one month's imprisonment in default of payment.

OPONENTS OF THE CONSTANT SUPPLY SYSTEM.—At the Lambeth Police Court on Friday last, Mr. Besley appeared before Mr. Ellison to support various summonses taken out against the owners of property, for non-compliance with the regulations as to the fitting of appliances so as to ensure a proper and constant supply of water. Several of the cases have been before the Court for some months past, the Lambeth Water-Works Company having endeavoured to cause owners of property in the districts they supplied to use such an apparatus as will ensure a proper and constant flow of water. Mr. Besley said he was very glad that owing to the action taken by the Company a large number of the owners of property had complied with the regulations, and provided the necessary fittings; there had only been a necessity to cut off the supply of water in a few cases. Mr. Ellison said the action of the Company was such as would be productive of much good to the general public. He should certainly impose penalties where the law and the regulations of the Company were not carried out. The various summonses were then adjourned to enable the defendants to carry out the regulations; one defendant, who had, after some trouble, carried out the work, being ordered to pay 1s. fine and £1 1s. costs.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

EXTENSION OF THE CONSTANT SERVICE SYSTEM.

According to Lieut.-Col. Bolton's last-published report, all the London Water Companies are moving in the matter of affording constant supply in their several districts. With the New River Company, "the total number of constant services is now about 15,730." The East London Company "now give constant supply to about 106,043 services." The Southwark and Vauxhall Company "are proceeding with the constant supply in their district on several large estates—viz., Rotherhithe New Road estate, Goose Green estate, and Peckham Road estate; the total length of mains on constant supply being 3890 yards." The West Middlesex Company "are giving constant supply on the application of consumers, and are extending the system as required. They are also giving constant supply to all new estates and buildings; and where new services are laid down, constant supply is made compulsory by the Company. This Company are also giving constant supply to a considerable district in St. Pancras parish. The total number of services now receiving constant supply is 7123." As to the Grand Junction Company, the report states: "This Company have resolved to adopt energetically the constant system

of supply on all new building estates and districts, as they are developed within the Company's country area. They propose to begin with the Springfield Park estate, the Goldsmith's estate, and Fairlawn Park estate at Acton, the Baron estate at Twickenham, the Elms estate at Ealing, the Hayden Park and other estates at Shepherd's Bush, the St. Quentin estate at Notting Hill, and such portion of the Bishop of London's estate at Paddington as may be now in course of development at Maida Hill. Hereafter, they say, they may be able to convert portions of their older districts to the constant system; but in such case they must endeavour to accomplish their object as far as possible with the consent of the inhabitants, as they think they must look forward to certain obstructions arising from the objections of landlords and tenants to the cost and trouble of altering their present fittings and arrangements." The remarks, on the subject, in reference to the Lambeth Company, are these: "This Company have for a long time past been giving a constant supply to their outlying districts at Esher and Molesey, and also in various courts and alleys in and about their town district; and in October, 1878, began the systematic introduction of constant supply, which will be continued until the whole district is brought under it. There are now 13,078 services on constant supply. This Company are now preparing to give constant supply to a third division of their district, the second being nearly finished, and they propose to go on applying Deacon's waste-meter system, which has been of signal advantage to No. 1 division. This Company still experience great difficulty in getting landlords and tenants to make the necessary alterations in the fittings for constant supply." The works of the Chelsea Company "are now in a thoroughly efficient condition, and they possess a power of supply greatly in excess of the demands of their district. They are now giving constant supply to 1524 services, and are fully prepared to extend the system of constant service as required. All new estates and new lines of streets are being so supplied, though, judging by the very few applications made for such supply, there appears to be no desire on the part of public authorities or private individuals for constant service in this district." The Kent Company "have extended the constant supply to about 13,777 services;" and have served notice upon the Metropolitan Board of their intention to extend the system into the following districts:—

Upon the 1st of April to such parts of the parish of St. Mary, Woolwich, as are contained within an imaginary line drawn from the point in the centre of the roadway in Green's End, where the South-Eastern Railway passes under the said roadway, and passing northward and westward along the railway to the centre of Rectory Place, thence southward along Rectory Place and Mulgrave Place to Wellington Street, and thence eastward and northward to Green's End.

Upon the 1st of June to such parts of the parish of St. Mary, Woolwich, as are contained within the district which is bounded on the north by the south wall of Woolwich Dockyard, on the east by the eastern boundary of St. Mary's Churchyard and premises abutting on Charles Street, on the south by the South-Eastern Railway, and on the west by Bowling Green Row.

On the 1st of August to such parts of the parish of St. Mary as are contained within the district bounded on the north by the South-Eastern Railway, on the east by Rectory Place and Mulgrave Place, on the south by Artillery Place, and on the west by Francis Street, Bowater Crescent, and Samuel Street.

Upon the 1st of October to such parts of the parish of St. Mary, Woolwich, as are contained within the district bounded on the north by the south wall of Woolwich Dockyard, on the east by premises on the west side of Bowling Green Row and Samuel Street, on the south by an imaginary straight line drawn from the point of junction of Godfrey Hill with Samuel Street to the boundary stone of the parish in New Kidd Street, and therefrom passing westward and northward along the parish boundary to the centre of the Lower Woolwich and Greenwich Road, and thence across the road to the south wall of the Dockyard.

Upon the 1st of December to such parts of the parish of St. Mary, Woolwich, as are contained within an imaginary line drawn from the point of junction of Godfrey Hill with Samuel Street directly to the boundary stone in New Kidd Street, thence southward along the boundary to Hill Street, thence eastward along Hill Street to the corner of Francis Street, and northward along Francis Street and Bowater Crescent to the point of junction of Godfrey Hill with Samuel Street aforesaid.

Upon the 1st of February, 1882, to such parts of the parish of St. Luke, Charlton, as are contained within an imaginary line drawn from the point in the Old Dover Road where the boundary of the said parish meets the boundary of the parish of Greenwich, thence eastward along Shooter's Hill Road to the eastern boundary of the said parish of Charlton, thence northward along the boundary to the point where it crosses the South-Eastern Railway, and thence westward along the railway to Church Lane, thence southward along Church Lane to Charlton Road, thence westward along the Charlton Road to the boundary of the parish, and southward along the western boundary to the point in the Old Dover Road above mentioned.

The number of miles of streets which contain mains constantly charged, and upon which hydrants for fire purposes could at once be fixed, in each district of the Metropolis, is as follows:—Kent, 85 miles; New River, 204 miles; East London, 85 miles; Southwark and Vauxhall, 115 miles; West Middlesex, 74 miles; Grand Junction, 35½ miles; Lambeth, 70 miles; Chelsea, 62 miles—making a total length of 730½ miles. The Companies are ready to affix hydrants thereon when required by the Authorities. The total number of hydrants erected is at present 5384, of which 3010 are for private purposes, 563 for street watering, 1336 for public use, and 475 in Government establishments.

Lieut.-Col. Bolton concludes his report in these terms: "It has been generally admitted that constant supply is not only desirable but necessary, and as considerable pressure has been put upon the Water Companies to take the initiative in its introduction, it would be well if the public were to render the Companies every assistance, instead of raising difficulties for them to encounter in changing the system of supply—amongst which difficulties may be counted the obstinacy of many of the landlords and tenants in refusing to perform their part of the work."

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has just presented his report on the quality of the gas supplied by The Gaslight and Coke, Commercial, and South Metropolitan Gas Companies, during the quarter ending Dec. 31, 1880:—

I. *With respect to Illuminating Power.*—The average for the quarter at each of the testing stations, in standard sperm candles, was as follows:—

The Gaslight and Coke Company—			
Beckton (common gas)	17.5	Station closed	Oct. 8.
Do., City of London (common gas)	17.5	"	Nov. 5.
Friendly Place "	16.8	"	Nov. 6.
Jewry Street "	17.2	Station opened	Nov. 9.
King Street "	17.2	"	"
Dorset Buildings "	17.2	"	"
Millbank Street (cannel gas)	20.9	"	"
Ladbroke Grove (common gas)	17.2	Station closed for repairs	Dec. 14.
Devon's Road "	16.9	"	"
Carlyle Square "	16.7	"	"
Camden Street "	17.0	"	"
Graham Road "	16.9	"	"
Kingsland Road "	16.9	Station opened	Oct. 25.
Commercial Gas Company—			
Welleclose Square (common gas)	17.0	"	"
Parnell Road "	17.2	"	"
South Metropolitan Gas Company—			
Hill Street (common gas)	16.8	"	"

From these results it will be seen that the average has been, at each station, above the parliamentary standard, more especially at the two

stations of the Commercial Gas Company, and the Camden Street station of The Gaslight and Coke Company.

II. As regards Purity.—Sulphuretted hydrogen has not been present in the gas. The average proportions of sulphur in other forms were as follows:—

Grains of Sulphur per 100 Cubic Feet of Gas.		Average.
The Gaslight and Coke Company—		
Beckton		10.8
Do., City of London		10.6
Friendly Place		9.4
Jewry Street		10.8
King Street		11.1
Dorset Buildings		10.6
Millbank Street		16.7
Ladbroke Grove		10.7
Devon's Road		12.2
Carlyle Square		11.4
Camden Street		11.5
Graham Road		13.2
Kingsland Road		11.4
Commercial Gas Company—		
Wellclose Square		8.4
Parnell Road		13.1
South Metropolitan Gas Company—		
Hill Street		10.8

From these results it will be seen that the average at each station was considerably below the parliamentary limits, more especially at the Ladbroke Grove station of The Gaslight and Coke Company, the Wellclose Square station of the Commercial Gas Company, and the Hill Street station of the South Metropolitan Gas Company.

Ammonia has been present in slight quantities at all the stations, with the exception of Beckton; the average in each case being far below the parliamentary limit.

SALE BY AUCTION OF STOCK OF THE SOUTH METROPOLITAN GAS COMPANY.

On Friday last, Mr. G. A. Wilkinson offered for sale by auction, at the Mart, Tokenhouse Yard, E.C., £18,000 of ordinary "B" stock, and £12,000 of ordinary "C" stock of the above-named Company, being the first portion of additional capital authorized to be raised under the Company's Act of 1876 and the Scheme of Amalgamation with the Phoenix Gas Company confirmed by Order in Council in March last year.

In opening the sale, Mr. WILKINSON briefly explained that the Company whose stock he had the honour then to offer for sale was the amalgamated South Metropolitan, Surrey Consumers, and Phoenix Gas Companies. The total capital of the Company, he said, amounted to £2,082,000, of which £250,000 was unissued, and of this the £30,000 for which he was about to ask for offers formed a portion. He drew special attention to the fact that the Company worked under the sliding scale, the operation of which he explained, and stated that the stock would be sold with the dividends accruing as from the 1st inst., which, according to the present price of the gas supplied by the Company, would, for the half year ending June next, be at the rate of 11½ and 12 per cent. respectively.

The biddings were then taken, and the whole of the stock was disposed of at the following prices:—

"B" Stock.		
9 shares at £182 10 realized		£1,642 10
1 " 182 5 "		182 5
4 " 181 10 "		726 0
2 " 181 0 "		362 0
4 " 180 10 "		722 0
45 " 180 5 "		8,111 5
115 " 180 0 "		20,700 0
180 shares.	Total	£32,446 0
"C" Stock.		
7 shares at £200 0 realized		£1,400 0
3 " 199 10 "		599 0
3 " 198 10 "		594 0
1 " 197 5 "		197 5
3 " 196 10 "		589 10
2 " 195 10 "		391 0
6 " 195 5 "		1,171 10
1 " 195 0 "		195 0
20 " 191 15 "		3,835 0
1 " 191 10 "		191 10
3 " 191 0 "		573 0
20 " 190 15 "		3,815 0
16 " 190 10 "		3,048 0
25 " 190 5 "		4,756 5
5 " 190 0 "		950 0
120 shares.	Total	£33,098 10
Add "B" stock, as above		32,446 0
Total		£65,544 10

There was a very crowded attendance of buyers, and some smart competition at times took place for the stock, which was so eagerly sought for that the 144 lots were disposed of in rather over an hour.

THE GAS EXPLOSION IN GLASGOW.

There is very little to be added to what was reported in last week's JOURNAL in reference to the disastrous gas explosion which occurred in Henderson Street, Glasgow, early on the morning of New Year's Day. All the sufferers, with one exception—that of Mary Chapman, who has since succumbed to her injuries—are progressing favourably, and it is to be hoped may soon have completely recovered from the effects of the calamity. The Lord Provost has issued a notice inviting a public subscription in aid of the sufferers by the explosion, and contributions will be received either by his Lordship or Mr. Nicol, the City Accountant, who has consented to act as Honorary Treasurer to the fund. A first list of donations has already been issued.

With reference to the long delay that occurred before the gas was cut off, it is stated that when the explosion took place a messenger was at once sent to the Gas Office in Virginia Street, and he informed the watchman there of what had happened, and requested that a man should be sent at once to cut the pipes. Shortly afterwards the watchman was seen to leave the premises, presumably in search of some one to attend to this duty; but as no one put in an appearance at Henderson Street, a messenger was despatched to summon the attendance of the gas officials. The officer could not get any one to answer his knocks, and he had to return without accomplishing his errand. A sergeant of police was afterwards despatched, and he also failed. Then a fireman and a police inspector were sent off with positive orders not to return without some one with them to see to the gas; but after considerable delay, and visiting various places, they also failed to gain admittance to the gas premises, and had to return like the others. Shortly afterwards a man appeared in Henderson Street, and the gas-pipes were cut, but not until some three hours had been lost, during which the firemen were comparatively helpless.

An examination of the wrecked building was made on Monday last week by skilled workmen, with the view of reporting on its condition to the Dean of Guild Court; and afterwards the Lord Provost and the Dean of Guild, accompanied by Mr. White, Assistant Master of Works, made an official inspection. In the afternoon the pavement in front of the houses affected by the explosion was opened with a view to ascertain the condition of the main-pipe at the point where the pavement had subsided. It was then found that the pipe was fractured and bent, and that while the ends of the fracture were close at the top, the lower edges were about ¾-inch apart, thus confirming the opinion expressed that the escape of gas was from the main. The Procurator-Fiscal has obtained a warrant authorizing a skilled person to take possession of the main-pipes, with the view of having them thoroughly examined.

BILSTON GASLIGHT AND COKE COMPANY.

The Annual General Meeting of this Company was held on Monday, the 3rd inst.—Mr. T. HOLCROFT in the chair.

The SECRETARY and MANAGER (Mr. J. S. Reeves) having read the notice convening the meeting, the following report and statement of accounts were submitted:—

The Directors present to the Shareholders their 35th annual report, together with statement of accounts.

The trade account shows a profit of £3598 13s. 6d., which with £1551 11s. 7d., brought from last year's account, makes a total of £5150 5s. 1d. The Directors propose to appropriate this amount as follows:—

Half year's dividend of 4s. per share, paid Aug. 1, 1880.	£1400 0 0
payable Feb. 1, 1881.	1400 0 0
Debit interest	589 4 2
Reserve fund.	200 0 0
Carry to next year's account	1561 0 11

Total £5150 5 1

The Directors have pleasure in reporting an improvement during the past year in the trade of the district, and a consequent increase in the sales of gas. It is gratifying also to state that the special attention which has been given to the distributing plant has resulted in a considerable diminution in the unaccounted-for gas. With a view of giving their customers a share in the advantages thus obtained, your Directors have determined to allow a discount of 5 per cent. on all gas accounts paid promptly. This concession will come into operation from the 25th of March next, and, as it involves a reduction of nearly 2d. per 1000 feet of gas, or about £500 in the income of the Company, it is hoped it will lead to a further increase in the sales of gas.

The Directors who retire by rotation are Messrs. G. Edwards, W. R. Colbourn, and P. Bullock. They are eligible, and offer themselves for re-election. The Auditors also retire, and offer themselves for re-election.

Dr.	Trade Account for the Year ending Sept. 30, 1880.		Cr.		
Value of stock, Sept. 30, 1879.	£360	0 0	Gas	£9,598	8 6
Coal	5,501	18 3	Meter-rent	421	15 9
Mains	791	7 9	Residual products	4,703	5 7
Meters	175	13 0	Sundries	723	16 8
Retorts, fire-bricks, stores, wear and tear of works, &c.	421	15 5	Estimated value of stocks	665	0 0
Materials &c., for Manager's house and additional purchase of land	666	10 4	Amount expended on Manager's house and additional land	666	10 4
Wages	2,762	6 10			
Salaries and Directors' fees	611	14 2			
Rents, rates, and taxes	484	1 10			
General charges	647	18 9			
Abatements	153	16 7			
Amount written off works account for depreciation	560	0 0			
Balance, profit	3,598	13 6			
	£16,778	16 5		£16,778	16 5

The CHAIRMAN, in moving the adoption of the report, said he thought the Shareholders would agree with him in regarding it as a very satisfactory one. The profits, it was true, were not more than sufficient to pay the usual 8 per cent. dividend; but it should be remembered that a somewhat heavy expenditure had been incurred in completing the alterations and improvements in the Company's distributing plant. That such expenditure had been judiciously made he ventured to think was proved by the fact that the increase in the sales of gas for the year, amounting to upwards of 5 million cubic feet, had been entirely met by the saving effected in the unaccounted-for gas—a result which he considered very satisfactory. The Directors, however, hoped to effect greater economy in this direction, though in a mining district like theirs the waste of gas from leakage must necessarily be greater than in towns not so circumstanced. During the year the Directors had met a claim for compensation for damage arising out of an explosion of gas at Bradley. After fully investigating the matter, with a view to determine the liability of the Company, they were of opinion that they were not wholly responsible for the accident, but that it would be difficult to establish their irresponsibility, and they elected to compromise the matter by paying what they considered a reasonable compensation (£300), rather than involve themselves in costly litigation, the issue of which might be doubtful. As these special items of expenditure would not have to be provided for in the future, the Directors decided to allow the discount referred to in the report. In making this concession, however, they had no intention of overlooking the rights of the Shareholders to participate in the improved results which, from the advantageous position of the works, and by good management, they were able to secure. The Directors therefore hoped to be able, during the ensuing year, to recommend some addition to the rate of dividend hitherto paid.

The report was unanimously adopted, and a resolution passed authorizing the payment of a dividend of 8 per cent. for the year.

The retiring Directors and Auditors were then re-elected, and votes of thanks having been accorded to the Directors and Officers of the Company, the proceedings closed.

THE DUDLEY GAS COMPANY AND THE CORPORATION.

At the Meeting of the Dudley Town Council on Tuesday last—the Mayor (Alderman Wainwright) in the chair—the subject of the relations existing between the Corporation and the Gas Company was introduced by the Chairman, who said he had long promised to make a communication to the Council upon the gas question. As far back as the month of June last a case was stated to be argued in the Court of Queen's Bench, the question raised being whether the Gas-Works Clauses Act of 1871 affected the Dudley Gas Company. He ventured then to advise that the Company were affected by the Act, and, unless words had no meaning, he was perfectly confident that the decision of the Magistrates (given some months ago) would be upheld, and that the Company would be brought under the control of the Act. As long as the matter was pending before the Court, he thought it well to abstain from making any observations; but, inasmuch as the Company had taken the initiative, and gone to Parliament for additional powers, it became necessary that a statement should now be made, and that he (the Mayor) should advise the Council in the matter. He had carefully read the Company's Bill, and at the first blush it seemed to involve a most innocent and unpretentious operation—and a mere matter of arrangement between the Company and the Shareholders. The Bill had been framed expressly for the purpose of

shutting out any opposition, and preventing the gas consumers and inhabitants from having any word to say in reference to the proposed legislation. He was, however, happy to tell the Corporation that there need be no apprehension, and that this attempt to obtain parliamentary power without challenge would fail to have any effect. In the first place the Bill stated: "Whereas the demand for gas increases largely every year, and further capital is required to enable the Company to provide a supply for such increased demand." The Company said that they were already authorized by their Act of 1853 to raise additional share capital, amounting to £36,000, and they asked, beyond this, for the following sums:—Additional share capital of £46,000, and they said that in the first year after the passing of the Act they should raise £20,000, and after that would require £10,000 a year. They then asked to extend their borrowing powers, and applied for permission to borrow £11,500 in respect of old share capital, and £11,500 in respect of new share capital; thus making altogether £69,000, which amount they said should not bear a higher rate of interest than 7 per cent., which was to come out of the pockets of the gas consumers before they received any benefit whatever. He had always contended that the Act of 1871 had applied to the Company ever since it was passed, and that they were liable to indictments in consequence of their failing to observe its provisions. On the 28th of December he wrote to the Secretary of the Company asking whether they would permit an accountant appointed by the Corporation to inspect and examine their accounts and books for the purpose of understanding the Bill they proposed to introduce. This was refused by the Company's Solicitor, and in consequence he consulted with Alderman Bagott, and, as ratepayers, they petitioned the Quarter Sessions for an order to inspect the books. The petition had been presented and fought out that day with some degree of pertinacity and bitterness, and he was pleased to inform the Council that the Court had made the order for the Council to examine the books of the Company. He himself went into the witness-box, and supported by his evidence the ground upon which the application was made, and he stated that the Company had proved by their own accounts an accumulation of capital from gas-rates to the amount of £17,481 lls. 11d., and this money had now disappeared. He did not mean to say they had spent it for their own purposes, but as a lawyer he would say it had been spent for purposes utterly illegal, and that so much of it as had not been properly spent the Company would have to bring back into the account. The Company were required to provide a reserve-fund, to be applied in equalizing dividends, and when their income fell short in making them up to the prescribed amounts; and any surplus between the dividend and the reserve fund was to go back to the ratepayers in the shape of a diminution of the charge. He had always been looking for this with considerable interest, but now they would have particulars supplied, even if they did not obtain any immediate benefit. The Corporation held that the Company had misapplied the capital they had raised—that they had taken the income and misapplied it by spending it for purposes for which they were wholly unauthorized. He now suggested that the Town Clerk be instructed to write to the Directors of the Gas Company asking them—first, what they wanted with so much money; secondly, whether they intended to spend the money, or any of it, in works; and if so where and when, and how much they intended to expend. He also suggested that the Company should be asked for what purpose the operation of the Act of 1871 was to be delayed till January, 1882.

On the motion of Alderman SMITH, seconded by Mr. HOWAT, it was resolved—"That the Council approves of all that has been done by the Mayor and Alderman Bagott in reference to the Gas Question, and that the Town Clerk be instructed to write a letter to the Gas Company's Directors embodying the inquiries suggested by the Mayor."

BIRMINGHAM CORPORATION WATER SUPPLY.

At the Meeting of the Birmingham Town Council last Tuesday—the Mayor (Alderman R. Chamberlain) in the chair—a lengthy report from the Water-Works Committee was presented. In the course of it they stated that, having taken into consideration the large and progressive increase in the daily consumption of water, which, however, had been attended by a corresponding increase in rental, and having also considered the necessity of making an adequate provision for the maximum as well as for the ordinary requirements of the water undertaking, the Committee adopted a resolution instructing the Engineer "to report with respect to the capacity and sufficiency of the present water supply, and the probable future requirements of Birmingham and the water district; together with his recommendations with regard to the construction of the projected storage reservoir and other works at Whitacre." In pursuance of this instruction the Committee had received from Mr. J. W. Gray the following report:—

I beg to report that on the 29th of September, 1868, I considered it my duty to lay a similar report before the Directors of the late Water-Works Company. At that time—viz., 1868—the maximum quantity of water distributed to Birmingham and the district (the maximum quantity required being that which all water-works undertakings should at all times be capable of giving) was, during the week ending July 31, 64½ millions of gallons. In that report I stated that the Company could not, during a dry summer, supply their district with water without taking a portion of the supply from the River Tame, or executing further works. And I further stated that the total quantity of water for which parliamentary power had been granted to the Company to take did not in my opinion exceed 104 millions of gallons per day; and I concluded the report by suggesting that, considering the strain that was put on the Company by the compulsory abandonment of the Tame, it would not be asking too much from Parliament to confer further powers. Acting on this report the Directors applied to Parliament, and power was obtained to take the waters of the rivers Blyth and Bourne. In 1873 I was requested by the Board of Directors to report upon the then position of the Company as regarded their available water supply, the probable demand on the Company for water, and the cost of new works on hand, with any recommendations I might have to make as to future works. In my report I stated that I believed the quantity of water available during a dry summer might be taken as follows:—

Water from the wells 7½ million gallons.
" " streams 7½ " "

Total 15½ million gallons.

And as regarded the probable demand on the Company for water, I estimated the natural or general increase of the demand on the works of the Company at 25 million gallons each half year.

At that time—namely, 1873—the maximum quantity of water distributed to Birmingham and the district was 9·4 millions of gallons per day; and I stated that, owing to more water being used for street watering and sanitary purposes, and also to the increase in the number of suburban residences with gardens and pleasure-grounds attached, I believed the maximum quantity of water that would be required would increase in a much greater ratio than the average. I also stated, looking forward to the next ten years, that if the Legislature should make the supply to property compulsory in cases where it was known that the water obtained from domestic wells was bad, which I thought very likely to be the case, such a proceeding would immediately raise the demand on the Company 1½ million gallons per day. In 1873 the supply was 1400 million gallons per half year; my estimated increase in 10 years was 500 million gallons per half year—therefore, 1900 million gallons, or nearly 10½ million gallons per day, which, with 1½ million gallons, the probable immediate increase, would give 12 million gallons as the daily average quantity for the year 1882; and by that time I expected the maximum quantity required for distribution would be nearly one-third more than the average quantity, which would be 4 millions in addition to the 12 millions, making together 16 millions of gallons as the maximum daily supply for the highest week of 1882. The supply during the seven years from 1859 to 1866 was nearly as possible doubled. During the seven years subsequent to 1866 it increased one-third, and in 1873 I stated that I expected it would increase at about the same rate, owing to the alterations

proposed to be made and being made in the mode of distribution, by dividing the district into three zones—the high level, middle level and low level—and I went on to state that in ten years, therefore, we might expect the maximum daily supply to rather exceed the minimum daily yield of all the sources of supply from the works then executed; but by the construction of the proposed reservoir on the Bourne, containing about 400 millions of gallons, that, together with the brook, would add 10 millions of gallons for 50 days. It is seven years since the report, from which the above are general extracts, was submitted to the Directors of the Company, and I am confirmed in my estimate then made of the probable requirements of Birmingham and neighbourhood by 1883.

In 1873 the maximum demand was.	9·4 million gallons per day.
In 1876 it had increased to	10·7 " "
In 1877 " " " " " " " " " " " "	10·9 " "
In 1878 " " " " " " " " " " " "	11·6 " "
In 1879 " " " " " " " " " " " "	12·7 " "
In 1880 " " " " " " " " " " " "	13·1 " "

And, had the dry weather of this year continued for a fortnight longer, I have no doubt the demand would have reached 14 million gallons per day.

In 1873 the available sources of supply gave 15½ million gallons to which is to be added the temporary supply from the Bourne, 2 millions and the ½ million gallons from the well at Selly Oak (the only works that have been constructed since 1873 to increase the available sources of supply). This gives the present water supply available from all sources at 18 million gallons, exclusive of the Blyth. This assumes that at all our wells the engines are in order and capable of being worked, but if an accident should occur to the pumping machinery of those wells where the engines are not in duplicate, this 18 millions per day might have to be reduced when most wanted. This is an important contingency, and should be taken into serious consideration. As the construction of the reservoir at Shustoke (the only work authorized by Parliament which has not been executed), will at least take two years to carry out, it is my opinion that the time has arrived for the execution of this necessary work; and as means must be taken to make the supply from the Bourne available while the reservoir is being constructed, so that it may form part of the whole work when executed, I recommend that the sanction of the Council be obtained for the construction of this reservoir and other necessary works, and that plans be prepared and submitted for the approval of the Committee.

In conclusion, I am of opinion that the construction of this great reservoir would make an ample provision for the water supply of the borough and surrounding districts for many years to come. (Signed) JOHN W. GRAY, Engineer.

The Committee stated that, having deliberately and carefully considered this report, they were of opinion that measures should be forthwith taken for proceeding with the construction of the large reservoir at Shustoke, estimated to contain 400 million gallons of water, and recommended that they be authorized to instruct the Engineer to prepare plans and specifications for its construction, and the necessary works in connection with it; and also that they be authorized to obtain tenders, or adopt such other measures for the execution of the works, in accordance with such plans and specifications as they may deem advisable, and to report to the Council thereon for approval. The report then proceeded to deal with the question of the charges made for water, concerning which they made the following remarks:—

For some time past the Committee have been anxiously considering the prudence and expediency of recommending an adjustment, and also a reduction, of the water-rents, which, though below the charges authorized by statute, appear to press somewhat unequally upon different classes of water consumers. With this view, they have for some considerable time been engaged in placing meters in various parts of the town and district for the purpose of ascertaining, as nearly as practicable, the quantity of water actually used in the various classes of houses, but it will necessarily be some time yet before the desired information is fully and completely obtained. The primary necessity has also existed of making proper provision for furnishing an increased and improved water supply by the construction of new filter-beds, covering reservoirs, and the like, and erecting additional pumping-engines and other works requisite for purifying and improving the quality of the water, and making it more readily available for distribution. The works for these purposes are now completed or in progress, and the Committee are of opinion that the time has arrived when, after providing for the interest upon the large outlay which will be necessary for constructing the proposed reservoir at Shustoke, a reduction in the water-rents may be prudently and conveniently made, and they propose that such reduction for the present be limited to about £5000 per annum, and commence on the 1st of January, the first half year of such reduction terminating on the 30th of June, 1881, and that the reduction shall be effected as nearly as may be in the following manner, viz:—

Houses.		Landlords		Proposed		Reduction.
25,000	Per Week.	compounding.	Per Annum.	Per Annum.	Per Annum.	
	Under 4s.	6s. and 8s.	6s. and 8s.	6s. and 8s.		
12,000	4s., 4s. 3d., 4s. 6d., and 4s. 9d.	10s.	9s.	£600 0 0		
5,155	5s.	16s.	10s.	1546 10 0		
5,155	5s. 3d. and 5s. 6d.	16s.	12s.	1031 0 0		
2,689	5s. 9d. and 6s.	20s.	16s.	537 16 0		
848	6s. 6d.	24s.	20s.	169 12 0		
848	7s.	26s.	22s.	169 12 0		
946	7s. 6d. and 8s.	32s.	24s.	378 8 0		
946	8s. 6d. and 8s. 9d.	32s.	28s.	189 4 0		
982	9s. and 10s.	38s.	32s.	294 12 0		
29,569		Annual reduction		£4916 14		

The Committee would have gladly proposed the extension of the reduction to other classes of water consumers, but, at present, there are no surplus funds available for the purpose. Still, they hope to be able, from time to time, to suggest further reductions.

Alderman AVERY moved—"That, in accordance with the recommendation contained in their report, the Water Committee be authorized to instruct the Engineer to prepare plans and specifications for the construction of the proposed storage reservoir at Shustoke, and the necessary works in connection therewith, and also to obtain tenders or adopt such other measures for the execution of the works in accordance with such plans and specifications as they may deem advisable, reporting to the Council thereon for approval." It would, he said, be perceived that the scope and effect of the resolution was to authorize the Water Committee to direct plans and specifications to be prepared for the execution of the great storage reservoir at Shustoke, with certain engine-houses, pumping power, and other works in connection therewith, and to obtain tenders for the execution of the work. The formation of this great storage reservoir, estimated to contain, when completed, 400 million gallons of water, was originally designed by the late Water-Works Company, under the advice of their experienced Engineer, Mr. J. W. Gray. Powers were obtained in the late Company's Act of 1870, and by one of the sections of this Act it was provided that the work should be completed or in progress during the year 1880. The Corporation having occasion to promote a financial Bill in Parliament in 1879, obtained an extension of those powers to the year 1885. In 1870 the Company were of opinion that the work was so urgently required, and should be proceeded with without delay, that they forthwith exercised all the powers of the Act, so far as obtaining land was concerned. They obtained about 150 acres at a very great cost, which land from that time to the present had been a considerable burden to the revenues of the Water Company when it was in their hands, and to the revenues of the Water Committee since it had been in the hands of the Corporation. One of the reasons which, as he was informed, induced the late Company to consider that it was of such importance to proceed at once with the construction of the reservoir was the comparative uncertainty then existing with respect to the water supply from deep wells. The deep well at Aston was then in full operation, and other wells were in course of construction; but the opinions of the most eminent authorities on water engineering were exceedingly diversified with respect to the permanent character of the water supply from deep wells, and as to whether such deep wells would stand, year after year, drawing upon for

the very large quantities of water required for the consumption of a great community like that of Birmingham and its surrounding districts. As time went on these water engineers, who, always of opinion that for some miles around Birmingham there was an enormous water-bearing area that could be drawn upon indefinitely and permanently, received a confirmation of their views by the experience which year after year was derived from that time to the present. The late Water Company and the Corporation had derived vast quantities of perfectly beautiful water from deep wells, without showing at present any symptoms of exhaustion of any kind. The Company, therefore, with their additional experience, acted wisely in making this first provision, and with further experience they acted wisely in postponing the great and necessary work, especially when it was considered the outlay would necessarily be considerable, and a burden—he could not at present tell what, though a very large sum indeed—upon the revenues of the water department. The same causes had induced the Water Committee from time to time to postpone any recommendation for actually proceeding with these works, but in the meantime the consumption of water in Birmingham and the surrounding districts had gone on largely increasing, and it now became necessary, in the judgment of the Committee, to make further provision for the water supply. The Committee had been exceedingly anxious to regard the economical view of the question, and to spare the pockets of the ratepayers as much as they could; but they also recognized, in a still higher degree, the imperative duty that devolved upon them, as far as their recommendations and advice to the Council were concerned, to provide a permanent, a satisfactory, and a safe supply of water for Birmingham. The following was the daily average of water supplied from deep wells and streams from 1874 to the present time:—1874, 8 millions of gallons; 1875, 8½ do.; 1876, 8½ do.; 1877, 8½ do.; 1878, 9 do.; 1880, 10 do., of which an average of 4½ million gallons were daily derived from deep wells, and 5½ million gallons from streams. The water-rental had increased in greater proportions, almost entirely from new services as follows:—In 1876, £93,527; in 1878, £107,393; and in 1880, £118,000. Therefore, the consumption of water, large as the increase was, had not increased to the same extent as the revenue of the department. But it was not only necessary, as the Engineer very clearly pointed out in his report, to make sufficient provision for the average requirements of the community, but for the maximum. Sometimes in drought and frost the maximum requirements advanced, to use a well-known phrase, by leaps and bounds, by a very large quantity indeed; and unless provision for the additional supply was made, and the necessity came upon the department suddenly and without notice, somebody must go without water. The Council would see how this had practically to be considered, by the following statement of the maximum quantity of water pumped for distribution on ten days respectively of 1876 and 1878:—

Days.	1876.	1878.
1	11½ million gallons	15 million gallons.
2	11	15
3	11	14½
4	11	14
5	11	13½
6	10½	13
7	10½	13
8	10½	13
9	10½	13
10	10½	13

Therefore the Council would perceive that unless provision was made for these maximum requirements, when they occurred there would be a serious and dangerous derangement of the water supply. The Council would probably wish to know the present storage reservoir capacity of the department. It was as follows:—

Aston reservoirs	30 million gallons.
Witton reservoirs	82
Perry reservoirs	13
Plant's Brook reservoirs	30½
Whitacre reservoirs	30
Erdington reservoirs	11½
Edgbaston reservoirs	10
	207
Shustoke reservoirs	400
Total storage capacity	607

The deep wells were capable of yielding a constant supply of 8 million gallons daily, and the streams, under almost any circumstances, except in great drought, were capable of giving the same quantity. Now, taking the wells at 4 million gallons a day, and the streams at 4 million gallons—that was about half the present capacity—and adding the amount of water which would be stored in the great reservoir, they would have in a time of drought 14 million gallons per day for 100 days; 16 millions for 75 days; 18 millions for 60 days; 20 millions for 50 days. This was a provision not only equal to, but beyond all probable and reasonable requirements. But he must ask the Council to consider the dangerous consequences of any reduction in the supply of water, and the necessity of providing not only for the average and the maximum requirements, but for such contingencies as drought and frost. The Committee were of opinion that when the reservoir was completed they would have made arrangements for a most ample supply of water for many years to come, and for all probable and reasonable requirements. The time had arrived when the matter could not be safely postponed, and the work would take at least two, and possibly three years to complete. Should the consumption of water in the borough and district continue to increase, he feared very great danger would be incurred unless some provision of this kind was made.

Mr. BRINSLEY seconded the motion.

Alderman LLOYD asked what was the estimated cost of the proposed reservoir.

Alderman HEATON wished to know what was the acreage area and the proposed depth.

Mr. BEARD asked if inquiries had been made as to whether there was any prospect of mining operations taking place near the streams from which it was intended to take the water for the reservoir.

Alderman BIGGS said he did not think the Water Committee were going to the right spot for a good water supply. He had previously stated in the Council that the right direction to go for water was the Northfield side of Bromsgrove Lick. It was remarked by the Chairman of the Committee, when the question was discussed, that the supply of water to be obtained there would not be sufficient, and yet a report was subsequently brought up, stating that 1½ million gallons, or at least a considerable quantity of water, had been pumped at Selly Oak. The Rubery Hill Asylum Committee had been sinking a well for the purpose of acquiring water, and their success had been far beyond all anticipations. Although a depth of only 60 feet had been sunk, the supply of water was far in excess of what the Committee would require for the institution. Now the spot where the well was sunk was 600 or 700 feet above the sea level, and if the sinkings were carried only 100 feet deeper the Committee would be able to supply the upper levels of the town without the expense of pumping up the water. Let them see, therefore, what an immense saving would occur. The level at Aston was only 270 feet above the sea level,

and the water had therefore to be forced from there to the higher parts of the town at considerable expense. There was the advantage at Rubery Hill that they had a magnificent supply of water, purer by far, according to the Borough Analyst, than that which was now supplied. He hoped the Council would hesitate before sanctioning this heavy expenditure, and that the Committee would not altogether ignore the locality he had referred to.

Alderman AVERY, in reply, said with regard to Alderman Lloyd's question as to the cost, the Committee had some notion what it would be, but at present, before the estimates were obtained, it would be very inconvenient to inform all the contractors who would be invited to send in tenders the exact sum the Committee estimated it would cost. In about a month they would be able to submit a tender to the Council. In reply to Alderman Heaton, he said that the extent of the land was 150 acres, but he forgot the depth. There would be two reservoirs, containing together 400 millions of gallons. Mr. Beard had asked him a question as to whether the Committee could anticipate what future mining operations would take place in the locality. Was it possible fifty years ago to anticipate what was now occurring? At present there were no mining operations, and it was not very probable there would be, and, so far as he knew, the rights of the Corporation were not likely to be interfered with. With regard to the observations made by Alderman Biggs, he said that if the Committee's recommendations were adopted, provision would be made for a long time to come for an ample supply of water, and it would be an unnecessary expense to impose an additional burden. The district Alderman Biggs referred to was on the red sandstone formation, and was therefore uncertain and varying as to the water supply. The Committee preferred going where there was plenty of water, to making fanciful experiments in other districts.

The motion was then put and carried.

Alderman AVERY next moved that the report be approved. The adoption of this resolution, he said, would dispose of the question of the reduction of the water rates. After making provision for the execution of the works and all charges consequent on the resolution already sanctioned, the Committee estimated that an annual surplus would remain of about £5000, for disposal by the Council. In the opinion of the Committee such a surplus might be appropriated in one or more of the three following ways:—First, by increasing the reserve fund; secondly, by granting contributions from the revenue of the water department in relief of the borough rates; thirdly, by reducing the water rates. With regard to the reserve fund, the Birmingham Corporation Water Act of 1875 authorized the formation of a fund for certain contingencies and other purposes mentioned in the Act, and one of the sections of the Act directed that the reserve fund should not exceed £50,000. On Jan. 1, 1880, the reserve fund had reached £30,000, and on the 13th of June last it had increased to £35,000. It might be safely taken that at the present time the reserve fund was not less than £40,000. The Committee proposed that it should remain at this sum, perhaps with an occasional further contribution from revenue, and that it should accumulate at compound interest until it reached £50,000, when, as directed by the statute, the interest thereon, amounting to about £2000 yearly, would flow into the borough fund, and relieve to that extent the borough rate. This proposal was in direct conformity with the expressed provisions of the Act, and the Committee believed it was a prudent and proper arrangement for almost all possible contingencies. The works were of the most durable kind, and year by year were kept in admirable order. The next way in which the surplus might be appropriated was by contributions to the borough fund. His opinion upon this subject had been declared to the Council, and as no recommendation was submitted thereon it would be unnecessary to occupy time about it. This brought him to the proposal of the Committee, that the charges for the water should be reduced. It must not be taken as a final recommendation; he hoped it was only the beginning of other good things of the same kind which would take place from time to time if the prosperity of the water department should continue, and the Committee had funds at their disposal. The reduction was limited to the extent of the surplus in the hands of the Committee. If the surplus had been larger, he thought he was justified in saying that the Committee would willingly have recommended further reductions. He rejoiced exceedingly to have to submit the proposal on behalf of the Committee. They had endeavoured to carry on the responsible duties committed to their charge on the broad principles that there should be an abundant supply of water, that it should be good and wholesome in quality, and be supplied at the most moderate charge compatible with the efficient management of the department. The provision for a large supply was promoted by constructing a deep well at Selly Oak, from which 1½ million gallons per day could be obtained; by forming a channel whereby the waters of the Bourne could be brought in great mains to the immediate neighbourhood; by constructing large mains from Plant's Brook to the reservoir at Edgbaston; and by the construction of about 120 miles of additional mains in all parts of the borough and district for increasing the distributory power of the water department. All these arrangements, with the great reservoir which it was now proposed to form, would make ample provision for water as respected quantity. With regard to its pure and wholesome character, the Committee would endeavour to secure this by taking a further quantity from deep wells. They were giving the community nearly all the present supply by constructing additional filtering-beds and reservoirs, and devoting attention to mains. All these things had been done in the five years that the department had been under the control of the Corporation, and a reserve fund of £40,000 provided. The Committee, having this surplus, had anxiously considered how it should be disposed of. They had come to the conclusion that the householders paying between 4s. and 10s. in weekly rentals were the class to whom the reduction could first be most properly applied. The basis upon which the water rates were levied was not, in the judgment of the Committee, an altogether satisfactory basis, but it was the only basis they had any statutory powers to adopt. They must not, under any circumstances, exceed certain statutory limits, and they must proceed according to the lines laid down by the statute, which provided that the rentals of the houses should govern the charge. By his direction, the Secretary had worked out a table showing the amount per head paid by the different classes of ratepayers, the number of persons estimated to occupy each house, and the water rent per head per annum. This table was as follows:—

Annual Value.	Number of Persons to each House.	Water Rent per Head per Annum.
£5 to £10	four	2s.
Not exceeding £17	five	4s.
Do. £30	six	6s.
Do. £50	eight	7s.
Do. £100	ten	9s.

He did not say this was a scale of exact fairness, but it appeared to be one in which there was not much, if any, substantial injustice done. The Committee were desirous, as far as they could, to ascertain the actual consumption of water by each of these classes of ratepayers, so as to govern the Committee in any future recommendations. For this reason they had

fixed and were still fixing meters in various parts of the borough and district, and inquiries were being instituted for ascertaining the number of persons occupying premises, the consumption of water per head, the actual present cost of water per head upon premises not exceeding the rentals of £10, £20, £30, £50, and £100, and for warehouses, offices, and shops of each of these classes. When the Committee had obtained these particulars they would be able to come before the Council with a comprehensive report such as would guide them in submitting more general recommendations to the Council. In conclusion, he said that the expenditure of Birmingham in connection with the water department was very moderate compared with that of other towns. Manchester had already expended between £2,000,000 and £3,000,000 on their water supply. They had now a great scheme in operation, which was estimated to cost £3,750,000. Liverpool had another great scheme, the estimated cost of which was £3,250,000. He hoped the ratepayers would give the Committee their earnest and active co-operation in preventing waste of water. The quantity of water that was wasted very much increased the cost of working the department. He asked the public to remember that they were dealing with the water department, and not with a trading body trying to make profit. The water undertaking was their own property, of which the Corporation were the trustees for the public benefit, and with no other object.

Alderman BAKER seconded the motion.

Alderman BIGGS said there were 26,000 houses, occupied exclusively by the working classes, left entirely out of the reduction now proposed by the Water Committee. Yet they ought to have received the first consideration at their hands. He moved, as an amendment—"That such portion of the report of the Water Committee as refers to the readjustment of the water rates be referred back to the Committee, with instructions to consider and report upon the present charge to houses under 4s. per week, and their reasons for excluding that class of property from the proposed reduction in charges for water."

Dr. BARRATT hoped that the Committee would see their way to extend the reduction to the small houses, the occupiers of which were least able of any to pay the rates for the water they used.

Mr. BEARD said the table now under consideration gave to the occupiers of small houses an advantage which was not given to those who came within the scope of the higher scale. The occupier of a 4s. house would pay at the rate of 4 per cent., while the occupier of a 6s. 6d. house would pay 6 per cent., and the occupier of a 9s. house would have to pay 7 per cent. This difference, he considered, was ample in favour of the smaller class of houses. Three houses let at 4s. per week would pay 24s. for water, while one house let at 9s. per week had to pay 32s.

Alderman COLLINGS said that, according to the list, the water for a 3s. house would be just 2d. a week; for a 4s. or 4s. 9d., 2½d.; and for a 5s., 2½d.; but if they went from 5s. to 10s. per week, then the 10s. house was charged not twice as much, but nearly four times. The 10s. tenant had to pay 9d., while the 5s. one only paid 2d. The object of the Committee was first to equalize the rates, and then as fast as a surplus accumulated to make a reduction all round.

Alderman AVERY, in reply to the observations as to the reduced scale, pointed out that the statute imposed upon landlords the obligation of supplying water to all houses having rentals of less than £10. They had no option; it was part of their compulsory obligations, and if they did not comply he would like to know how they would let their houses. The landlords dealt with these houses in blocks, and nearly every block consisted of back and front houses. If the Council made this considerable reduction in the front houses, at from 4s. to 7s. per week, surely the landlords would get a general reduction so far as their pockets were concerned. He should be delighted to hear of landlords giving to their tenants the reduction in the water charges which the Committee were now making. The Committee would be glad, when they had further surplus sums at their disposal, to consider the whole class of water rents.

As the amendment proposed by Alderman Biggs was not seconded, the report was approved.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.

A Meeting of the Shareholders of this Company (in liquidation) was held last Friday, at the City Terminus Hotel, under the presidency of Mr. WILLIAM THOMAS WESTERN, having been summoned, by authority of Vice-Chancellor Hall, for the purpose of submitting for confirmation, as a special resolution the resolution, passed at the meeting held on the 20th ult.,* to alter the Articles of Association in order to enable the Company to carry out an arrangement with their debenture-holders, &c.

The CHAIRMAN briefly explained the object of the meeting, and at the request of a Shareholder, read the resolution proposing the alterations. He concluded by moving a resolution confirming that passed by the meeting on the 20th ult.

Mr. R. S. GUINNESS seconded the motion, and

The CHAIRMAN, in reply to questions, said that the advantage of the proposed alterations was to bring the Articles of Association in conformity with the scheme of arrangement which had been made with the bondholders, by which the latter agreed to substitute certain debenture stock for a portion of the debentures now held by them. It was necessary that the articles should be altered as proposed, in order to give effect to that arrangement. There would then be two classes of bondholders, "A" and "B," whose positions would not be equal. The present issue of bonds amounted to £111,000, and they had power to issue £9000 more. The resolution now proposed to be confirmed authorized the issue of £60,000 of "A" debentures, which would be a first charge on the Company, and £60,000 of "B" debenture stock, which would be a second charge upon the property and profits of the Company. These two issues would be in substitution for the present authorized issue of £120,000, and, therefore, the proposal did not increase the debt of the Company, but altered the form in which it stood. It would increase the expenses ultimately by ½ per cent., to which the debenture-holders thought they were entitled for deferring the time of payment of their interest.

The resolution was then unanimously confirmed, and

The CHAIRMAN, in reply to a vote of thanks, expressed a hope that he would meet the Shareholders about the middle of next month, and that he would then be in the position of a Director instead of Liquidator of the Company.

THE WATER SUPPLY OF SOUTH STOCKTON.

At a recent meeting of the South Stockton Local Board, the subject of the Board obtaining an independent supply of water for their district was under consideration, and the Clerk (Mr. J. Dodds, M.P.) was requested to consider the matter, and report to the Board thereon. This he accordingly did, and his report, which was presented to the Board at their meeting on Tuesday last, was as follows:—

In reply to your inquiry as to your powers of obtaining an independent supply of water for your district, I have to report as follows:—The Public Health Act of 1875, which consolidates all previous Sanitary Acts, is the only source from whence you derive any authority; and its provisions in relation to the supply of water are clear and distinct.

* See JOURNAL, Vol. XXXVI., p. 1011.

It enacts that any urban authority may provide their district, or any part thereof, with a supply of water proper and sufficient for public and private purposes, and for these purposes may construct and maintain water-works, take on lease, or hire, or purchase any water-works, and any rights, powers, and privileges of any water company, and contract with any person for a supply of water. This general authority is, however, restricted in its application by the section of the Act immediately following, which provides that "before commencing to construct water-works within the limits of supply of any water company empowered by Act of Parliament, the local authority shall give written notice thereof to such company, stating the purposes for which, and the extent to which, the water is required by the local authority;" and that "it shall not be lawful for the local authority to construct any water-works within such limits if and so long as any such company are able and willing to supply water proper and sufficient for all reasonable purposes for which it is required by the local authority;" and any difference of opinion on these points shall be settled by arbitration in manner provided by the Act. The Stockton and Middlesbrough Water Company (the Company from which your supply is obtained) is empowered by the Stockton and Middlesbrough Corporations Water-Works Act of 1876 to supply the parishes, the townships, and places therein mentioned, including South Stockton, Thornaby, Mandale, &c. There is nothing in that Act to alter the powers given to you by the Public Health Act; but it contains an important provision which may be mentioned. Section 87 of the Act provides that if any local authority of any district within the limits of the Act shall, at any time within ten years after the passing of the Act, give six months' notice in writing to the Water Board that they require to be supplied with water in bulk, then and in that case the powers of the Joint Board to supply water within such district shall cease; and from such period the Water Board shall supply such district with such quantity of water as may be required—not exceeding 25 gallons per head per day of the estimated population of such district; such quantity, however, not to exceed the quantity per head supplied to the boroughs; the prices to be agreed upon and determined by arbitration, and these to include the use of mains and pipes. The Water Board can also charge 6 per cent. on any additional outlay for pipes and mains, and on all such other outlay as may be necessary for the supply of water in bulk. If, therefore, you are not satisfied with the ordinary supply by the Water Board, or wish to make an alteration without going to the expense of constructing works, you have power to demand such an arrangement, provided you give notice within the time specified. If this will not, in your opinion, be sufficient to meet your requirements, or you do not choose to adopt it, your only course is to prove that the Water Board is not "able and willing" to supply water proper and "sufficient for all reasonable purposes" within your district. This would undoubtedly be referred to arbitration, and the arbitrators would have full power to make a final award, binding on all parties, with such provision as to costs as they might think proper. If the arbitrators decided that the Water Board are not able and willing to supply you with water as before mentioned, you will then be at liberty, under the Public Health Act, to provide a supply of your own. If they decide in favour of the Water Board, you cannot provide your district in any other way than under the Stockton and Middlesbrough Corporations Water Act.

The report was referred to the Plans and Works Committee.

THE WATER SUPPLY OF WORKSOP.

EXTENSION OF THE WATER-WORKS.

In a notice of some extensions that have been recently carried out in connection with the water supply of Worksop, a local contemporary gives a short history of the water undertaking, from which it appears that although the Water Company's Act was passed in 1823, the town did not take advantage of its provisions until 1875. On the 14th of June of the latter year an Act was passed empowering a private company to supply the town with water. Works were speedily commenced, and so far completed as to admit of the water being turned on for the use of the inhabitants in June, 1878. The opening ceremony took place on Sept. 5 of the same year. At present, the cost of the undertaking has reached about £15,000. Of course the capital of the Company was increased to this sum as alterations and extensions were made to meet the requirements of a town gradually developing in size and population like Worksop. When first the scheme was proposed, an examination was made of the surrounding district, and a site was fixed upon in one of the highest places available. On this elevated spot a reservoir was constructed of sufficient capacity to meet the demands of the consumers for some years. It was 150 feet square, and of such a depth as to be capable of holding a million gallons. The supply is obtained from a deep well, from which the water is pumped by a 20-horse power engine. About 8 miles of mains have been laid out in the public streets, and in the district generally. The leading main-pipes are 8 inches, and the lesser ones 3 inches in diameter. There are 76 hydrants fixed for watering streets, and for other sanitary purposes, also for the preservation of life and property in case of fire, and for these the Local Board pay an annual rental. The greatest pressure, amounting to 60 lbs. per square inch, can be obtained in the most populated and most frequented streets. Until a recent period, the above constituted the provisions for the domestic and business wants of the inhabitants of Worksop. Considering the great number of good wells that existed in the locality, and that there was a rather strong opposition to the payment of a water-rate, it was not to be expected that a large number of property-holders and their tenants would avail themselves of the facilities afforded by the Water Company, and it will doubtless take many years before the consumption of water supplied from the Company's works will become general. Many persons are, however, learning the benefits of having pure water, and are beginning to prefer it to that contaminated with impurities of sewage and excrement, such as are often observable in water from the best of wells. There are 250 houses now furnished with water from the Company's mains, and it has been necessary to construct an additional reservoir, which has recently been completed. It differs from the former one by being arched over, and is capable of holding 70,000 gallons. The first reservoir was an open one, and its exposure to the air rendered the water liable to become impregnated with matters that were detrimental to its purity. In the new reservoir this defect has been completely remedied, and the water now consumed by the inhabitants from the Company's mains will compare most favourably with that furnished to other towns throughout the United Kingdom. The alterations and extensions, and also the new reservoir, have been made under the superintendence of Mr. Allsopp, the Surveyor to the Worksop Local Board of Health. When the undertaking was commenced, Mr. J. F. Fairbank, C.E., of London, was the Engineer.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the American Gaslight Journal.]

(Continued from p. 24.)

It having been resolved that the next meeting of the Association should be held in Boston, and a Committee of Arrangement having been appointed to prepare for it,

Mr. W. H. PEARSON read the following paper on

THE WORKING OF THE LOWE PROCESS AT TORONTO.

This paper is presented in compliance with a request conveyed in a resolution passed by this Association at its last meeting. Had I merely consulted my own inclinations, I should have respectfully declined the request; but, believing that it is due to the Association that they should have fuller and more complete information upon the subject than I was able to present in my last paper, and that the interests of gas making would be promoted thereby, I have waived my personal feelings. I wish it to be understood that I do not appear as an advocate of the Lowe process, but that it is simply my intention to present facts regarding it of which I am cognizant, and leave it to the members of the Association to draw their own conclusions therefrom; and in doing this I shall endeavour as frankly to mention what I believe to be its disadvantages as well as its advantages, but it is certainly a fact that I am still as well satisfied of the superiority of the process, as a whole, over the old process, as I was last year.

It will not be necessary for me to give a description of the process, or the method of working it, as I did so in my last paper, and most of the members of the Association are doubtless well acquainted with it, and those who are not can easily obtain the information elsewhere. I shall, therefore, without further introduction, enter upon the discussion of those points which I believe will be of interest to the meeting as a whole.

Gas by the Lowe process was first made in Toronto on Feb. 9, 1879, with two sets of apparatus. Between then and Sept. 30, 1879 (up to which time I had reported), 26,641,000 cubic feet had been manufactured. Two more sets went into operation on Dec. 19, two more on Jan. 3, and in August last a seventh set was completed. Up to Feb. 17 the process was worked in conjunction with coal gas-works; since that time gas has been made by the Lowe process alone. In referring to the general working of the process, and in giving items of wear and tear, I shall go back to the time of its introduction; but I shall give the items of the manufacturing statement from the date the gas was made by the process alone up to September last, the end of our financial year. This statement I now give below:—

Statement of Gas Manufactured by the Lowe Process at the Works of the Consumers' Gas Company, Toronto, from Feb. 17 to Sept. 30, 1880.

Number of charges	14,865
Average production per charge	4,690 cubic feet.
Total production	69,729,000 "
Average material used per 1000 feet—	
In generators:	
Crude petroleum	4 29 gallons.
Anthracite coal	59 lbs.
In boilers:	
Anthracite coal	4 "
Bituminous coal	7 "
Average gas purified per bushel of lime	9,709,000 feet.
Purification—	
Material, average cost per 1000 feet.	2 16 cents.
Labour,	1 48 "
Superintendence and labour—	
Gas-making, including salary of superintendent and wages of two foremen, stokers, engineers, and coal wheelers; cost per 1000 feet	7 65 "

The largest production per diem of 12 hours from four sets was 270,000 cubic feet; six sets, 362,000 cubic feet. The largest production per diem of 24 hours from six sets was 681,000 cubic feet. Between April 18 and Sept. 21, all the gas was made in the daytime, except on special occasions, and none was made on Sundays. Three stokers are sufficient to work four sets, and, on an emergency, five; and four stokers can work six sets, and, on an emergency, seven, each capable of producing 100,000 cubic feet in 24 hours. The men at the purifiers are also employed at other work, though their whole time is charged to purification. The cost per 1000 feet for superintendence and labour will, of course, be considerably lower during the winter months, when a larger quantity of gas is made (with us about 75 per cent. more in the six months commencing Oct. 1 than in the six preceding months), and only the same superintendence and the same number of engineers and men at purifiers are required. Steamboat-size coal has been found the best to use, as allowing sufficient space for the steam to pass through during the process of gas making. The Canadian crude petroleum used is much inferior and heavier than American, the gravity being 31° and 32°, and produces a large quantity of tar—American crude being about 45°, and comparatively free from tar. Gas oil of 35° gravity, costing about the same as crude, is now being used with more satisfactory results.

Condensation in holders and distribution is a point that has considerable effect upon the unaccounted-for gas account and illuminating power, and one that came up in the discussion on my paper last year. I was not able to give definite information regarding it, not having then had the opportunity of making any satisfactory test. Since then I have given the matter a good deal of attention, and I am satisfied that but very little condensation takes place after the gas leaves the works—in fact, almost none. Of this I have obtained proof in various ways. I put 5 feet of the gas into a meter prover. Seven days after, with the thermometer and barometer the same as at first, no loss whatever had taken place. Three days after, at same temperature, there was a loss of 2 per cent. In another experiment no loss was shown until the sixth day, when a diminution of 1 per cent. took place. On making a third test, no shrinkage took place until the fifth day, and on the eleventh day but 2 per cent. loss was shown. During the time of the experiments the temperature ranged from 52° to 67° Fahr. The illuminating power of the gas was taken at the commencement and close of each test with a Sugg's Illuminating Power Meter, and no perceptible difference was shown. The gas was kept in a holder at the works for four days, without any apparent loss in quantity or candle power, the candle power being taken with a jet photometer. This is not so satisfactory a test as to loss in quantity as the former ones, as the temperature at its commencement and close was not carefully noted; but it was more satisfactory as showing that, notwithstanding its exposure to a low temperature, the gas retained its illuminating power—the gas being tested in March in a holder in the open air, and the difference between the highest and lowest temperature being considerable. In February and March last a burner was supplied with gas passed through a 1/2-inch pipe a distance of 20 feet, with a fall to catch condensation, exposed to the temperature during three weeks of cold weather, and, notwithstanding the thermometer registered as low as 6° Fahr., the light was unaffected, and no condensation whatever was found.

[There was here inserted a "Statement showing the Illuminating Power and Purity of the Gas supplied by the Consumers' Gas Company (Toronto) for the year ending Sept. 30, 1880. Made by the Government Inspector."]

The following comparative statement of the unaccounted-for gas account for a number of quarters in this connection may not be uninteresting:—

Statement of Unaccounted-for Gas.

Quarter Ending.	Gas Manufactured.	Loss.				Miles of Pipe Laid.
		Quantity.	P. Ct.	Per Mile of Pipe Laid.		
				Per Quarter.	Per Diem.	
Sept. 30, 1878	All coal.	Cub. Feet.	19 75	52,118	572	85 00
Do. 1879	44½ per cent. Lowe.	4,430,100	18 25	50,614	556	91 18
Do. 1880	All Lowe.	4,615,000	13 70	37,039	407	97 47
Dec. 31, 1878	All coal.	3,610,200	15 75	80,223	872	86 71
Do. 1879	31 per cent. Lowe.	6,956,200	12½	64,291	656	92 71
Mar. 31, 1879	11½ per cent. Lowe.	5,960,500	15 50	72,084	792	86 71
Do. 1880	78¾ per cent. Lowe.	6,250,400	7½	35,893	394	92 71
June 30, 1879	47 per cent. Lowe.	3,327,700	17 25	49,464	543	87 07
Do. 1880	All Lowe.	4,306,900	7 ¾	19,916	218	93 60

Between Aug. 1 and Oct. 16, 1879, about 1600 yards of 20-inch pipes were substituted for smaller sizes, as a trunk main; and between the middle of May and the middle of July, 1880, it was extended 2200 yards further. The day pressure was considerably increased in July last, in

consequence of an increased demand for gas in the daytime. The night pressure on the mains supplying the principal portion of the gas consumed was increased about one-seventh in December last; but notwithstanding this, the supply was defective. In the middle of July last, when all the connections were made to the trunk main referred to, the pressure was reduced to what it was before. This, however, gave a very much higher pressure in certain localities where there had been a deficiency before, even with the higher pressure. This, and the increase in the day pressure referred to, will, at all events partially, account for the increase in the unaccounted-for gas return in the last September quarter, as compared with that for June last. No leaks of any consequence were found in the pipes replaced by the 20-inch main referred to; nor elsewhere during the last two years. The station meters were tested and found correct. The workmen all say that there is not a quarter of the condensation in the drips that there was formerly. I do not claim that the whole of the reduction shown recently has resulted from the cause referred to, but I cannot but conclude that it is mainly to be attributed to it.

The specific gravity obtained by the effusion method averaged about 0.560. I did not obtain that of the coal gas, but assumed it to be 0.443—the approximate gravity of 15-candle gas. Theoretically, about one-eighth more pressure would be required, and in practical working this addition to the pressure at the works gave the same pressure on the burners in various localities as there was when coal gas was supplied. I also verified this by testing both gases with a meter and burner prover.

Not having any analysis of the gas from which to obtain the heating power theoretically, I tested both gases in a somewhat crude manner, with the results shown in the following table. The water was put in a covered tin vessel, and the thermometer inserted through a hole in the cover. The burner used was a common batswing, and the vessel was in all cases suspended at the same distance above the flame. The time was carefully noted, and the gas was always passed at the same pressure from a meter prover through a burner tester. The temperature of the room in each test did not vary more than 2°.

Date of Test.	Minutes taken to Raise Temp. from 70° to 120°.		Cubic Feet of Gas consumed.		Size Burner used.
	Coal.	Lowe.	Coal.	Lowe.	
Jan. 23 . .	16 00	15 15	1 20	1 14	4 1/2 feet.
" 24 . .	16 45	—	1 25	—	4 1/2 "
" 24 . .	10 30	—	1 22	—	7 "
" 26 . .	—	15 00	—	1 12	4 1/2 "
" 27 . .	16 30	—	1 23	—	4 1/2 "
Oct. 9 . .	—	16 14	—	1 21	4 1/2 "
" 9 . .	—	16 14	—	1 21	4 1/2 "

Quantity of water used, 2.75 lbs.

I cannot account for the different results obtained from the Lowe gas on Oct. 9, except that the composition of the gas must have varied at different times. The results of the tests are only claimed to be approximately correct.

The only available residual is the tar, and this contains a large quantity of water, some of which it retains mechanically even after boiling. Passing it through a sieve has had the effect of removing a large proportion of the water, and we have hopes of eventually being able to remove it entirely. The following analyses of the tar were obtained from Dr. W. H. Pike, Professor of Chemistry, University College, Toronto:—

Per 100 parts by weight—			
Water	28	Corresponding to	Water 0
Light oil	3	" "	Light oil 4
Naphthaline	18	" "	Naphthaline 24 5
Anthracine oils	13	" "	Anthracine oils 18 2
Pitch	38	" "	Pitch 53 3
	100		100 0

Owing to the large quantity of water that runs away with the tar, it is difficult to say accurately how much is made. I should judge it to be between 15 and 20 per cent. of the oil used.

We have found lime to be the only effective purifying agent. Oxide of iron has been tried, but in a few days it is converted into a thick paste, owing to the oily nature of the gas, and fails to take up the impurities, and it cannot afterwards be renewed. Lime thoroughly slaked, and allowed to remain so for a couple of days before using, produces much better results than lime slaked and used immediately, about 40 per cent. more gas being purified to the bushel. Owing to the gas being made with great rapidity, larger purifiers, with deeper cups, are required than for coal gas, each generator producing about 5000 cubic feet per run of 20 minutes. Passing the gas into a small holder before purification would, no doubt, remedy the difficulty, as it could be passed regularly, and at such pressure as might be found best. At present we aim at commencing to run each set a few minutes after the other, in order to accomplish this.

The only difficulties of any importance that have been experienced have arisen from naphthaline. But little trouble was experienced or expected from this until about a month since, just as the cool weather commenced, or provision would have been made to obviate it by conveying the gas for some distance over tar, as is done in coal gas-works. The difficulty, however, is not so great as that we have experienced from the same cause with coal gas, and is confined to the pipes in the works, and a number of services where they enter the houses. There have been no obstructions whatever in the mains. Some which were recently taken up within a short distance from the works were almost as clean as when they were put down years ago. Trouble has also arisen from the closing up of the lava-tip burners with a substance as hard as the burner itself, which forms on the side of the orifice, and increases until the burner is closed up, and which cannot be removed. Oxidation and the deposition of carbon have been suggested. The difficulty was not altogether unexpected, as we were informed that elsewhere lava-tip burners would not answer. The most peculiar and apparently unaccountable feature is that these stoppages are almost entirely confined to burners in houses at the extreme limits of the mains, and are not caused by any impurities carried forward in the gas. The evil does not exist to any extent, and the substitution of brass burners remedies it, as they are never affected in a similar manner. This trouble is not confined to Lowe gas, as I have been informed by the manager of a coal gas-works that some of the burners of his company were affected in a similar way.

Since the erection of two sets of apparatus in February, 1879, 603 dols. 87 c. have been expended in repairs. This expenditure was for re-lining two of the generators, sundry repairs to others and to the superheaters, and taking down and re-building and altering brickwork for boilers. Part of this expenditure was rendered necessary by some of the blocks in the generators being unsuitable for the purpose. The gas made by the apparatus during this period was 126,030,000 cubic feet.

As information as to the cost of the apparatus was particularly desired by several members at the last meeting of the Association, for their

benefit, and that of any others who may desire it, I now furnish it. The two sets, with generators 10 ft. 6 in. by 5 ft., and superheaters 15 ft. by 4 ft., with all connections, and a 25-horse power engine and boiler, working gallery 30 ft. by 36 ft., oil storage tank, and two oil distributing tanks, purchased from the patentee, cost \$6000. The five sets of similar size with gallery, all valves and distributing tanks, connections and foundations, one 25-horse power engine, two boilers, steam hoist, four oil storage tanks of 42,000 gallons wine measure capacity, &c., cost 20,000 dols.

Discussion.

Mr. LITTLEHALES said he was somewhat disappointed in the paper, especially as there were not any financial results stated. He also took exception to the great variations experienced in the illuminating power of the gas as supplied at Toronto, which, together with its poisonous qualities, had caused the gas to be unfavourably spoken of in the local papers. The fact that there were not any residuals, except tar, resulting from its manufacture, told against the employment of the gas. He further alluded to the mention of the saving effected in unaccounted-for gas, and asked for more information on this subject. His principal objection, however, to the paper was the almost utter absence of reference to the "dollars and cents question."

Mr. PEARSON admitted that, as with other companies, there were at times variations in the quality of the gas supplied, but not to a very great extent, as had been stated. As to the leakage question, he said it was a fact that the larger proportion of Lowe gas they used, the less leakage they had. This was a fact which his statements, when carefully read, would, he thought, establish. As to the commercial side of the question, he was disinclined publicly to give exact figures as to the saving effected by his Company through using the Lowe gas; but might state that they had made considerably more money during the past year, with about 10 per cent. increase of consumption, than they had ever made before, notwithstanding the reduction of 25 cents per 1000 feet in the price of gas, on about 100 million cubic feet, which reduction took place on Oct. 1, 1879. They were at present selling gas to large consumers—those using 200,000 feet—at 1 dol. 50 c. per 1000 feet, and to those using less than this, at 1 dol. 75 c.

The discussion then drifted into a conversation upon the poisonous qualities of the gas, about which there was not any question, and led to a call to order by the President.

Mr. SOMERVILLE asked if coal gas and the Lowe gas mixed well.

Mr. PEARSON: Yes; they do mix, there is no question about it.

Mr. STARR said he understood Mr. Pearson to say that the inlet and outlet of his holder were so near together that the gas would go out about as fast as it was made. He asked if there was a difference at different parts of the charge.

Mr. PEARSON said he admitted that on some occasions this was the case; but they always tried to prevent any such thing from taking place. In answer to further questions, he said they made, on an average, 4000 feet per charge, using 59 lbs. of coal in the generators; 70 lbs. of coal altogether per 1000 feet, and 4 gallons, or a little under, of crude petroleum.

Mr. FORSTALL asked Mr. Pearson at how much he put the cost of the Lowe gas in the holder. Supposing his coal gas to cost from 40 to 50 cents per 1000 feet in the holder, what did the Lowe gas cost in the holder?

Mr. PEARSON said the Lowe gas cost in the holder about 15 cents less than coal gas, in addition to whatever benefit might be derived from the non-condensability of the gas in the pipes. The saving depended a great deal upon the price of coal. They had saved fully 16 cents per 1000 feet as compared with the price it cost to put the coal in the year before they commenced using the Lowe process. They made 140 million feet; so it was easy to reckon up what the saving was.

Mr. FORSTALL: Does that figure of 16 cents refer only to the difference in the amount of coal used, or does it include everything?

Mr. PEARSON: It includes everything. It is our net gain over the coal gas process.

Mr. LITTLEHALES: Taking the loss of interest on your old retort-house?

Mr. PEARSON: I do not admit a loss of interest. That is a matter for ourselves.

Mr. BURTIS: Have you, in repairing meters, noticed any peculiar effect of the gas on the meters? Some repairers have told me that they have noticed a difference, and could tell what gas had been used.

Mr. PEARSON: We have not found any difference in the meters.

Mr. FORSTALL: In getting at this difference of 16 cents in the cost of the Lowe gas, at what price do you estimate coal, and at what price naphtha?

Mr. PEARSON: We have two kinds of coal. The bituminous coal, I think, costs us, put down, 4 dols. 35 c.; the hard coal about 3 dols. 90 c. The crude petroleum costs about 4 cents a gallon.

Mr. STARR: Have you found in the meters any sediment or gummy substance?

Mr. PEARSON: No; but I have heard of some instances where there was a little collection of water in the meters.

Mr. STARR: We once used a meter where we found the whole interior surface covered with a gummy substance about $\frac{1}{2}$ -inch thick.

Mr. PEARSON: There could not then have been a proper purification of the gas.

A vote of thanks having been passed to Mr. Pearson, the discussion terminated.

(To be continued.)

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

Dec. 22, 1880.

The current issues of the *American Gaslight Journal* contain the continuation of the proceedings of the recent meeting of the American Gaslight Association. Particularly worthy of mention is Mr. Ramsdell's paper on "Gas-Engines." This gentleman has had considerable experience in introducing gas-motors to public notice; and has, moreover, kept full data in regard to the engines he has sold, so that he is able to speak authoritatively on the subject. Mr. Ramsdell gave, at the opening of his paper, a comparison between a gas-engine he sold for use in a newspaper office, and a Baxter steam-engine, which the former replaced. The Baxter engine is particularly designed for light work, and consists of an engine and boiler combined, the former being fixed upon the top of the latter. Too much reliance should not be placed on this comparison, because the steam-engine was used up in four months; and the data obtained from its short life could not justly be applied to all steam-engines. It is, however, to be noted that, as the Baxter engines have a good reputation for light work, this particular one must have been an exception to the rule. Mr. Ramsdell recognizing that the comparison in this case might be considered unjust if applied to steam-engines in general, took the case of a gas and steam motor of equal life—viz., 15 years—and showed, during this time, a total saving of \$942 dols. (\$788 8s.) in favour of the gas-engine,

* See JOURNAL, Vol. XXXVI., pp. 976, 1014.

the figures in each case including the first cost of the engine and the running expenses of the same during the time noted. A 17-horse power gas-engine was next placed in comparison with a 25-horse power steam-motor, and taking a period of 25 years, a saving of \$7,992 dols. (£7598 8s.) was shown in favour of the gas-engine for this period. The reason assigned for putting a 17-horse power gas-engine on a par with a 25-horse power steam-motor, was that the former develops its full power immediately, while considerable margin is required in the case of the steam-engine, particularly in the boiler. It is to be understood that in referring to the steam-engine, I mean to include its necessary adjunct, the boiler. This margin is perhaps a little too wide, and the figures for the depreciation of the boiler during the term of 25 years—namely, 100 dols. (£20) a year for repairs, and also replacing the boiler one and a half times—are a little heavy; but even after giving these two items just weight, a large saving in favour of the gas-engine could still be shown, proving the economy of this motor for medium as well as for small power. The price of the gas was taken at 2 dols. (8s.) per 1000 cubic feet. The 17-horse power engine consumed when working at its full power 18 feet per hour. Mr. Pearson's paper on the results obtained from the Lowe process of gas making at Toronto,* provoked some discussion on the merits and demerits of this mode of manufacture; but, unfortunately, we do not approach any nearer the solution of the question whether this process is or is not a success. If a Committee of the Association took the matter in hand, following up the history of the process in every town where it has been tried, then the question might be definitely settled.

Some three or four cases of suffocation by gas have occurred in this country since my last letter; and accidents of this nature have become exceedingly common of late, usually occurring in small city hotels, where people who are not accustomed to the use of gas either blow out the light, or else turn the cock off and then on again. Many accidents have occurred from the fixture cock not having a "stop," the lack of which makes it very easy for any one to put the light out, and still leave the gas escaping.

A serious gas explosion, unfortunately attended with the loss of two lives, occurred recently at the old Municipal Company's works in New York City. This Company, it will be remembered, make gas by the Tessié du Motay process, but the old works in which the explosion occurred had not been used for gas making since the completion of the Company's new station in Feb., 1877. The Company had, however, determined to convert the old works into an experimental station, and for some months previously to the accident, a gang of workmen had been making the necessary alterations, which had nearly reached completion when the explosion occurred. It seems that a 48-inch station meter had been placed in position, and connected with the Company's main, as it was necessary to light up the works. Just how the accident occurred will never be known; but it appears to have been caused by the carelessness of the two men who were the victims of the disaster, for one of them was seen entering the meter-room with what appeared to be a hand-lamp, and immediately a terrible explosion occurred. The two men, the only occupants of the room at the time, were found dead, and a hand-lamp on the floor. The most probable explanation of the accident is that the stop-cock on the meter-pipe either leaked or else had been left open long enough to pass sufficient gas to form an explosive mixture within the meter, and that the drip-cock on the same pipe was open, when one of the men approached it with his naked light. The two heads of the meter were blown out and so completely broken up that no piece above a few inches square was to be found in the meter-room. The Coroner's jury exonerated the Company from all blame, assuming the death of the two men to have been due to their own carelessness.

Representatives of the several Gas Companies of New York City appeared before the Board of Estimate and Apportionment of the City a few days ago, to urge upon that body the necessity of a larger appropriation for lighting the lamps for the coming year. The larger Companies are now receiving 15 dols. (£3) per lamp per annum, but claim that at this figure they are losing money, and ask for an increase of 3 dols. (12s.) in the compensation; or, in other words, making the price 18 dols. (£3 12s.) per lamp per annum. The increased cost of making gas was given as the excuse for the request. The Board are to consider the matter.

The effects of the drought that prevailed during the past summer are yet visible in many sections of the country. Most of the large cities have, at present, a pretty good supply of water; but there are some who are still reminded of a possible water famine. Chief Engineer Van Buren, of the Brooklyn (N.Y.) Water-Works, sent to-day a communication to the City Works Commissioner, in which he stated that unless a saving of several million gallons of water per day was immediately effected, a water famine could not be much longer averted. Mr. Van Buren says: "I appeal to the consumers, and ask them to sincerely consider the question of waste, and to use the water as sparingly as possible. If every consumer will seriously consider this vital question, there need be no danger of a scarcity of water. The season has been a most trying one; the fall rains have not come to our relief as anticipated, and I feel great anxiety in regard to the water supply." After noting how his reports in regard to the inadequate supply had been disregarded, the Engineer says: "Twenty-five millions of gallons a day is an ample supply for all the wants of the city; all above that is waste." The Commissioner announces that the inspection of the plumbing of buildings, which had been temporarily discontinued, will be resumed immediately. So far, out of 20,000 buildings inspected, 15 per cent. have been found to have leaky pipes or faucets.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

Mr. John M'Crae, as the successor of his father in the management of the Dundee Gas-Works, enters upon his duties under somewhat inauspicious circumstances, and it is to be hoped that the old adage will come true in his case, "A bad beginning makes a good ending." It is not for a moment to be supposed that the qualifying adjective here, "bad," has any reference whatever to the new Manager of the Dundee Gas-Works; it has reference only to the very peculiar discussions which the fixing of his salary at £500 a year has excited, both among the Gas Commissioners themselves at their meeting on Wednesday, and in the Town Council, which met on Thursday. As I mentioned in my "Notes" of last week, the Committee of the Gas Commissioners, at their first meeting after the death of Mr. B. M. M'Crae, appointed his son, the subject of the present discussion, Manager of the works, at a salary of £500 a year. The minute conferring this appointment came up for confirmation at the meeting of the Commissioners on Wednesday, when Mr. M'Kinnon, who seems to be a financial reformer of the extreme type, moved the disapproval of the minutes in so far as they referred to the salary of the Gas Manager. He had nothing to say against Mr. M'Crae's qualifications, but he thought a gentleman capable of managing the gas business could be obtained for £300. Mr. Robertson had not the slightest doubt of Mr. M'Crae's ability to fill the place of his late respected father, but he maintained that it was quite possible to spoil the best of servants. In the

* See ante, p. 62.

same breath in which he announced his great respect for the late Mr. McCrae and his family, he said he considered it a gross waste of public money to give Mr. McCrae £500 a year. What follows is worth quoting:—"Many men who had passed a considerable time at college had to labour hard for £250 a year, and why a man appointed to the position of a gas manager should at first get such an enormous salary as £500 he could not understand. It was more than the ratepaying class would tolerate." Why Mr. Robertson fixed upon the modest sum of £250 as the amount for which a college-bred man had to labour, I am at a loss to understand. If he had been desirous of making the comparison more striking, he could have pointed to the case of the poor curate, with a University education, toiling from week to week for a mere pittance. In both cases, that of the University man and the gas manager, they could be considered men of "light and leading"—the one dealing with the spiritual, and the other with the physical desires of their fellow-men. Here, however, I am afraid the comparison must end. College men there are, without doubt, who labour hard for £250 a year—aye, and for less; but could a college-bred man deal with all the intricacies of gas manufacture and distribution? Of course he could, if he had the necessary ability and proper training; but it is just here that the shoe pinches Mr. Robertson, although he does not seem to feel it. He appears to have a kindly feeling towards that other Town Councillor who, in another town, when a similar appointment was being made, defiantly asked what there was in gas-making. "Why, all you have got to do is to throw a shovelful of coal into a furnace, and you cannot help getting gas." Of course, a college-bred man, or any other man, could do this; but, unfortunately for the stability of the argument of both parties, something more is required. A gas manager must possess that which a college education may refine, but which it can never give—namely, good judgment and ability. And when there are added to these an intimate knowledge of physical laws, and a thorough grasp of the most economical modes of gas manufacture, it will be seen that, for a town of the proportions of Dundee, at any rate, £500 a year is by no means the "gross waste of public money" which is here spoken of. Mr. Robertson and those who think with him have evidently to learn that efficient services can only be secured by proper remuneration, and that an inefficient manager would soon and easily create less serious than the salary to be given to Mr. McCrae. The motion for the disapproval of the minutes was held to be formal at the meeting in question, but it will in all probability come up for consideration at the next meeting of the Gas Commissioners. A similar fate befell a motion in the Town Council on Thursday, which was brought forward by Mr. Blair. He moved in the following terms:—"That the Town Council have learned with regret that their representatives at the Gas Commission have appointed a Gas Manager at a salary of £500 per annum. The Town Council hereby repudiate the appointment, and sincerely hope, if it is not too late, that their representatives will reconsider their decision and cancel this appointment." An attempt was made to have this motion discussed by suspending the standing orders; but it was defeated by a majority of 18 to 14. The Provost pointed out that the members of Council were not a majority of the Gas Commission, and could not do what Mr. Blair wished; the Council appointed a certain number of the members of the Gas Commission, but were not responsible for their action.

On the first day of the year the *employés* in the Edinburgh Gas-Works met Mr. Henderson, who recently retired from the position of Superintendent, and presented him with a massive marble timepiece, bearing the following inscription:—"Presented to Barclay Henderson, Esq., by the *employés* in the Edinburgh Gas-Works, as a parting gift in grateful and affectionate remembrance of him as their Superintendent." The presentation was made by Mr. Alexander, the general foreman, who in a few well-chosen phrases, expressed the regret they all felt at parting from Mr. Henderson, after 30 years' association. Mr. Henderson, in returning thanks, said he had been sorry to leave the works, but failing health compelled him to relinquish his duties. He expressed the hope that the *employés* would co-operate as heartily with his successor as they had done with him in supplying the city of Edinburgh with pure gas. Three hearty cheers were then given for Mr. Watson, the Manager, and for Mr. Henderson, and the proceedings terminated.

The annual meeting of the Macduff Gas Company was held in the Town Hall, on the 29th ult.—Mr. A. George in the chair. The Manager (Mr. Gray) submitted the balance-sheet for the year and the report of the Committee, which showed the affairs of the Company to be in a satisfactory condition. The usual dividend of 5 per cent. was declared. Subsequently the price of gas was reduced to 9s. per 1000 cubic feet, with 5 per cent. for prompt payment. This price is said to be as low as in any other town having the same consumption, and, as I presume, similarly situated.

I mentioned in last week's "Notes" that certain of the inhabitants of St. Ninian's, in the suburbs of Stirling, had resolved to oppose the new Water Bill promoted by the Stirling Town Council. The cause of this opposition is that the opponents of the measure desire, as was broadly stated at a meeting of the Water Commissioners on Tuesday, "the rates raised all over the water district, in order that the price of water might be reduced to them." A minute was read at the meeting in question, detailing the various steps which have been taken by the authorities since 1848 to provide a water supply for the town, and inviting a meeting with the opponents of the present measure. In moving the adoption of this minute, Mr. Christie, who, if I mistake not, was recently Provost of the burgh, said that the people in St. Ninian's district put him in mind of the Children of Israel who became discontented, and wanted to be like their neighbours, so they became clamorous for a king. I should not like to say that Mr. Christie is correct in his scriptural allusions, but he seems to have struck a chord when he said the people of St. Ninian's were imbued with a spirit of a different sort—namely, greed; and when he advised them to remember what the Tenth Commandment says about covetousness. His motion was adopted, but I do not think his remarks are calculated to allay irritable feelings on the part of the residents in St. Ninian's.

With reference to the supply of water to Carnoustie, a report has just been drawn up by Mr. J. M. Gale, the Manager of the Glasgow Water-Works, and submitted to the Local Authority of Panbride. He says: "The portion of Carnoustie which lies within the parish of Barry has a population estimated at 3000, and the part in Panbride parish a population of 1000, being 4000 persons in all; and to supply this number it is proposed to provide 100,000 gallons of water per day, or 20 gallons per head per day to 5000 persons, if the population should increase to that extent. This is, I think, a sufficient and proper provision." It had been proposed to obtain water from a point known as the "Brax Burn;" but Mr. Gale, after referring to certain gaugings and calculations which he made, says: "Looking to the effect of long droughts upon the streams and springs in this and similar districts; to the difficulty, or, I may say, the impossibility of extending the area from which water can be drawn; the doubtful quality of the water, especially in wet weather; the compensations which will probably have to be paid; and to the costly nature of the works themselves, it is not a scheme I can recommend for adoption."

On the same subject, Mr. Alec McCulloch, C.E., of Dundee, was called upon to report to the Local Authority of Barry, who are interested in this

water scheme. Mr. McCulloch enters into numerous details, and concludes his report in the following interesting style:—"Having thus shown that Mr. Gale has evidently under-estimated the amount of the supply which can be sent into the reservoir, and consequently the extent of the whole supply; that the quality of the water, even when unfiltered, is better than that from other practicable sources which have been under consideration; that the whole supply will be efficiently filtered; that no excessive compensation is at all likely to be required; and that the proposed works would entail on the village of Carnoustie a very much smaller annual outlay than would be entailed by the carrying out of any other suitable scheme available, it follows that the reasons upon which Mr. Gale has based his inability to recommend the Brax scheme have little or no foundation." The Committee of Management of the Barry Local Authority have this week unanimously approved of Mr. McCulloch's report, and instructed the Clerk to forward a copy of it to the Panbride Board.

With reference to the Whithorn water supply, a meeting of the ratepayers was held on Wednesday last, when the Rev. J. Fleming testified, after a residence of 40 years, to the general health and longevity of the inhabitants. A Committee has been appointed to draw up a memorial to the Board of Supervision, asking them to look at the whole matter *de novo*.

The Water Commissioners of Dundee, or some of them, evidently think that the Police Commissioners are not paying a fair price for the water they use. At a meeting of the former Commissioners on Thursday, a motion was made that the supply of water for sanitary purposes should terminate at Whitsunday next. The question has been remitted to the Works Committee for consideration, but meanwhile I cannot help thinking that the love of money seems to take precedence of healthy and well-lighted homes in Dundee.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

I hasten to make a correction in regard to what I said in last week's "Notes" concerning the proposed new gas-works for Hawick. It seems that in the meantime there is no probability of the services either of Mr. Smith, of Darlington, or of any other person being called in to design the new works, and that, indeed, the proposed works cannot be proceeded with until the following resolution has been confirmed by a majority of two-thirds in number and value of the Shareholders present or represented at a general meeting, called upon six months' notice, to consider the same, namely:—"That in view of the removal of the Company's works from their present site to the area of ground immediately adjoining the railway, acquired by the Directors in accordance with the resolution of the special general meeting of Shareholders, held in the Town Hall, Hawick, on the 13th day of December current, and the loss which will be occasioned by such removal, this meeting resolve that such total loss shall be written off, out of the profits of the Company, by equal annual instalments, spread over ten years; and that this resolution be added to the Company's contract of co-partnership." This special general meeting is called for the 1st of July. At their last meeting the Directors empowered the Chairman and Manager to visit a few of the most recently constructed gas-works, in order to inspect the latest improvements in gas-making plant. I understand that these gentlemen intend to carry out their instructions at an early date.

The Works Sub-Committee of the Glasgow Corporation Gas Committee, at a meeting held on the 29th ult., received and agreed to accept the resignation of Mr. Robert Mitchell, so that at the end of the present month he may be relieved of his duties of Manager at Dawsholm station, in order to enter upon his managerial duties under the Directors of the Edinburgh Gaslight Company. At the same meeting it was remitted to the Conveners of the Sub-Committees on Works and Finance (Messrs. Walls and Lamberton) to consider and report as to appointing a successor to Mr. Mitchell from the short list of six applicants, from which that gentleman was himself selected about the beginning of last October. If I mistake not, the other members of the list were Mr. D. Terrace, Arbroath; Mr. James McGilchrist, Dumbarton; Mr. Wilson, then of Saltcoats, now of Coatbridge; Mr. Smith, Hawick; and Mr. Innes, formerly of Forfar—any one of whom would doubtless prove to be a worthy and useful occupant of the now-vacant post. With the view, I believe, of more securely retaining the services of their Manager, Mr. McGilchrist, the Dumbarton Corporation Gas Commissioners have lately made an increase to his salary, so that possibly he may not be in the "running" this time.

I am informed that the before-mentioned Works Sub-Committee have lately remitted to three of their number to consider the expediency of extending the gas-works at the Tradeston station. Two of the gentlemen are Councillors Reid and Jamieson, who both occupy eminent positions as highly-skilled practical Engineers.

The propriety of reversing the vote of £5000 from the profits of the Glasgow gas supply undertaking is undergoing a "simmering" process. At last Thursday's meeting of the Town Council, one member asked that his protest should be entered against the vote; another said if it were worth while dissenting he wished to enter his dissent also, but he thought it hardly worth while, as he understood the matter was to be brought up in a direct form; and a third actually "took the bull by the horns," by giving notice to ask "the Council to consider the matter at their next meeting, in view of the opinion of the public expressed since."

It is evident that the recent Exhibition of Heating and Lighting Appliances, &c., in Glasgow, is bound to be fruitful in useful results in a variety of ways. For example, at the last meeting of the Town Council of Glasgow, Mr. W. R. W. Smith gave notice of motion as follows:—"That the Gas Committee be instructed to take into their consideration the propriety of expending £500 in an investigation of the best methods and machines for applying gas for lighting, heating, cooking, and motion purposes; with powers, if they so resolve, to employ, outside of their own officials, scientific and mechanical experts, and to publish the results of such investigation." Mr. Smith, I may mention, has long been an active member of the Philosophical Society of Glasgow, an enthusiastic sewage or sanitary reformer; and altogether he is a man of very decidedly progressive views. If he can only get his motion carried, the published results of the investigations may be expected to be of vast benefit generally in furthering the use of coal gas.

As I anticipated in the telegram which I sent last Monday regarding the already very fatal and destructive gas explosion in this city on New Year's morning, another death has occurred, the additional victim being Mary Chapman. A public subscription has been set on foot, for the benefit of the sufferers, by the Lord Provost of Glasgow. The question of how to build dwelling-houses properly, and how to lay gas-mains in newly-formed ground, will doubtless receive much more consideration henceforth, in view of this lamentable disaster.

The illuminating power of the gas supplied to Greenock during last month showed, from 27 experiments, a minimum of 26.34 candles, a maximum of 31.20 candles, and an average of 28.62 candles.

At a recent meeting of the Magistrates of Glasgow the Town Clerk was instructed to inform the Corporation Gas Committee that from Dr. Wallace's reports it appeared that in certain districts of the town the illuminating power of the gas supplied during two consecutive weeks was

under the statutory minimum, and to request that care be taken in future to keep the illuminating power at least up to the minimum.

The Glasgow pig iron market opened last Tuesday, after the holidays, with quite a burst of eager buying; but when the pressing demand had been supplied, the price quickly receded. The highest price paid during the week was 53s. 10d. cash, and at the close on Friday afternoon there were sellers at 53s. 4d. cash, and 53s. 6d. one month, and buyers offered 1d. per ton less.

Very little change has occurred in the coal trade. The market is abundantly supplied, and prices are very steady.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, Jan. 8, 1881.

Tar, worth 40s. per ton.

Ammonia liquor (sp. gr. 1.035), 22s. per ton.

" sulphate (white), £19 10s. to £19 15s. per ton.

" " (good grey), £18 15s. per ton.

" muriate, at about previous prices—white, £36 per ton.

" " (grey), about £30 per ton.

Muriatic acid, £1 5s. to £1 10s. per ton.

Sulphuric acid (brown vitriol), £2 19s. per ton, firm.

Oxide, and sulphur oxide, same value as last.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as business is concerned, the coal trade of this district is in a fair position, but the dispute now going on with regard to the Employers' Liability Act is causing an unsettled feeling all through Lancashire. The coal trade, in fact, is for the moment thoroughly disorganized. At nearly all the principal collieries the men have declined the proposal put forward by the masters for seeking compensation through the medium of mutual insurance, and they refuse to return to work except in accordance with the provisions of the Act. It is estimated that there are throughout Lancashire something like 30,000 men now practically out on strike to enforce the adoption of the Act by the employers, and this serious derangement of the output is naturally limiting the supplies of coal coming into the market. House coals are not scarce, but in manufacturing sorts considerable inconvenience is being experienced. Some of the gas companies are unable to get all their usual supplies, and engine classes of fuel are very difficult to obtain, some mills even having been compelled to stop. Where colliery proprietors have stocks they are charging extra rates for filling up for new customers, and for slack especially higher prices are being readily obtained. So far, however, as the regular trade is concerned, there is no actual advance in quotations, and at the pit's mouth prices may be given about as under:—Best house coal, 8s. 6d. to 9s.; seconds, 7s. to 7s. 6d.; common house coals, 6s. to 6s. 6d.; steam and forge coals, about 5s. 6d.; good burgy, 4s. 3d. to 4s. 9d.; and good slack, 3s. 8d. to 3s. 9d. per ton.

It is not expected that the present unsettled state of things with regard to the Employers' Liability Act will be of long duration, as, in the event of the men holding out, the masters will take some action to protect themselves; but in addition to this dispute there is an agitation for an advance of wages, and the notices at a large number of the collieries expire this week.

In the iron trade, although there has been no great weight of business doing, there is a firm tone throughout the market. In pig iron the business generally doing is for forward delivery, but for any very extended periods sellers ask a premium upon present rates. Local makers, however, still decline to go beyond three months, and for this delivery into the Manchester district they quote 47s. 6d. to 48s. 6d. per ton, less 2½. Finished iron makers are more cautious than producers of the raw material in entering into forward engagements, and, as a rule, they do not care to go beyond the end of the first quarter. For bars delivered into the Manchester district £6 per ton is now about the average quotation.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The shipping trade at all ports continues very active, and in most cases the quantities of coal now being sent down are not sufficient to meet the requirements of shippers. The collieries have been working full time, but from various causes the demand continues to keep ahead of the supply. The advance in prices at Cardiff and Newport has been well maintained. The fuel and house coal trades are proportionately busy, more especially so as regards Newport, where the latter trade is in a flourishing condition, realizing, on an average, 10s. 6d. per ton for large, 8s. 6d. per ton for brush, and 6s. 6d. per ton for smiths' and manufacturing small.

On Monday last week the sale of the Pen-y-graig Colliery (not the steam coal colliery wherein the explosion took place) came off at the Royal Hotel, Cardiff. The sale was conducted by Messrs. Alexander and Co., and Mr. W. T. Lewis became the purchaser at £16,500. This colliery is situated in the Rhondda Valley, a distance of about 16 miles from Cardiff, and was opened out at a cost of over £30,000, some ten or twelve years since by Messrs. Rowlands and Williams, on the well-known and excellent seam of coal No. 3, Rhondda. A dispute took place between the partners, which caused the concern to be placed in Chancery, and in order to bring matters to a close the sale above alluded to ended their grievances, unfortunately at a great sacrifice to both parties.

During the past week the shipments of coal were as follows:—Cardiff, 89,551 tons; Newport, 15,612; Swansea, 10,668 tons.

In regard to the tin-plate trade, with the exception of the Garth and Caerleon Tin-Plate Works, which are at a standstill, all the other works are going full time, and at such prices as will make both ends meet. The steel works are all in full operation, with the exception of the Panteg Works, the rail trade of which is quite stationary, and has been so for some weeks past, and only the tin-plate bar mills are now in motion, employing some 150 hands instead of 1000 as they formerly did.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The demand for coal from the South Staffordshire pits is, taking the various sorts all round, of a slightly improving character. At some of the pits, notably those renowned for best deep productions, full time is being made, and masters have a good assortment of orders on hand. Manufacturing fuel of all classes is reported to be more largely sought after, and orders, too, are of a more bulky description. A few contracts are reported to be open to the market, though these are not of a pretentious nature; nevertheless the trade of the district is considered steady, and growing upwards, and fairly promising for the commencement of the year. Gas coals are scarcely in so good request. Prices are, however, very low, and masters complain of the unremunerative rates at present existing. There is a growing market for ironstone, and cokes sell somewhat freer. The returns of the minerals raised in the district during the past half year, and which are now being made up, are looked forward to with interest, and it is considered by a few good judges that the total will be much better than it is generally calculated to be.

The iron markets are tolerably well attended, and notwithstanding the near approach of quarter-day, some good orders were given out during the past week. Inquiries were numerous for marked bars, and there is reason to believe that some fair lines will be placed at the quarter-day meetings this week. Finished iron manufacturers are holding out, and refuse to take orders at other than the old rates. The standard quotations of best bars, which have ruled throughout the past quarter, will, it is generally understood, remain in force, though a few of the largest houses are reported to be desirous of raising the scale another 10s. The reduction in wages is held out by some buyers as a means whereby to secure lower rates, but the smallness of the amount is held by masters to be so trifling as to be unworthy of notice. Common bars, which have been the characteristic feature of the finished iron trade during the past three months, still sell freely at £6 5s. Sheets, gas-tube strip, girder plates, and hoops, are receiving an increased share of attention, and in the matter of gas-tube strip more is now being asked. The pig market shows a somewhat brisker tone, and there is a greater call for all-mine and cinder qualities. It is, moreover, probable that an advance in this description of iron will take place in the course of the month. Indications point towards as much. There has not, however, been any increase made in the producing capacity, and the number of furnaces now in blast is practically the same as it was a month ago. During the holidays numerous alterations and repairs have been carried out, and a few furnaces have recently been put in working order, should necessity require them. Heavy ironfounders, engineers, and makers of hydraulic machinery, are well employed at present.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade is rather better than it has been during the past fortnight, when but little has been done in manufactured iron. The make of pig iron exhibits no falling off whatever. All the available furnaces are kept in blast, and large supplies of ironstone are being removed by rail from North Lincolnshire. Some of the foundries seemed to have commenced the new year better than they closed the old; the Railway Foundry, Barnsley, having received fair orders for slack washing and crushing machines for coke-making purposes. The Bessemer steel trade is healthy, there being a fair demand for rails, tires, and axles.

Fresh difficulties attend the South Yorkshire coal trade, and owners just now seem to come in for an abundant share of surprises. The demand of the colliers for 10 per cent. advance will result in but few strikes, for although the men have given notice at several collieries, they are very undecided, and not anything like a majority of them have sent in their notices. This was followed on Friday by a circular being sent out to the coalowners from the South Yorkshire Topmen's Association, requesting an advance of 15 per cent. Unfortunately the action of the men is likely to fall heavily upon themselves, for the owners in several instances have given notice to the workmen to leave their houses, whilst others have closed and have given notice to close their pits.

The house coal trade, upon which the pits in both South and West Yorkshire so largely depend, is so quiet that they are not being fully worked. Of late the demand for London and the Eastern Counties has suffered greatly on account of the mild weather, but as it becomes keener it is thought trade will increase. Prices are very low for the season of the year, and, singular to say, whilst the men in South Yorkshire are clamouring for an advance, those employed at Alfot's Colliery, West Yorkshire, are asked to submit to a reduction—a thing which it is believed will be demanded in the other districts before the men get back again to work.

There is a very fair output of gas coal at the majority of the pits, most of which is supplied per contract. Those coalowners who have agreed to deliver the coal carriage paid, and are compelled to send it over the Manchester, Sheffield, and Lincolnshire line, are likely to suffer a great deal owing to the rates being revised, the pits being now placed on the mileage system on account of the recent decision of the Railway Commissioners in the Denaby Main case. The rate from some of the pits to Hull and Grimsby has been increased from 6d. to 8d. per ton.

Although the coke trade is flatter than it was, the output of the district is very good, and a large tonnage is being sent by rail to North Lincolnshire, where 15 out of the 18 furnaces built in the district are in blast, and the other three are ready for lighting on the shortest possible notice.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

There has again been another busy week in the Durham gas coal trade. The shipments increased fully 2000 tons a day over the Christmas week, and the demand was very well sustained. There has been a good supply of tonnage. The contracts for the next six and twelve months' supply are being made, and several have been completed. The market is stronger than in January last year; and advances have been secured upon very best coals, ranging from 3d. to 6d. per ton. Some contracts were made last week at a rise of 6d. per ton; others were under negotiation, say, at an offer of an advance of 4½d. per ton. Affairs are active at the colliery offices, and the prospects for the next twelve months are good.

The coke and coking coal trades are improving. The business done in coke continues to be *bonâ fide*. The coke makers fight shy of speculators. They will have nothing to do with them, as very many of the coke collieries lost last year through merchants having bought quantities of coke on speculation, and when the market went against them they repudiated their bargains; and if the colliery offices had taken legal proceedings to enforce them they would have obtained no more of their custom, and have had to submit to the loss. Other classes of coals occupy a somewhat stronger position in the market, but without any alteration in rates.

Coasting freights are somewhat weaker. The reduction of rates is small—say, from 3d. to 6d. per ton. The coast business done by steamers was 3s. 10½d. per ton for London coal steamers. Sailing vessels have been paid 6s. 10½d. per ton to load for the same place.

The malleable iron trade of the Tyne and the pig iron market of the Cleveland district have a healthy look, and are improving. The prospects of these trades are considered to be somewhat satisfactory for the spring. There is not much done as yet in general manufacturing business; it is too soon in the year for it. There has been an improvement in the price of lead. The timber trade is very quiet, and there is no disposition shown to enter upon business at present.

INSTITUTION OF CIVIL ENGINEERS.—We have received a list, revised to the 2nd inst., of the persons composing this Institution. From it we learn that there are now 18 Honorary Members, 1231 Members, 1335 Associate Members, 569 Associates, and 686 Students—in all, 3839. The student class was only organized in 1867, when the society consisted of 18 Honorary Members, 589 Members, and 826 Associates—together, 1433—so that the increase has been remarkable within a comparatively brief period. At the first meeting of the newly-elected Council, Mr. Hugh Lindsay Antrobus was re-appointed Treasurer; Mr. Charles Manby, F.R.S., Honorary Secretary; and Mr. James Forrest, Secretary.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

5471.—HUTCHINSON, R., Mildmay Park, London, "Improvements in gas motor engines." Dec. 29, 1880.
5518.—WATES, P. J., Balham, Surrey, "Improvements in apparatus for the manufacture of gas." Dec. 31, 1880.
33.—DOTY, H. H., St. James's, London, "Improvements in gas-burners." Jan. 4, 1881.
60.—ABEL, C. D., Chancery Lane, London, "Improvements in gas motor engines." A communication. Jan. 5, 1881.

PATENTS WHICH HAVE BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
4825.—LONGSHAW, J., "An improved gas tap." Dec. 19, 1877.
4865.—SILBERMAN, A., "Improvements in gas blow-pipe machines." Dec. 21, 1877.
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.
3916.—UNDERHAY, F. G., and CARTER, A. E., "Improvements in apparatus for preventing waste of water." Nov. 29, 1873.
4178.—SPICE, R. P., "Improvements in apparatus used in the manufacture of gas." Dec. 19, 1873.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Jan. 5, 1881.

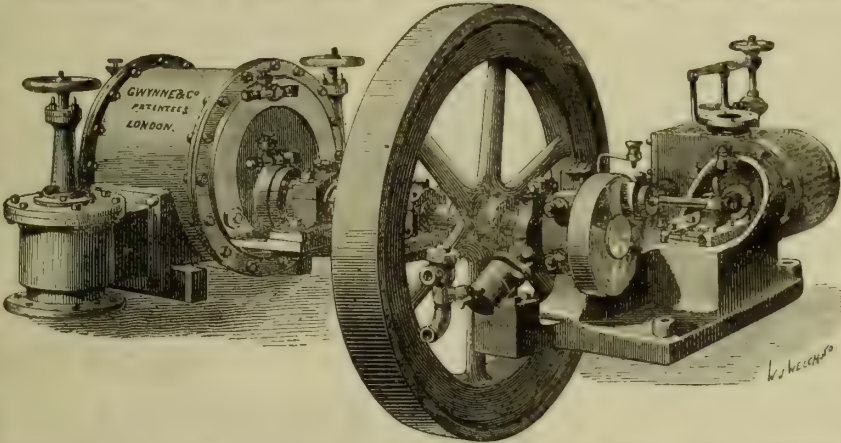
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill				Station	closed	for	repairs				
	Camden Town	17.0	16.5	16.9	18.3	12.8	15.8	0.0	0.0	0.0	None.	In excess.
	Dalston	17.2	16.4	16.8	14.7	11.0	13.1	0.2	0.0	0.0	"	"
	Bow	17.6	16.6	16.9	14.8	12.4	13.7	0.8	0.2	0.4	"	"
	Chelsea	16.9	16.7	16.8	16.3	13.8	14.5	1.4	0.0	0.4	"	"
	Kingsland Road	17.2	16.3	16.5	15.4	10.9	14.0	0.3	0.0	0.1	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas). . .	21.1	20.8	21.0	22.7	17.3	19.8	0.2	0.0	0.0	"	"
	Peckham	17.1	16.3	16.6	10.7	8.3	9.8	0.2	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.5	16.8	17.2	15.3	12.0	13.7	0.2	0.1	0.1	"	"
	St. George-in-the-East . . .	17.5	16.9	17.2	11.2	7.0	8.9	0.2	0.0	0.1	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

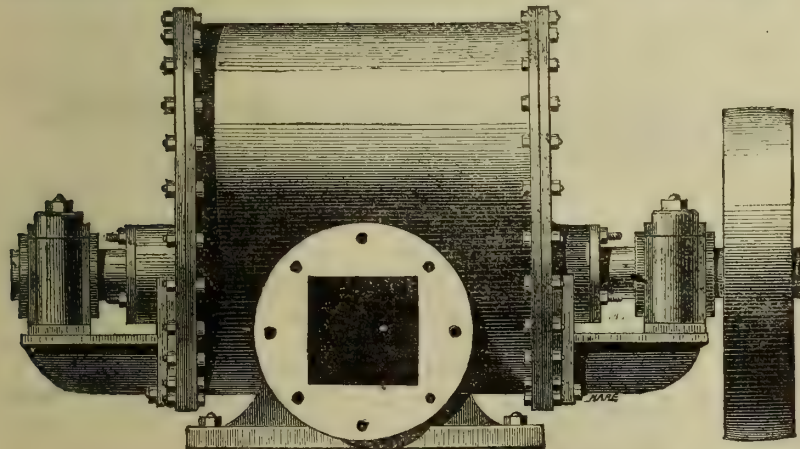


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Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.
The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

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GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.
Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.
PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**
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WROUGHT-IRON SPINDLES AND
ENGINES COMBINED.
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MAKERS OF
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BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
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WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas," on Burners, &c.
Copies, by post, Threepence, direct from the Author, **MAGNUS OHRÉN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, Situation in Gas Company's
Office by a young man. Good character. Moderate salary to commence.
Address No. 710, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUTH (aged 18) wishes to Learn Gas,
Mechanical, or Civil Engineering.
State terms, which must be moderate to X284, *Mercury* Office, LEEDS.

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THE Galway Gaslight Company, Limited,
require the Services of an Efficient and Experienced **GAS MANAGER**, at a salary of £120 per annum, with house, fuel, and light.
Applications, with testimonials of character and competency, addressed to the Chairman of the Galway Gaslight Company, Limited, Galway, will be considered on Tuesday, the 18th inst., at the hour of One o'clock p.m.
By order,
M. J. TIERNEY, Secretary.
Board Room, Galway, Jan. 3, 1881.

DEVONPORT WATER-WORKS.
WANTED, a General Foreman and
CHIEF INSPECTOR. He must be experienced in Main-laying, Plumbing, and Work generally connected with Water-Works. He will be responsible for Stores, and will be required to act under the direction of the Manager. General good character indispensable. Wages £2 5s. per week, with residence, including gas and taxes.
Applicants to state age and present occupation, and to forward copies of testimonials to the undersigned.
H. FRANCIS, Manager.

BOROUGH OF COLCHESTER.
THE Office of Analyst for this Borough,
under the Sale of Food and Drugs Act, 1875, is **VACANT**, and the Council are willing to receive **APPLICATIONS** for the **APPOINTMENT**, which must be sent in on or before the 29th of January inst., addressed to me as below.

The duties are those specified in that Act as those to be performed by Analysts to be thereunder appointed; and the pay will be £1 ls. for each analysis up to 100, and 10s. 6d. each beyond that number in each year, and reasonable travelling and other out-of-pocket expenses in addition.
The qualifications of each candidate will be subject to the approval of the Local Government Board. The appointment will be made according to the Act, and will require confirmation by that Board to give it final validity.
FRED. B. PHILBRICK, Town Clerk.
Town Clerk's Office, Town Hall, Colchester,
Jan. 7, 1881.

WANTED to know the Best and most
Economical way of Making Gas to Supply 100 Lights for Private Consumption.
Address J. WINTERBOTTOM, Ram's Head, Disley, near STOCKPORT.

THE Gravesend and Milton Gas Com-
pany have **FOR SALE**, Four 12 ft. square **PURIFIERS**, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's **VALVES**, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. **GOVERNOR**, by Sugg, of Westminster.
For further particulars apply to the undersigned.
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AMMONIACAL LIQUOR AND SURPLUS TAR
FOR SALE.
THE Penrith Local Board of Health
invite **TENDERS** for the **AMMONIACAL LIQUOR** and **Surplus TAR** produced at their Gas-Works for One or Three years from March 1, 1881.

Tenders, stating price per 100 gallons at the Works, to be sent to me on or before the 7th of February next.
The Local Board do not bind themselves to accept the highest or any tender.

WILLIAM E. ATKINSON,
Clerk to the said Local Board.
Public Offices, Penrith, Jan. 5, 1881.

TAR FOR SALE.
THE Directors of the Newmarket Gas-
light and Coke Company, Limited, are prepared to receive **TENDERS** for the Purchase of the **Surplus TAR** made at their Works for Two or Three years from Feb. 1, 1881. The quantity is estimated at 25,000 gallons per annum.

Tenders, stating price per gallon delivered on rails at Newmarket Station, to be sent, on or before Saturday, Jan. 29, 1881, to the undersigned, from whom any further information may be obtained.

The Directors do not bind themselves to accept the highest or any tender.
THOMAS WILKINSON, Manager.

AMMONIACAL LIQUOR.
THE Directors of the Bristol United Gas-
light Company invite **TENDERS** for the Purchase of the **AMMONIACAL LIQUOR** made at all or either of their three stations, situate respectively at Avon Street, Canons' Marsh, and Stapleton Road, in the Borough of Bristol, for a term of Five or Seven years, commencing July 1, 1882.

The annual quantity of Liquor produced at present at the three stations is about 2½ million gallons.
Conditions of contract and other particulars may be obtained of the Secretary, at the Office of the Company, Canons' Marsh, Bristol.

Tenders to be delivered on or before Tuesday, May 3 next, addressed to the Chairman of the Company, and marked "Tender for Ammoniacal Liquor."
The Directors do not bind themselves to accept the highest or any tender.

HENRY H. TOWNSEND, Secretary.
Gas Offices, Canons' Marsh, Bristol, Jan. 8, 1881.

THE Gloucester Gas Company have the

undermentioned **APPARATUS** for Sale :—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Exhaustor (Jones) to pass about 15,000 feet per hour.
Exhaustor (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shuffling used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned
R. MORLAND, Engineer.

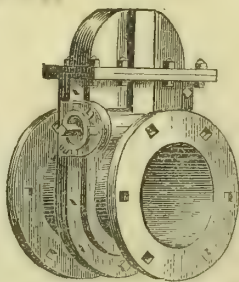
GLASGOW CORPORATION GAS.
THE Committee of the Town Council on
Gas Supply invite **TENDERS** for the Providing and Erecting, in Dalmarock Works of Two **STATION-METERS**, each capable of passing 120,000 cubic feet of gas per hour.
Plans and specification can be seen and further information obtained at the Gas Office, 42, Virginia Street.
Sealed offers, marked "Tender for Station-Meters," addressed to the Glasgow Corporation Gas Commissioners, to be lodged at 42, Virginia Street, Glasgow, on or before Tuesday, Jan. 25, 1881.
Town Clerk's Office, Glasgow, Dec. 24, 1880.

VALUABLE SHARES IN ESTABLISHED UNDERTAKINGS.
MESSRS. EDWIN FOX & BOUSFIELD
will **SELL**, at the Mart, on Wednesday, Jan. 19, at Two, the following **VALUABLE SHARES**:—
ORIENT STEAM NAVIGATION COMPANY, LIMITED—450 £10 Shares (£8 paid). Dividend last year 5 per cent.
WANDSWORTH AND PUTNEY GAS COMPANY.—81 original £10 Shares, paid up, paying 10 per cent.; 69 £10 Shares, paid up, paying 7½ per cent.
THE NITRO-PHOSPHATE & ODAMS' CHEMICAL MANURE COMPANY, LIMITED.—30 £10 Shares. Dividend last year 7 per cent.
WITLEY COLLIERIES TILE, BRICK, AND MARL COMPANY, LIMITED.—Seven £20 Debenture Bonds. Interest 12 per cent.
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GENERAL SHARE TRUST COMPANY, LIMITED.—Ten £10 Shares, paid up. Dividend 5 per cent.
Particulars may be obtained at the Mart; and of MESSRS. EDWIN FOX & BOUSFIELD, 99, Gresham Street, BANK, E.C.

NEWPORT (MON.) GAS COMPANY.
THE Directors of the above Company
herby invite **TENDERS** for the Supply of all the Cast-Iron **MAIN-PIPES** and other **CASTINGS** necessary in Laying Mains, required by them during a period of Two years, commencing from Feb. 1, 1881.
Specifications and forms of tender may be obtained from the undersigned.
Tenders, endorsed "Tender for Pipes," to be sent to the Chairman, Gas Company, Newport (Mon.), on or before Wednesday, Jan. 19, 1881.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
THOMAS CANNING, Engineer.
Gas-Works, Newport (Mon.), Jan. 7, 1881.

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WITH WROUGHT-IRON PINIONS.

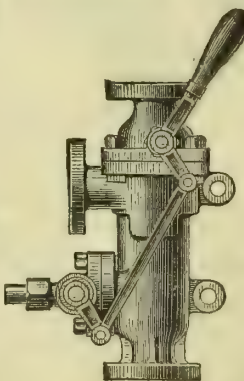


These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

Also Sole Makers of
J. BEALE'S NEW PATENT GAS EXHAUSTERS,
and Makers of
STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL
IN HYDRAULIC MAINS,
BYE-PASS VALVES, SCREW WATER-VALVES, &c.

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UNIVERSAL INJECTOR,**
ENTIRELY SELF-REGULATING.

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FEEDS WITH HOT OR COLD WATER.
WORKS WITH HIGH OR LOW STEAM PRESSURE.

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GEO. BOULTON & SON,
WHOLESALE GLOVE MANUFACTURERS,

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Will be pleased to send Sample Patterns and Prices to the Managers and Engineers of Gas Companies, similar to those which have been supplied by them to most of the London Gas Companies for Twenty-five years past.

ARGYLL IRONMONGERY COMPANY,
261, ARCYLL STREET, GLASGOW,
GAS COOKING & HEATING APPARATUS MANUFACTURERS.

MATTHEW WADDELL, in thanking his Friends and the Public generally for their kind support during the last five years, begs to intimate that he has assumed, as Managing Partner, Mr. ROBERT B. MAIN, for many years representative of Messrs. B. Laidlaw and Son, Gas Engineers, Glasgow, Edinburgh, and London. On and after Jan. 1, 1881, the business will be carried on under the Designation of

WADDELL & MAIN,
Sole Agents for **HISLOP'S METALLIC GAS FIRE.**
[See JOURNAL OF GAS LIGHTING, Dec. 29, 1880.]

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NOTICE TO SUBSCRIBERS,

AS TO PAYMENT OF SUBSCRIPTIONS IN ADVANCE.

SUBSCRIPTIONS at the advance rate (21s. per annum) are now due, and must be paid during the present month to entitle Subscribers to the advantage over the credit price of 25s. a year.

Post-Office Orders should be made payable at the Chief Office, St. Martin's-le-Grand; Cheques crossed "Union Bank of London"—both drawn to the order of WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to the PUBLISHER, as above.

TO CORRESPONDENTS.

M. P. B.—Next week we may be able to do something with the report you send.

C. H.—After perusal of your communication we are still of opinion that the majority of our remarks were justified. From the report of the proceedings at the meeting, whence our information was drawn, wherein mention was made of the contractor's sureties being men of straw, &c., we gathered that he had failed to carry out his engagements, or such language would have been unnecessary. We are, however, glad to alter our opinion in this particular, and also as to his being a local man. The remainder of our comments must stand.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 18, 1881.

NON-STATUTORY GAS COMPANIES AND PUBLIC ROADS.

ALTHOUGH the question has often been raised, in the Courts of Law and elsewhere, as to what is the position of a non-statutory Gas Company in regard to the opening of the public roads for business purposes, yet there remains considerable uncertainty as to some of the points involved. There have recently been put to us, by correspondents, two cases

which we will quote as illustrations. The first example is briefly as follows:—A Company was formed for the purpose of lighting a village with gas. Owing to a mistaken estimate of the probable consumption, the works were designed on too large a scale, the natural result being that a high price for gas has not yet enabled the Company to pay a five per cent. dividend on its excessive capital. But the small dividend received by the Shareholders of the Company does not reconcile the consumers to the high price they are still required to pay for their gas, and, local circumstances assisting, an ingenious expedient has been devised for obtaining a cheaper supply. In or near the village is a mill, the owner of which has, throughout the term—some ten years—that the village Company have been carrying on their unprofitable operations, manufactured gas for his own use. The works of this manufacturer have apparently either a considerable excess of power or they are capable of extension. The astute villagers put their heads together, and propose also to subscribe their money, with the intention of forming a second Company, which will be free from the vice or failing of the first. They intend only to raise sufficient capital to lay mains and services, and then retail to themselves, and others who may desire it, gas which they have purchased in bulk from the millowner. If this scheme is carried out, and the millowner is willing to sell his gas at a small profit, it is clear that a formidable competitor to the existing Gas Company will be created, and that, with a diminished rental, the small dividend of the original Company may vanish entirely, and be replaced by a balance upon the wrong side of their accounts. The legal status of this Company is similar to that of a very large proportion of the smaller undertakings of the kind in England. They have no parliamentary right to carry on their operations, and have been able to lay mains only by sufferance of the road authorities. Having, however, expended their money and occupied the ground, they naturally feel aggrieved at the proposed invasion, and desire to prevent it if possible. Their "possession" gives them, we fear, but slight advantage. The proposed Company will have just as much or as little right to open the roads as they have, and neither would have any ground upon which to ask an injunction to restrain the other; while both would be equally liable to be prosecuted by the highway authorities, or any user of the road, for obstruction of the same.

The second case is that of a Company enjoying parliamentary rights. Their statutory limits include part of an adjoining local board district, in which, after a while, another Company is established for its special supply. So long as the new and non-statutory Company confine themselves to those portions of the district not defined in the Act of the older Company, no difficulty is experienced. The Local Board in question, however, grant permission to the new Company to open the roads and lay mains and services over the whole of their area, thus encouraging an invasion by the new Company of the statutory district of the original undertaking. Not only have they done this, but they have contracted or proposed to contract with the interloper for the supply of gas to the public lamps.

Now these two cases are typical. They illustrate the condition of two Companies, one protected and its district defined by an Act of Parliament, the other without any such defence; both equally exposed to rivalry and competition from opponents who do not seek any special power beyond the favour of the respective Local Authorities.

It is worth while to inquire what advantage will accrue to the statutory Company by virtue of their Act, under circumstances of so serious a character; for if they do not stand at an advantage, then it would be difficult to justify the incurring of expense, to say nothing of submitting to restrictions and regulations, in order to obtain an Act of Parliament.

The statutory Company enjoy at least this advantage, that in carrying on their operations—and we have in view especially the opening of roads, &c.—they are free from the possibility of vexatious interference by the Local Authorities. Their opponent, on the contrary, is not only open to indictment by any person who is inconvenienced by the opening of a trench, but may be prosecuted by the road authorities, and have to pay heavy penalties every time an attempt is made to do such necessary work without their special sanction; indeed, it may be broadly stated that the existence of such a Company is only possible where, and for the time that it retains the favour of the Local Authority within whose district it seeks to do business, and as such bodies are said occasionally to act in a capricious manner its position cannot but be precarious.

The advantage to the statutory Company has so far been shown to be of a negative character. There is, however,

another and very important one, which is of special application to such a case as that illustrated by our second example. The powers by virtue of which the authorities of most small towns and villages undertake the lighting of the public lamps in their several districts are those contained in the Public Health Act of 1875, and not by special Act of Parliament. Now this Act, while giving the urban authority (which may be a corporation, local board, or body of improvement commissioners) the right to contract for this purpose, further empowers them in certain circumstances to provide and supply gas themselves. But the conditions under which this may be done are expressly stated to be "where there is not any company or person (other than the urban authority) authorized by or in pursuance of any Act of Parliament, or any Order confirmed by Parliament, to supply gas for public and private purposes, supplying gas within any part of the district of such authority." We think it is clear, therefore, that if the Local Authority may not supply gas to themselves or others in presence of a duly authorized Company, neither may they contract with any one else for this purpose. If they feel that there is just cause of complaint as to the character of the service they are receiving, or the price they are being charged, they must, in the words of the learned Judge upon the Longton case, "take the usual, regular, and constitutional course of getting the protection of the Legislature" for the necessary competitive works.

This being so, one of the most effective weapons of offensive warfare against Gas Companies is taken away. In the two well-known cases of competitive Companies, at Longton and Cambridge, there was no question as to the licence granted by the Local Board and Corporation respectively to lay down mains and services for the supply of gas to public lamps, because these bodies, being possessed of power to break open the streets, &c., for the purpose, were also at liberty to transfer their powers to their agents. It was only when, in the one case, the footways were opened for the purpose of affording a supply to private consumers, and in the other where the licence of the Corporation was withdrawn from the intruding Company, that the Courts of Law were able to declare them to be in the wrong. Clearly, however, if urban authorities, without especial powers, may only contract for the public lighting with a statutory Company where such a one exists, then it will be an easy matter to sustain actions for obstruction and nuisance against those who cannot obtain the legal permission to open roads either for mains or services.

We are not aware that this point has ever been raised, and we may be wrong in our reading of the Public Health Act. We commend the suggestion, however, to those who may be exposed to the difficulties which it is calculated to meet. There can be no doubt as to the wisdom of Companies who are at all able to afford the expense, securing the protection of an Act of Parliament or Provisional Order. The usually small cost of the latter renders inexcusable continued neglect in this respect by many Companies. Whether the possession of legislative protection will greatly help a Company in the position of that first cited may be open to some question. If the proposed distributing Company were in operation, and supplying gas at a lower price than that of the Company now in possession of the field before the latter obtains an Act of Incorporation, we much doubt whether any Court would interfere to prevent its extending its business. The nuisance created in so doing would be very slight, and the Local Authority could not well assist in crippling those who would have the support of the consumers. While an Act of Parliament is, as we have said, a great aid to the operations of a Gas Company, it by no means confers a monopoly. If it can be shown that the privilege has been used to cover careless or inferior management, whereby the consumers are weighted with an excessive charge for the article supplied, then it will be difficult to resist the claim of the latter to be allowed to supply themselves at a cheaper rate.

GAS COMPANIES AND THEIR CRITICS.

Gas Companies are perhaps the best-abused trading organizations of the age. The fact is not to be denied, however much it may be deplored. Railway Companies are considered to share the position with them, but on closer examination it will be made manifest that the ingratitude of the travelling public towards the ruling powers of the various railroads, great and small, which embrace the land with a network of iron, is faint and intermittent when compared with the virulent distrust and misrepresentation with which a number of people speak and write of the actions and principles of Gas Companies. It is as if the mere fact of having invested a considerable amount of capital in works for the supply of

gas to a town is sufficient reason why an otherwise estimable body of gentlemen are to be considered as having constituted themselves a band of Ishmaelites, "whose hand is against every man, and every man's hand against them." It only needs the additional crime of having the lighting of a district committed to them by special permission of the Legislature—an arrangement which generally confers more obligations than benefits upon those who are compelled to resort to it—to place the miserable culprits, who are "monopolists" also, entirely beyond the pale of human sympathy. By word of mouth and in the columns of the daily newspapers these hardened offenders are continually being scarified, their possession of common business qualities denied, and their proceedings persistently misinterpreted.

It is generally observed that the confidence with which a man speaks of any subject is in inverse ratio with his knowledge of it. In the matter of gas this is particularly noticeable. The more bitter are a man's reflections on the conduct of the Gas Companies, the more hopelessly is he in the dark as to what he is talking about. This is the general rule; it is also true that there is no more fearful reformer of gas affairs than a man who just knows the difference between coal and cannel, or is aware that coal is put into the retort, and, after passing through a few processes, goes into the gasholder. This man is, perhaps, tolerably well educated in other respects, and if endowed with the necessary amount of confidence and "public spirit," is a prominent figure in cheap gas agitations, and a regular contributor to the correspondence columns of the newspapers. It is a painful thing to be compelled to charge educated men with wilful ignorance, yet not only local prints, but even leading scientific publications repeatedly give space in their columns to statements on questions of gas polity which, if paralleled in matters political or social, would utterly condemn the intelligence of those who made them, and of the editors who permitted them to appear in print. Year after year the same old complaints are made, the identical criticisms expressed, and hackneyed abuse is levelled at Gas Companies; and still there is found room for it in organs of public opinion, the editors of which might have been expected to possess a knowledge of contemporary facts, but do not, neither will they confess their ignorance. It is true that this style of criticism does not prevent the business of the Gas Companies from growing year by year; but it is nevertheless a grievance of which the Companies have a right to complain, not only in their own interests, but in the interests also of their customers, that the attempts of Acts of Parliament, public authorities, and their own officials to educate the masses in the principles upon which the gas supply of our towns is now carried on, should be so fruitless as the recurrent blazonment of blundering fault-finding seems to show.

For an example of what we mean, we may refer to a recent number of *Nature*, wherein Mr. Mattieu Williams goes out of his way to have a fling at the London Gas Companies. In a letter on a notable discovery in the art of carbonizing coal, advocated by Mr. Scott-Moncrieff, which consists in drawing the charge when it is half burnt off, Mr. Williams says that the Companies "are suffering from commercial congestion due to a plethora of prosperity; and, receiving no stimulation from wholesome competition, they display very low commercial vitality. The public welfare is no business of theirs." Now, what is intended to be understood by this statement? In the first place, how is it that the Companies are prosperous, if not by the exercise of the business virtues of foresight, frugality, and patience—qualities which will ensure success to any undertaking, so long as it supplies an acknowledged want, and which are not by any means characteristic of Gas Companies alone. Still less, if they possess them, should the Companies be denied their fruit, which is that prosperity for which they are flouted by Mr. Williams. Then, what are we to think of his reference to competition? If Mr. Williams believes in the benefits of gas competition, then we have a right to say that he reads history with a most unfortunate bias, or he betrays a lamentable carelessness in getting up his facts before committing himself to an opinion. But, in any case, the fact that a correspondent of a modern scientific journal should, in reference to a matter which is under parliamentary control, be allowed to make mistakes as glaring as would be the assumption by a writer on medicine that surgeons are in the habit of treating their patients by blood-letting, after the fashion of a century ago, is a sufficient instance of the heedlessness in gas matters, not only of the populace, but of those who should be better informed. How many of those who may peruse Mr. Williams's remarks, and agree with him in his estimate of the London Gas Companies, have the faintest idea of the legislative restrictions under which the Companies carry on their opera-

tions, or of the manner in which these obligations are fulfilled? Who that thoughtlessly stigmatizes the gas supply as a "great monopoly," and regrets the lack of competition, has any knowledge of the nature and operation of the sliding scale as it actually applies to the Metropolitan Gas Companies? For any one to allege that the Companies are above or beyond the operation of the ordinary laws of business is absurd, and to maintain that in nothing that they do are the interests of the public considered is equally mistaken; while to profess an admiration for competition in gas supply, in the commonly accepted meaning of the term, is an instance of utter blindness to the conditions of the case, and of complete ignorance or disregard of the experience of the past.

It is not our intention to defend everything done by Gas Companies, or every principle which appears to guide their actions. In many things they may fairly be considered to fall short of their proper duty, frequently to their own detriment; and it may even be conceded that with them, as with other old and complicated organizations, fundamental reforms will be perhaps most hopefully effected by influences originating from without; but for any innovation to have a fair chance of success it must be based on fact and reason. It is also true that the alleged indifference of the Companies to the pressure of public opinion will be unlikely to melt away while those who set themselves up as prophets of a new dispensation are destitute of the commonest ideas respecting the economics of gas supply, and while the hatred of the Companies, which in them supplies the place of knowledge, is generally held to be sufficient reason for their crude utterances being favoured with publication in journals wherein similar absurdities in reference to any other matters would never be tolerated.

THE STRETFORD GAS COMPANY AND THEIR CONSUMERS.

WE have on several occasions referred to the dispute between the Stretford Gas Company and their consumers, with reference to the surplus profits divided among the Shareholders, in respect of which the Company have been prosecuted before the Magistrates, and convicted of a breach of the Gas-Works Clauses Act, 1847. The hard-working Vigilance Committee of the gas consumers, having been successful beyond their hopes in this matter, have been further gratified by the willingness of the Company to make restitution of the amount said to have been unlawfully divided among the Shareholders. It must be remembered that the Company have not been compelled to take this step by any judgment of the Law Courts; it has been agreed to simply to stop further agitation and ill-feeling between the Company and their customers. Unfortunately, the Vigilance Committee and their Secretary seem to have lost their heads in consequence of their good fortune, and the complaisance of the Company only makes them insolent. The evidence of Mr. T. Newbigging, given on behalf of the Company at the late trial before the Justices, to the effect that the quality of the gas supplied was much in excess of the legal limits, appears to have surprised some of the malcontents; thus affording confirmation of the frequently stated fact, that the ordinary public have no notion respecting the illuminating power of the gas they burn, and will grumble at 20-candle as readily as at 15-candle gas. Two of the moving spirits of the agitation have recently tested the Company's gas at a point some distance away from the works, and did not find it equal to the maximum stated by Mr. Newbigging. Whereupon the energetic Secretary to the Committee takes upon himself to announce that no settlement will be made with the Directors unless the old standard of illuminating power is kept up; that is to say, the Company, who are under parliamentary obligations to supply 14-candle gas, are to be compelled by an irresponsible *coterie* to give them gas of 22-candle power, simply because it had been a custom with the Company to do so before the late disturbance! In this pretension the aforesaid Secretary shows the cloven foot, and indicates that the Company will never succeed in satisfying him and his friends, no matter what reasonable concessions may be made. It would be nothing more than a fair reprisal if the Company were to rescind their resolution to refund the money they have divided, and compel the Committee to go to law for it. But if they are too good-natured for this, it is not to be expected that, with the interests of their Shareholders to look after, the Directors will continue to give gas of unnecessarily high quality, unless they can afford to do so after providing for all legal capital charges. The consumers and their Committee have appealed to Cæsar, and to Cæsar they must go. If they availed themselves of the full power of Parliament as against the Company, the latter have an undoubted right to take every advantage of their own special Act, in spite of the preten-

sion of the Secretary of the Committee to dictate the terms of any possible settlement of the outstanding dispute. The Committee have managed to get the provisions of one Act of Parliament enforced; they should pause before attempting to override the regulations contained in another.

DISSENSION ON GAS AFFAIRS AT GOOLE.

It was too much to expect that the remarkable three-sided organization for the gas supply of Goole, which it was proposed to submit for the sanction of Parliament this session, would always work smoothly, or stand as firmly as a three-legged stool. But it is rather early for a general fall-out such as appears to have already happened, in consequence, of course, of the action of the Local Board element. The cause of the rupture and the consequent imperilment of the whole venture was a demand, on the part of the Local Board, that the Aire and Calder Navigation Company, who are the vendors of the gas undertaking, should enter into an agreement never to adopt any other means of lighting than that to be supplied by the new Company. The Navigation Company naturally declined to bind themselves or their successors in any such manner, and pointed out that as they should retain a third part of the capital of the proposed Company, and were even prepared to take a moiety thereof if necessary, this circumstance was a sufficient guarantee of their interest in the concern. This argument did not satisfy the Local Board, and therefore the negotiations between them and the Navigation Company were broken off. Meanwhile the latter took the necessary steps to apply for a Bill embodying their own views on the subject of the gas and water supply of the district, consequently taking the power of settlement into their own hands. Certain advantages with respect to drainage and other matters, which are now lost, would have accrued to the Board if they could have come to terms with the Navigation Company. Consequently, it is only after the manner of Local Boards for this particular body, having muddled away their chances, to abuse the Company for being hard upon the town. At the last meeting of the Board, the virulence with which some of the members attacked the Company for knowing their own interests and attending to them, was only equalled by the heartiness with which they abused each other for letting the opportunity of benefiting the town slip from such a cause. This pattern Local Authority will now content themselves with examining the deposited Bill, and will try to decide whether or not it shall be opposed, with the pleasant consciousness of having exhibited themselves to their constituents in painful contrast to the businesslike Navigation Company.

CASH DISCOUNTS OR REDUCTIONS IN THE PRICE OF GAS.

THE question of the relative advantages of a reduction in the price of gas, and of a commensurate discount for early payment, was very well argued out at Blackburn, on the occasion of a recent Town Council meeting. The Gas Committee advocated the grant of a discount of five per cent. on all quarterly accounts paid before the 7th day of the second month of each quarter, commencing with the accounts due in April next. When this proposal came before the Council for confirmation, an amendment was brought forward, and eventually carried, to refer the matter back to the Committee for reconsideration, with a view to a reduction in price—of threepence per thousand cubic feet, or about six per cent.—being allowed to the consumers all round. Alderman Duckworth, although Chairman of the Gas Committee, was the leader in this successful attempt to reverse the policy of the Committee, and it is only fair to say that he and his following had decidedly the best of the argument. Speaking generally, a definite reduction in price is a more tangible fact, from the consumers' point of view, than a discount of equal value for prompt payment. There is much to be said for a discount for cash, in respect of the advantages it generally confers of lessened labour for collecting, and other benefits of which business men do not need to be reminded; but it is not difficult to prove that a positive cheapening of gas is more widespread in effect than any discount on payments for it can possibly be. This does not refer to discounts based on the gross amount of a gas account, which are supposed to indicate the value to a gas undertaking of large as compared with small accounts. These form an entirely different class of discounts, the policy of which is debateable on other grounds. It must not be overlooked that the real basis upon which the system of cash discounts rests is the assumption that the allowance made for early payments is equal to the interest on the money for the time which would, in the ordinary way, elapse before the bill would have to be paid, added to an allowance for risk while the amount is outstanding. The power of controlling the time of payment is,

perhaps, more in the hands of the undertakers of gas supply than of any other traders who are compelled to give a certain amount of credit, and it is therefore improper to allege that they have any special reason for allowing more than the habitual two and a half per cent. discount for cash while it is hard to say why even this should be given. If, on the other hand, regard is to be had to the increased business which is the chief result of reductions in the price of gas, and which alone makes continual cheapening possible, it becomes very clear that an absolutely lower figure is likely to be far more potent with the general public than a boon which all can neither participate in nor appreciate.

THE PUBLIC LIGHTING OF BURY ST. EDMUND'S.

THERE is some unhappiness among a section of the Town Council of Bury St. Edmund's respecting the price charged by the Gas Company for gas supplied to the public lamps. It appears that under the Company's Act of 1879, which came into operation last year, the price of gas to private consumers has been reduced from 4s. 7d. to 4s. 2d. per thousand cubic feet, while the price of the gas supplied for public lighting has remained at 2s. 3d. per thousand feet since 1877. A late Chairman of the Company, now an active member of the Council, conceived the idea that a reduction ought to be made in the price charged to the Sanitary Authority, apparently upon the principle that the Company were bound to supply gas for the public use at cost price, which, in his opinion, was materially less than that actually charged. The Secretary to the Company, Mr. W. Salmon, is also the Town Clerk, and seems to have some little difficulty in performing the double duty with an unruffled brow. At all events, he could not remain silent when the recreant ex-Chairman, at a meeting of the Council on New Year's morning, proceeded to evince his determination to make use of certain information which had been supplied to him by the Company, in the endeavour to make them grant a substantial reduction in the price of gas for the public lamps. The worthy Secretary and Town Clerk contended that the Company had always lost money by the street lighting contract at the price named, and that consequently they could not be expected to reduce it any further. Speaking without any more complete knowledge of the facts than is supplied by the newspaper report, it might be considered that a difference of nearly one-half between the prices charged to the ordinary consumers and to the Public Authority would seem to indicate that the latter ought not to complain; but there is no satisfying some people. After much excited debate on the occasion in question, and at the following weekly meeting, it has been decided by the Council to have the whole question reported on by an influential Committee next month, when it will be determined what further action, if any, shall be taken to bring the Gas Company to book.

We have been asked to correct a slight inaccuracy, in the "Retrospect of 1880," published in the JOURNAL of the 4th inst. It was there stated that Mr. Mitchell, of Dawsholm, Glasgow, had been appointed "Chief Engineer to the Edinburgh and Leith Gas Company." Mr. Mitchell's position is that of Engineer and Superintendent of the Edinburgh Gas-light Company; Mr. Frederick T. Linton still occupying his office of *Engineer and Manager of the Edinburgh and Leith Gas Company*.

We understand that at a meeting of the Directors of the Bury St. Edmund's Gas Company last Friday it was unanimously agreed that Mr. Alexander Mitchell should be appointed Manager of their works, in the room of Mr. John McCrae, who leaves for Dundee. Mr. Mitchell has been six years assistant to the late Mr. B. M. McCrae at the Dundee Gas-Works.

THE City and Guilds of London Institute for the Advancement of Technical Education have arranged their Spring courses of lectures and laboratory instruction, commencing next Monday. Professor Armstrong, Ph.D., F.R.S., will treat of "Coal Gas, and its Uses as an Illuminating and Heating Agent," on Fridays in the daytime; and of "Coal Tar Products" on Monday evenings.

DEATH OF MR. JOSEPH CLARK.—We regret to announce the death, on Sunday last, at Clapton, of Mr. Joseph Clark, for very many years one of the Engineers to the late Imperial Gas Company, and who was Joint Engineer with Mr. Kirkham of the large gas-works at Bromley. Mr. Clark was in his 72nd year, and his loss will be much regretted by his many old friends.

INFORMATION FOR GAS CONSUMERS.—We have received a copy of a very neatly printed 12 pp. pamphlet, by Mr. Henry Wimbhurst, of Sleaford, intended for free distribution among the gas consumers of the town. It contains information—of course, not new so far as our readers are concerned; but such as will prove useful to the public generally, and should lead to a largely extended gas consumption, as has undoubtedly been the case in other places where similar means have been adopted to popularize the use of gas for lighting, heating, and cooking purposes. It should be stated that Mr. Wimbhurst recently advised his Board of Directors to let out on hire all kinds of gas-fittings, stoves, &c., at a nominal rent, and the suggestion was acceded to as from the 1st inst. It is hoped the use of gas will thus be so far extended as to render possible an early reduction in the price charged for gas (17-candle), which now is sold at 4s. 7d. per 1000 feet, with discounts of 5 to 10 per cent.

Water and Sanitary Affairs.

THE Metropolitan Board having received notice from the Kent Water-Works Company that a constant supply of water is now given in a further portion of their district, have required the Company to provide 86 hydrants at specified points. This is now the practice of the Board, but we seem to remember a time when notices of the constant service received only a formal response, and when the order for hydrants was little better than nominal. We trust a wiser view of their relation to the Water Companies is now beginning to prevail at the Board. Had such been the case at an earlier date, the Board might have been saved many troubles, and the public would have been better served. In respect to fires, we think we already see within the City boundaries that they are more readily suppressed than formerly—a result which may be partly attributed to the constant service and the presence of hydrants. In this matter the Corporation have set a good example to the Metropolitan Board, though it is fair to allow that every Company does not give so good a pressure as the New River.

Under the Public Health Act of 1875, a Local Authority may require houses to be supplied with water in certain cases. In accordance with this statute, the Board of Guardians of the Horsham Union, being the Rural Sanitary Authority of the district, took proceedings a few days ago against a Mr. Thomas Chester, of Ifield Park, for failing to give a proper supply of water to a lodge which he had built on his estate. The lodge was erected last year, and was occupied, but was without any water supply whatever. The defendant had received ample notice, but had made no attempt to comply with the Act of Parliament. Being summoned before the Horsham Bench, he contended that a "lodge" was something different from a "residence," and that there was, moreover, a supply of water within a "reasonable distance." As a matter of fact it appeared that the water was laid on to a point nearly 180 yards from the lodge. The defendant fought his case very resolutely before the Magistrates, and on being convicted in a penalty of five shillings and costs, immediately announced his intention to appeal. The final settlement of this case will possess some interest, as showing what is the responsibility of landlords with reference to the supply of water to house property. In this instance the defendant has received more than one notice, and when the Magistrates gave their decision it was intimated that the Sanitary Authority would not make another application for a month, so as to give the defendant ample opportunity to comply with the law. Water at such a distance that to go and fetch it involves a journey, going and returning, of nearly a quarter of a mile, would seem to be too remote to constitute a "supply" to the building in question. It is to be regretted that a gentleman occupying the position which evidently belongs to the defendant in this case, should object to comply with a law so highly salutary in its character. There also appears to have been nothing in the conduct of the authorities which could properly excite a feeling of antagonism. Perhaps on reflection Mr. Chester will forego his appeal, and will convert his "lodge" into a healthful "residence." The newly-erected structure may then serve to adorn Ifield Park, instead of being in the eye of the law a "nuisance."

A member of the medical profession, who happens to be a Town Councillor of Monmouth, lately complained of the quality of the water supplied to that borough, and proposed that the Water Company should be prosecuted. Some complaint was also made in the Hereford Town Council, but in a less vehement strain. It appears that the sole ground for the dissatisfaction expressed consisted in the muddy state of the water, arising from the flooded condition of the Wye—a river peculiarly liable to floods after heavy rain or snow. There is no proof that the water was at all deserving the epithet of being "abominable," or that it was "injurious to health." Analysis has shown that the water is of excellent quality, but if the people of Monmouth wish to have it at all times perfectly clear, an expense must be incurred which could not possibly be borne. The daily supply to Monmouth is at the rate of thirty gallons per head, and the only practicable method of counteracting the floods appears to consist in the private filtration of that portion of the supply which is devoted to drinking purposes. In Hereford the state of the case is the same, and both Companies offer the same defence—viz., that they are only supposed to supply water in as good a condition as circumstances will permit.

The Registrar-General calculates on an addition of 453,000 to the population of London between the Census of 1871 and next Midsummer. An estimate is also given of the probable in-

crease in the population of the large towns. It is a subject for consideration that all this growth in the population—which the figures show to be enormous—has an intimate bearing on questions affecting the public health, including such matters as the drainage of towns and the provision of the water supply. A demand was made in the House of Lords a few years ago by Lord Camperdown, that the London Water Companies should be restricted from further outlay for the extension of works. If the Legislature could stop the growth of the population, the extension of the water supply might be avoided. But amidst all that has been said against the supply which is given to the Metropolis, no alarmist has ventured to assert that London is likely to experience at any time the horrors of a drought. In all our large towns, growing as they are in size, it is pre-eminently important to guard against the effects of a dry season. After passing through a wet cycle, we have reason to expect the approach of a dry one, which will severely test those works which are at all limited in their character. A fund of valuable information as to the natural sources of the water supply throughout England and Wales is about to be given in a comprehensive and elaborate work by Mr. C. E. De Rance, of the Geological Survey. The subject, we understand, will be treated in a most complete manner, and the book will be of such a character that we may designate it as a work of national importance.

The success which has attended the working of the Edinburgh Sanitary Protection Association, has led to the establishment of a similar society for London. It is an association without share capital or profits, and offers to its members, in return for a moderate annual subscription, the benefit of competent professional advice and supervision to ensure the proper sanitary condition of their own dwellings. Members are also privileged to obtain practical advice, on moderate terms, as to the best means of remedying defects in houses of the poorer class in which they are interested. Professor Huxley is the President, and Sir William Gull has a seat on the Council, together with several other individuals of note. Professor Fleeming Jenkin is one of the Consulting Engineers, and gave an account of the enterprise in a paper which he read before the Society of Arts last week. It was explained that the work of the Association would not clash with that of the Local Authorities, but would supplement the latter by doing that which the Local Authorities could not possibly undertake. It was not disguised that the sanitary inspection of a house would often show that considerable expense must be incurred in remedying the defects discovered in it; but the Association would have no interest in augmenting the expenditure, and the householder would know that, unless the work was done, the dwelling could not be healthy. Mr. Jenkin points to twelve hundred cases in which the system has worked satisfactorily in Edinburgh. In the discussion which followed the reading of Mr. Jenkin's paper, Sir Henry Cole expressed his feeling of despair with regard to all the Local Authorities of the Metropolis. It would seem there is plenty of work to be done, for, according to one gentleman, out of sixty or seventy thousand houses built in London every year, as many as fifty thousand are "unfit for human habitation." Sir Henry Cole even stated that the Society of Arts, having called in an expert some time back to inspect their premises, were told "that their 'sanitary arrangements were as bad as could be.'" The deplorable condition of London is certainly exciting a good deal of attention. We are now having a rapid succession of societies, institutes, associations, committees, and the like, all zealously careful to do something or other to promote the health of the Metropolis, and it would almost seem as if, by-and-by, the Vestries would become superfluous.

The drainage difficulties of the Metropolis are by no means slight. From various parts of London the Metropolitan Board are receiving complaints as to the insufficiency of the sewers to carry off the heavy rainfalls which frequently occur. To meet these complaints the Board have resolved on an expenditure of three-quarters of a million sterling, and have just decided on commencing operations in two districts. But if the great intercepting sewers are to receive a larger proportion of the rainfall, the discharge from the storm outfalls is likely to be more extensive. What this means is apparently shown by a representative action which has been brought against the Board by a coal merchant at Deptford, who claims damages on account of the flood which invaded his premises in August, 1879, when, in order to prevent an inundation in the south-eastern district, the Officers of the Board allowed the storm water to rush out of the main sewers into Deptford Creek, the effect being to sink the plaintiff's barge, besides sweeping away all the coals from the wharf and flooding his premises. Other

parties suffered with him, and their claims await the result of the action which he has brought. The Board pleaded that what they did was necessary to prevent the flooding of a large low-lying and populated district. Nice points of law are involved, and the case is now to be argued before Lord Coleridge, without a jury. From Puddington comes a complaint that certain deep basements in Bayswater serve as mischievous outlets for the over-gorged middle-level sewer in the Uxbridge Road. The Vestry wish the Board to restrict the depth of these basements to a limit of seven feet from the surface of the roadway. Unfortunately, the Board in one instance some time ago sanctioned nine feet, and the builder now seems determined to repeat the process, although permission has in the present instance been refused. The rain-storm question is a serious one, and it is to be hoped that the addition of three-quarters of a million to the five millions already expended on the main drainage will give relief in a satisfactory manner.

At a meeting of the South-Western Branch of the British Medical Association, held at Plymouth last week, a paper was read by Mr. F. L. Stephenson, from which it appeared that the pail system for the removal of excreta is undergoing rapid extension, and is working very satisfactorily, especially in Birmingham, Stafford, Manchester, Rochdale, and Bolton. The old original method of mixing with fine ash and turning over with spades has given way to a complete manufacturing process by steam machinery, based on scientific principles, producing what is designated "a rich, powdery guano," valued at prices ranging from £3 10s. to £9 per ton, but sold for something less. Different towns vary in the details of the process, but the several modifications are stated to be all based on one or more of the processes included in Mr. Fryer's patents. At Birmingham the ash-tub refuse is used instead of coal for the purpose of raising steam to work the machinery. Dr. Mitchell Wilson, Health Officer of Rochdale, has produced figures to show that the introduction of the pail system has been followed by a diminution in the mortality from diarrhoea and fever. The pail and guano system is advocated as the most suitable for inland towns, not only in respect to economy, but as offering the advantage of good sanitation, devoid of the drawbacks connected with sewage and sewer gas. At the same time we must observe that the pail system cannot be expected to dispose of all the dirty water in a district, and this will inevitably appear somewhere in the shape of a weak kind of sewage. Rochdale, nevertheless, is confident of avoiding the outlay of £120,000, once apparently necessary for the construction of sewers and the disposal of sewage, in order to comply with a Chancery injunction.

DEATH OF MR. W. NAIRN, OF PAISLEY.—The death has just been announced of Mr. W. Nairn, late Treasurer to the Paisley Gas Corporation. He occupied this office for about 57 years, and had when he died almost completed his 86th year. In 1823 he was appointed Treasurer to the Shareholders of the Paisley Gas Company, and when the gas undertaking passed to the Town Council, Mr. Nairn was continued in the office, which he filled to within a short time of his death.

INSTITUTION OF CIVIL ENGINEERS.—At last Tuesday's meeting of the Institution the newly-elected President, Mr. James Abernethy, F.R.S.E., delivered his Inaugural Address, which dealt largely with statistics of the accommodation afforded by the various harbours throughout England. Towards the close of his address, the President alluded to the floods which of late years have inundated the low-lying lands of the Midland and Fen districts of this country. Confining his remarks to the chronic cases of the rivers Ouse, Witham, Nene, and Welland, he said there were obvious causes for these inundations; and the remedial measures required were the improvement of the outlets, the enlargement of the river beds, the formation of subsidiary flood channels, the removal of obstructions, and the construction of reservoirs to impound the flood waters, which might be used for irrigation purposes during seasons of drought.—It was announced that the Council had recently transferred, among others, Mr. E. K. Burstall, Oxford City Water-Works, and Mr. J. Hewson, Borough Surveyor of Rochdale, to the class of members. The monthly ballot resulted in the election, as associate members, of Messrs. D. F. Goddard, Ipswich Gas-Works, J. H. Hanson, Borough Surveyor of Barnsley, R. A. MacBrain, Deputy-Engineer to the Oxford Local Board, and C. F. Wike, Assistant Borough Surveyor of Leicester.

THE WATER SUPPLY OF ST. HELENS.—At the last meeting of the St. Helens (Lancs.) Town Council, the minutes of the Water Committee were read and confirmed. These contained, among other statements, particulars of the Committee's proceedings in regard to a new water scheme. It appears that—the Chairman of the Committee having submitted and read the proposed heads of terms which he and the Deputy-Chairman had prepared, for submission to Lord Derby for approval, on the subject of the contemplated supply of water to the St. Helens district, from his lordship's estate at Knowsley; and the Town Clerk having stated that, if it was the intention of the Corporation to apply to the Public Works Loan Commissioners for a loan during the coming year, it would be necessary for them to state, in the form which he produced, the amount they would probably apply for between March 31, 1881, and March 31, 1882—it was resolved, "That the Town Clerk be instructed to inform the Public Works Loans Commissioners, in the form submitted, that the St. Helens Town Council will probably apply to them, between the said dates, for a loan of £15,000, being one-third the estimated cost of the proposed Knowsley water scheme, and £5000 for mains and the laying thereof.

VALUATION AND RATING.*

MESSRS. RYDE'S new volume is the third edition of their handy little work on Metropolitan Assessment brought down to the present day. The utility of the book is unquestionable, and its issue at this juncture, when the new valuation lists come into operation, is most opportune. The synopsis of the Valuation (Metropolis) Act, 1869, is very clear and readable, giving all the important provisions of the Act in a form that permits of their being readily retained in the memory. The bulk of the book is, however, made up of appeal cases against the lists of 1870 and 1875, to which, in most instances, instructive comments are appended. The cases are arranged under distinctive headings, and important points are set out in detail. Much curious reading as to the principles contended for in various instances is to be found in these reports, and it is not the fault of the compilers if an impression is conveyed by the fruit of their labours, that assessment is something of a lottery, dependent in a great measure upon the degree of plausibility which may be found to attach to the hypotheses so freely brought forward by both parties to an appeal on a doubtful case. Vivid and realistic powers of imagination appear, on Messrs. Ryde's showing, to be the most valuable qualifications of assessors for rating; and they must themselves be credited with manifesting this gift in a remarkable degree, aided with considerable powers of observation. We can recommend their volume to any one seeking information on the subject of valuation in all its most abstruse developments.

KLÖNNE'S GAS GENERATOR FURNACES.

IN another part of the present number of the JOURNAL will be found a tabular statement of the working results of Herr Aug. Klönne's generator furnaces, which, on the authority of this table, must be considered as having attained great success. It will be seen that the examples given are drawn from places situated widely apart, and consequently under different conditions as to the kind of coal carbonized, &c., while the works themselves are of all sizes, from the Utrecht works, where six settings of sevens are in operation, to the last example of Meran, where a single retort is heated by Herr Klönne's furnace with good effect. We have no particulars to accompany the table of the sizes of retorts, more definite information on which point might help to explain the differences observable in the quantity of gas made per retort in the various instances, and which are not to be accounted for entirely by the differences in the quality of the coal. It might be instructive to know how it happens that the production in the case of Meran, already mentioned, is so much more in proportion than that of Kaiserslautern, where the coal is apparently of even better quality. Much food for reflection is to be found in this table, wholly without reference to its being compiled on the results of any particular system of generator firing, as it is a most complete synopsis of what may be done with gas heating in large and small retort-houses. For this purpose it is not necessary to consider whether Herr Klönne's system is or is not the best that has been introduced into Germany or elsewhere; we have merely a collection of statistics which tell their own tale.

It will be observed, on first looking over the table, that there is absolutely no restriction as to the number of retorts in a setting which may be heated by a carbonic oxide furnace. It is known that a considerable amount of uncertainty exists upon this point, many persons in this country having an impression, which repeated assertions to the contrary have not effectually dispelled, that gas firing is only suitable for large works where stage retort-houses are general. Without disparaging the advantages of stage retort-houses for this and other reasons, it becomes evident from the table that a system which will adapt itself to settings of twos and threes as well as to sevens and nines, must have a good deal of universality about it. It will be seen that two examples are given of furnaces heating only two retorts each. It is generally known how wasteful of coke and even of gas such small settings generally are when worked in the ordinary way. Let us see how the matter stands in their case by the new method. Take the example of Kettwig. It is stated that the two retorts here carbonize 2 tons 4 cwt. of coal per day, which is 22 cwt. per retort. If four-hour charges are the rule—and when would settings of two, with ordinary stoking, burn off four-hour charges?—every charge must weigh $3\frac{1}{2}$ cwt., which is tolerably heavy for any but a very large retort. As the coal used is capable of yielding 10,791 cubic feet per ton, the production per retort is no less than 11,831 cubic feet—a truly remarkable result for a small works. But the strangest thing about it is that all this was achieved with an expenditure of coke for fuel of only 17·8 per cent. by weight of the weight of coal carbonized, or of 396 lbs. per ton. Supposing the production of the coal to have been 1456 lbs. of coke, it appears that rather over 27 per cent. thereof was sufficient for fuel. In this, again, there is a marked difference between the old and the new practice, for it cannot be said that a private or a public gas-works, keeping a couple of retorts going, could, with grate firing, afford to dispose of 73 per cent. of the coke produced. Nor have we taken the most favourable example of working on a small scale, for in the case of Meran it will be noticed that 13,632 cubic feet of gas per retort were produced with a consumption of only 352 lbs. of coke per ton of coal carbonized. Strangely enough, were it not that differences in the value of the coke and the readiness of the coal to yield its gas may account for it, the smallest settings, except in the

very exceptional case of the single retort, do not appear to be the most extravagant of fuel. A setting of six at Bautzen is, in the matter of fuel, as costly as any, except the setting of three at Pirna; but another setting of four at Bautzen is equally extravagant, so the coke must be rather poor. The best results, as far as economy of fuel is concerned, seem to have been attained at Hanover, with a setting of nine, which only consumes coke at the rate of 320 lbs. per ton of coal carbonized; although a setting of five at Wormerveer runs it close with a consumption of 325 lbs. per ton. But the most astonishing part of the information conveyed by the table is in the quantity of gas which is produced per mouthpiece—for the retorts are, of course, single. In no instance is less than 8224 cubic feet credited as the daily yield of a retort, while in one case it actually reaches 15,257 cubic feet per day. Even if this and the next highest production be considered as due to the use of abnormally large retorts, amounting in reality to ovens, there are plenty of cases to show that 10,500 and 11,000 cubic feet are what may be expected from ordinary retorts. It must be said that the high yield per ton which generally accompanies these sensational productions seems to prove that quantity and not quality of gas is aimed at in certain places, although this is not an invariable rule.

The table is, on the whole, a most instructive compilation of what can be done in the retort-house if a certain principle of retort-heating is adopted and worked in a proper manner. It must also be remembered that such heavy productions as those given us by Herr Klönne are to be compassed, not with any distressing wear and tear of men and material, but quietly and regularly, and with the minimum of skilled supervision.

Communicated Article.

OBSERVATIONS ON GLASS AS AN OBSTRUCTOR AND REFLECTOR OF ARTIFICIAL LIGHT.

By Mr. F. W. HARTLEY, A.I.C.E.

SECOND ARTICLE.

At the end of the previous article, particulars were given as to the effects produced by glass sheets as reflectors. Further trials were made, but it is needless to tabulate any save the following:—

OBSTRUCTION AND REFLECTION.

TABLE No. 8.

Screen of thin sheet glass $3\frac{1}{2}$ inches in front of 19-candle Argand flame.	loss 10 per cent.
Do. with reflector of 16-oz. clear sheet $3\frac{1}{2}$ inches behind the flame	loss 7 per cent.
Screen of 16-oz. sheet $3\frac{1}{2}$ inches in front of 19-candle Argand flame	loss 11 per cent.
Do. with a thin sheet as a reflector $3\frac{1}{2}$ inches behind the flame	loss 8 per cent.
Power of the reflected light in each case, 3 per cent.	

GLASS CYLINDER,

12 $\frac{1}{2}$ inches diameter, thickness about equal to 10-oz. Sheet.

TABLE No. 9.

Light from Argand without cylinder	13·5	19 candles.
Loss of light with Argand in centre of cylinder	3·7	3·8 per cent.

In the last example I have been compelled to indicate the losses to decimal places. Practically the percentage loss of light may be regarded as equal for 13 $\frac{1}{2}$ and for 19 candles power; the actual loss with the low-power flame being equal nearly to one-half candle power, and with the higher-power flame to nearly three-quarters of a candle's value. The experiment with the cylinder furnishes the first illustration of the practical superiority of curved surfaces as reflectors of light, the percentage and actual loss with the cylinder being only about half that caused by the flat sheets, although the latter were so much nearer to the flame than the glass of the cylinder. Truly the illustration relates only to horizontal light. To what extent curved surfaces may be better, as regards angular or slant lights from burners above the level of the object which is illuminated, remains in some degree yet to be determined. As far as I can see at present, the only form of lantern or moon which is advantageous in respect to "slant" light is the globe, or some form closely approximating to it.

GLASS GLOBE SERIES.

TABLE No. 10 (Clear Glass Globe, 7 in. diameter).

Light by Argand without globe	13	19 candles.
Loss of light with globe	2·7	3·0 per cent.

This is a second illustration of the advantages of curved surfaces, the losses being a little less than with the greatly larger cylinder, while the maximum only amounts to 3·7ths and 3·8ths of those shown with clear sheet in Table No. 8.

The value of the light reflected from curved surfaces of clear glass is manifested by the results given in the two immediately preceding tables; but I felt that it was desirable to go a step farther with clear, ground, and opal globes. I therefore determined to cut some globes into halves in the direction of their vertical axes. This I found a thing easier to conceive than to effect; however, after trials and some breakages I succeeded in getting one clear, one ground, and two opal moons very accurately divided in the manner wished for, and then contrived a simple manner of using these halves in three ways. First, one half in front of the burner as a screen or obstructor of light; secondly, accurately fitting the second half to the first half, so as to enclose the flame centrally within the two, which together constituted a perfectly formed moon; thirdly, one half behind the flame as a reflector of light. In every instance great care was taken to adjust the parts of the globes so that the circumferential line of greatest diameter should always be at exactly $3\frac{1}{2}$ inches distance from the centre of the burner, the entire globes

* Metropolitan Rating: A Summary of the Appeals heard before the Court of General Assessment Sessions, held at the Guildhall, Westminster, in the Years 1871-80; with a Synopsis of the Valuation (Metropolis) Act, 1869. By Edward Ryde and Arthur Lyon Ryde. Third edition. London: Crosby Lockwood and Co. 1881.

Mr. King's loss is 29.48 per cent.; Mr. Wood's 40 per cent.; while my maximum, with a flame of 8 candles' power only, is but 25 per cent., and the average loss with all the many globes I have tried, for about 15 candles' power, only about 18 per cent. As I remarked at the beginning of my first article, globes with small openings were almost, if not quite universal in 1860, and I thought it possible that this might be the cause of part, if not the whole, of the discrepancies between my results and those of the above-named gentlemen in respect to globes. I therefore, by the insertion of a metal neck, reduced the lower opening of the clear glass globe to $2\frac{1}{2}$ in. diameter, but the difference produced was very trifling, while a somewhat startling fact was discovered—viz., that so far from a clear globe of good glass diminishing the amount of light given from a flat flame, the globe positively causes the flame to become more powerful. Thus with a flame giving light—

Without moon . . = 9 . . 9.5 . . 15 candles.
The gain was . . $6\frac{1}{2}$. . 6 . . 4 per cent.*

As it is impossible for me or any one else who is acquainted with the gentlemen in question to imagine that they were in error, I conclude that the globes with which they operated were inferior to those now to be had, and much more obstructive to the passage of light.

Notes.

APPLICATION OF GAS TO HEATING THE TIRES OF RAILWAY CARRIAGE AND WAGGON WHEELS.

In the workshops of the Lower Silesian Railway, at Frankfurt-on-the-Oder, an apparatus has been for some time in use for heating by gas the tires of railway carriage and waggon wheels, for the purpose of expanding them to the extent necessary to enable the tires to be placed on the wheels, upon which they become firmly fixed by the contraction that ensues on cooling. The apparatus consists of an annular casting, supported by pedestals, and on this the tire to be heated is laid. The gas-burners consist of two iron pipe-rings, situated on a level with, and in close proximity to the tire, the one on the inner and the other on the outer side. That on the inner side is $1\frac{1}{2}$ inches in diameter, and is pierced with two rows of holes on the convex side, so as to direct the gas-jets against the inner side of the tire; while the outer ring, of $1\frac{3}{4}$ inches diameter, has four rows of holes from which the jets impinge against the outer surface of the tire. The holes have a bore of about 0.078 inch. The burners are supplied with gas and air from an arrangement below, consisting of a mixing-chest and conducting-tubes, having separate cocks or valves for the admission of the air and gas. The gas passes through two 100-light meters, and enters the burners at a pressure of about 2 inches of water. The air is supplied by a fan driven by a steam-engine, and has a pressure equal to 11 inches of water. The quantity of gas consumed in heating each tire amounts to about 175 cubic feet. To prevent an explosion taking place in the burners, it is necessary first to turn on the gas only, and to light it after it has commenced to issue from the holes at full pressure. The air blast is then turned on gradually until the jets become non-luminous, and assume the character of a blowpipe flame. In extinguishing the burners the action is reversed, the air supply being first discontinued and the gas afterwards shut off. A cover is placed over the tire and the burners during the operation, to prevent loss of heat by radiation. Some 15 to 20 minutes suffice to heat the tire to the required extent.

DUST A CAUSE OF FOGS AND CLOUDS.

The only really scientific definition of the nature and cause of fogs and clouds, which has been brought forward in the course of the present discussion of the subject, is that supplied to the Royal Society of Edinburgh by Mr. John Aitken, and published in a recent number of *Nature*. This gentleman has conducted a very elaborate series of experiments to show the connection between the presence of dust and condensed watery vapour in the atmosphere, and he claims to have proved that the latter is a consequence of the former. He maintains that particles of watery vapour do not combine with each other to form a cloud-particle, but the vapour must have some foreign solid or liquid body on which to condense. Vapour in pure air therefore remains uncondensed and super-saturated, while the particles of dust in ordinary air form the nuclei on which the vapour condenses and forms fog or cloud-particles. Hence it appears that if there were no dust in the atmosphere there would be no fogs, no clouds, no mist, and probably no rain, but the moisture of the air would be deposited on the surface of the earth as dew. Further, it is shown that if the air contains much dust, every particle of it condenses only a small portion of vapour, so that the particles become but little heavier, and easily float in the air, thus forming the closely-packed but light form of condensation known as fog. Whence it may be readily seen that whatever multiplies dust, increases to a corresponding extent the liability to fog-formation. When the multitude of causes of dust natural to the existence of a great city are considered, there is no difficulty in foreseeing that under ordinary conditions, such places must be peculiarly liable to fogs. Dust is formed not only by the wearing away of solid substances and the organic waste constantly going on around us, but all matter in a heated state, and all products of combustion, are prolific sources of the dust which causes the condensation of watery vapour. The products from an atmospheric as well as from a luminous gas flame, and from a coke or coal fire, are all equally powerful fog-producers; but of all the substances experimented on by Mr. Aitken, sulphur

was the most instrumental in giving off, by its combustion, that peculiar and invisible dust which condenses water. Mr. Aitken is careful to refrain from dogmatizing on the results of his experiments, which, indeed, he is himself careful to point out are merely laboratory experiences, and must be regarded more as offering suggestive facts than as positively declaring an invariable physical law. Still, even in this restricted application, they are very remarkable. It might almost be inferred from them that no method of burning fuel, especially if it contain sulphur, will effectually prevent the formation of fog in the air of towns. It has been calculated that over 200 tons of sulphur are burned in London every winter day, and this of itself is enough to cause fogs to be almost constantly present. As disinfectants, however, burnt sulphur and suspended carbon particles may, in Mr. Aitken's opinion, have some redeeming features, and may be useful in neutralizing the evil influence of decaying matter and deadly germs that might otherwise fructify in the stagnant air of a foggy day.

THE ECONOMY OF CARBONIZATION.

Mr. W. D. Scott-Moncrieff claims to have discovered the only true method of making coal gas and producing good coke at the same time. In some recent correspondence appearing in *Nature* on the question of rendering London smokeless, Mr. Scott-Moncrieff states that he has succeeded, at a gas-works which was strained beyond its capacity of production on the ordinary system, in keeping up the supply by the simple device of taking only about 5000 cubic feet of gas from every ton of coal carbonized. By quick charging and low rate of production he was able to effect the purpose that could not be fulfilled with six-hour charging and a production of about 9000 cubic feet per ton. He adds that the coke, although not so well carbonized as usual, was practically smokeless when quenched immediately after being drawn from the retorts. He does not say that this process is being continued at the works in question, which are presumably conducted on ordinary commercial principles; but we may assume that such is the case, as he is about to bring the subject before a scientific society. The difficulty of the smoky nature of the coke, resulting from imperfect carbonization, has been specially urged in several letters to our contemporary by persons who, in other respects, appear to agree with Mr. Scott-Moncrieff, but he is nothing daunted thereby. He maintains, indeed, that not only is the solid residual of bituminous coal from which 5000 cubic feet of gas have been taken, quite smokeless if properly treated, but that the lesser quantity of 3333 cubic feet of gas might be taken off, and still the coke need not necessarily be smoky. As a result of a general adoption of this style of carbonization by gas companies, much of the smoke now loading the atmosphere of our large towns is to be prevented, although the reasons why such a result may be expected are not very clear.

UNIFORM STANDARDS FOR GAS STATISTICS.

The want of uniformity in the standards of weight and measure used by the members of the American Gaslight Association led to the appointment of a special Committee, charged with the important duty of examining the standards in common use throughout the region whence the constituency of the Association is drawn, with a view to the selection of such definite and invariable units of weight and measure as might be considered most suitable for adoption by the Association. The Committee, in accordance with their instructions, reported in favour of the following regulations, which are now to apply to all communications made to the Association by the members, on matters of ordinary practice:—

1. That all statements of gas production be made in cubic feet per pound of coal, specifying the kind and quantity of enriching material used—if it be cannel, in percentage of the total weight, and if naphtha, in gallons per 1000 cubic feet of total gas production.
2. The U.S. standard bushel of 2150.42 cubic inches, for the measurement of coke and lime. Statements of lime to specify whether slaked or unslaked. (The U.S. bushel contains 67.77 cubic inches less than the English bushel.)
3. The U.S. standard gallon of 231 cubic inches for the measurement of tar, naphtha, oil, and ammoniacal liquor. (The U.S. gallon is 46.25 cubic inches smaller than the English gallon.)
4. That all statements of illuminating power be accompanied with the description of the burner and photometer used in testing; and the general adoption of Sugg's London "D" burner is further recommended.

The report was adopted by the members of the Association at their last meeting, and therefore it will be understood that all statements published henceforth by the authority of the American Gaslight Association will be based on these standards. It will be observed that the principle of rating the production of gas at per pound of coal, although apparently inconvenient from its dissociation with the units of commercial transactions in either gas or coal, avoids the difficulty sometimes experienced from the occurrence of the ton of 21 cwt. and its confusion with the ton of 20 cwt., while further trouble is sometimes caused in America by the fanciful adoption of a ton of 2000 lbs. as a method of approximating to a decimal system of weights, sometimes desired as being more in harmony with the U.S. decimal coinage than the existing irregularly divided standard.

METALLIC DRY METERS.

An attempt has been made by Mr. J. Urquhart, of Manchester, to overcome the difficulty presented by the leather diaphragms of dry gas-meters as usually constructed. The durability of the flexible sides of the measuring chamber of such meters is usually short, and their integrity is not to be generally relied upon. Mr. Urquhart proposes to construct the expanding portion of the measuring chamber of thin metal, sufficiently flexible for the purpose. The "white metal" commonly used in parts of meters is a suitable material for

* Doubtless this is due to the better conditions of combustion, the flame becoming much steadier within the globe.

these plates, but any other metal may be used. The thin plates, cut into circular form, are punched through the centre, and are then connected in pairs by soldering together the edges of the central holes of two plates. The outer edges of the pairs of plates are then connected in a similar way until five or six pairs are joined up, when the ends are closed by stouter circular plates, the whole then forming a metallic circular bellows. Subsidiary arrangements, some of which are applicable to other forms of meters, are designed for the proper working of the measuring chambers so constructed. When used for measuring liquids, the chambers are similarly constructed of flexible metallic bellows. The number of measuring chambers in a meter may be varied, and the form of the plates may be square, or of any other suitable shape, instead of being circular; and the metal may be corrugated if found desirable. The object of the inventor is simply to substitute flexible metal of any kind for the leather at present used in the measuring chambers of dry meters of every description.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE OXIDATION OF SULPHUR IN COAL GAS.

SIR,—In the note you appended to my letter on the above subject in your issue of Dec. 28, you only appear to demur to the first proposition that I laid down, which was this: "That the whole of the sulphur from an ordinary jet of coal gas, except whilst within a zone of about a foot from the flame, exists as the vapour of sulphuric acid." I do not quite gather whether or not, if I had added, after the word "vapour," or "as minute particles of sulphuric acid," you would still give the proposition an unconditional negative. You appear to doubt it in either case. The time at my command does not allow me, in this letter, to take up the purely scientific side of the question as to the sulphuric acid, in the air of rooms, existing as an actual "gas" or as what may be termed "a cloud of finely-divided particles;" but I will endeavour, with your permission, to do so at another time. At present I will merely observe that the term *vapour* may include both these conditions of matter, and will confine myself to citing proof that "the sulphur of the gas burned in a room exists as sulphuric acid."

I may remark, parenthetically, that so far as the results of sulphur impurity in coal gas are concerned (*vide* 3, 4, 5, and 6, of the conditions which I summarized in my letter to you*), the effect would be practically the same whether the sulphur exists in the atmosphere of a room as sulphuric acid (H_2SO_4), sulphur dioxide (SO_2), or sulphur trioxide (SO_3). The conditions which render sulphuric acid detrimental are just the conditions which would at once transform either sulphur di- or tri-oxide into sulphuric acid; and there would be also no practical difference in the ease with which either of the three in a "gaseous state" would pass away with the ventilation.

The state of the case being, then, that whether the sulphur dioxide theory which you appear to favour, or the sulphuric acid theory which I am about to attempt to substantiate, be correct, the practical result will be the same. We are, therefore, in one sense, "thrashing a dead horse." Let us, however, proceed to examine the two theories. In the first place, what evidence is there that sulphur dioxide (SO_2) exists in the air of a gas-lit room? There appears to be "none." The state of things which exists in the Referees' apparatus is not anything identical with the combustion of an ordinary gas-jet. The production of but a small proportion of sulphuric acid in a Referees' apparatus when pure water only is used, is only a proof of my statement that sulphur dioxide does not exist if you recede much more than a foot from the burner. It proves nothing more. The fact that the sulphur makes its way to some extent through the Referees' apparatus as sulphur dioxide arises simply from the fact that the atmosphere in the apparatus contains only half the normal proportion of oxygen; a large amount (4 per cent.) of carbonic acid; and is also immensely less in amount with respect to the sulphur dioxide than in the case of combustion in a room. This was amply proved by Mr. C. Heisch,† who also showed that, although there was sufficient sulphur dioxide present at the exit-tube at the top of a Referees' apparatus, to give the blue reaction with iodic acid and starch paper, yet on suspending over the exit a tube 7 inches long and 2 inches wide, the oxidation of the dioxide by access of air was so complete that half way up the tube, or $3\frac{1}{2}$ inches from the exit of the apparatus, "no reaction whatever" took place, and therefore no sulphur existed as sulphur dioxide. Mr. Heisch also burned coal gas containing 22 grains of sulphur per 100 cubic feet through an ordinary batwing burner, at the rate of 4 cubic feet per hour, for 48 hours, in a small room almost hermetically closed, and failed to detect "any" sulphur dioxide by the starch and iodide reaction. I myself have not detected, even by this very delicate reaction, any sulphur dioxide at a little distance from the flame of the burning gas. If any experimentalist has satisfactorily detected sulphur dioxide at large in the air of a gas lit-room, I am not aware of it.

If this be the case—namely, that the dioxide cannot be detected—the question becomes: In what form is the sulphur present in the air of rooms? On this point I have no expectation of finding a chemist who will suggest that it can be anything but sulphuric acid if it is not sulphur dioxide.

Now, although one or two chemists had made observations and experiments on the products of the combustion of the sulphur in coal gas earlier than the last three or four years, it may be said that it was not until 1877, when a Select Committee of the House of Commons considered the claims of the Crystal Palace Company and The Gaslight and Coke Company to be relieved from their Acts of Parliament, which prescribed that the sulphur in the gas manufactured by them should not exceed 20, 15, and 30 grains per 100 cubic feet at the various works of those Companies, that any general attention was paid to this subject. On this occasion, as scientific evidence for the Companies, Drs. Odling,

Stevenson, Tidy, and Russell implied generally that the products of combustion of the sulphur present in coal gas were not such as to be injurious to health and furniture. The three Gas Referees, Professor Tyndall, Dr. Pole, and Mr. Vernon Harcourt (at the request of the Committee), then showed in detail the reasons which had led them to fix the allowable amount of sulphur at the point they had prescribed. Dr. Frankland, Mr. Heisch, Mr. Kentes, Professor Church, Mr. Pattinson, Mr. Falconer King, and Mr. Wigner, then gave evidence, "that the products of combustion did in part consist of sulphuric acid; and that, although at first the sulphur in the gas produced sulphur dioxide only, yet the moment the latter acid had passed away from the actual zone of combustion in the burner it became oxidized, and converted into free sulphuric acid, and as such was liable to damage furniture and health." To which side the balance of evidence inclined was shown unmistakably by the fact that the Bills of the Companies, praying for the removal of the restrictions as to sulphur, were both thrown out by the Committee.

Dr. Odling's and also Dr. Stevenson's and Dr. Russell's results were examined in a paper by Mr. Wigner during the same year,* and the small proportion of sulphuric acid found by the former was shown to be most probably owing to the efficient ventilation of the room in which the experiments were made; whilst experiments by the latter gentlemen appeared to show that they had recovered, as sulphuric acid, no less than 42 per cent. of the total sulphur in the gas. Mr. Wigner himself, by special ventilation, recovered in one case sulphuric acid corresponding to 62 per cent. of the total sulphur; and also found that the products of combustion of about 6000 feet of coal gas, during 180 hours, did not give the slightest reaction for sulphur dioxide, on starch and iodide paper placed in the small ventilator tube through which the products passed. I am not aware that any of these chemists asserted that he could detect sulphur dioxide in the air of a gas-lit room.

Original experiments by Mr. Young, also published in the same paper,† tend to prove the presence of the sulphur as sulphuric acid in the air of rooms. In the second of his papers alluded to, this gentleman gives results of determinations of the sulphuric acid found in books, wall papers, varnished and unvarnished woodwork, curtains, bed-hangings, dust, &c., and cloth and paper purposely suspended; and these coincide with my own conclusions in my letter to you.

And now as to the injury to books proceeding from sulphuric acid, I certainly cannot agree with you in your article on my paper, that "the evidence is conflicting." So far as I know, it is anything but conflicting. I have seen Professor Nichol's paper that you referred to, but find nothing in it which throws a doubt on the liability of excess of sulphur in gas to attack leather bookbinding, but the contrary. At the time I read my paper before the Manchester Literary and Philosophical Society, most conclusive cases as to the action of sulphuric acid from impure gas were cited by several members, among them Dr. Angus Smith and Mr. Cunliffe, which I may bring forward in detail on a later occasion. I may add that in the discussion none of the chemists present expressed a doubt as to the existence of the sulphur as sulphuric acid.

Allow me to add finally, as you again allude to it in your foot-note to my letter, that I stated myself that I should not expect to find drops of sulphuric acid on a gas globe under ordinary circumstances. The globe, of course, has nothing whatever to do with the state of combination in which the sulphur exists in the products of combustion of coal gas; and, in fact, if the sulphur were lower than 10 grains in 100 feet, I should hardly expect to see actual drops of acid in any situation. The true solution of the whole problem is to take "all the sulphur out of gas."

Manchester, Jan. 11, 1881.

H. GRIMSHAW.

[We thank Mr. Grimshaw for his letter, and for the particular references to his authorities. We do doubt the statement that "the whole of the sulphur from an ordinary jet of coal gas, except whilst within a zone of about a foot from the flame, exists as the vapour of sulphuric acid, or 'even' as minute particles of sulphuric acid." We believe it possible that some liquid sulphuric acid may hang suspended for a short time in the air of a gas-lighted room. We believe the term "vapour" is applied by scientific writers only to matter in the *gaseous state*. If sulphuric acid existed as a *vapour*, it would have no tendency to settle on objects in a room, except such as are damp or happen to be lower in temperature than the dew-point of such assumed vapour. Whereas, if it existed in large proportion as a cloud of liquid particles, it would settle on all objects indiscriminately; and since, at ordinary temperatures, it is practically non-volatile, every article of furniture (not only the damp and hygroscopic ones) would become in time coated with a fine layer of sulphuric acid. Of course, the conditions of the products of combustion of a flame burning in a Referees' apparatus are not identical with those of the products of combustion of an ordinary gas-flame. But since the issuing gas contains 14 per cent. of oxygen and 4 per cent. of carbonic acid, it is neither a reducing nor a neutral atmosphere; but, on the contrary, a strongly oxidizing one. Mr. Young has shown that a solution of an alkaline sulphate containing 5 per cent. of sulphur is completely oxidized in running slowly through a Referees' apparatus. It seems to us hardly consistent that almost all the sulphur contained in coal gas can be obtained as sulphur dioxide from such an atmosphere, if it be also true that, when mixed with ordinary air, sulphur dioxide is so quickly oxidized that there is not any existing a foot from a gas-flame. In Mr. Heisch's experiments in a small, tightly-closed room, referred to by Mr. Grimshaw, it appears to us that the conditions were favourable for oxidation, as the room after a short time must have been more than saturated with moisture, and the walls and test-papers soaked. Mr. Heisch's experiment on bringing air in contact with the gases issuing from the education-tube of a Referees' apparatus is a good one. We think experiments in this direction should be repeated with various tests, care being taken to keep the sides of the chimney perfectly dry. In Mr. Wigner's experiments, also referred to by Mr. Grimshaw, the value of the evidence is lessened by the fact that he tests for sulphur dioxide in the ventilating-tube, after first passing the gases through a condensing-tube 5 feet long surrounded with ice. Such a tube would

* See JOURNAL, Vol. XXXVI., p. 1007.

† See Analyst, Vol. II., p. 135.

* See Analyst, Vol. II., p. 138.

† Ibid, Vol. I., p. 143; Vol. II., p. 135; Vol. IV., 201.

quickly offer a large surface of cold water to absorb the sulphur dioxide. We believe that before long the "oxidation of sulphur in coal gas" will be taken up in a manner that will put the question beyond dispute. Meantime we confess to hardness of heart, and put before our readers the reasons which make us still hold to our unbelief.—Ed. J. G. L.]

DR. ADAMS'S GAS-STOVES.

SIR,—In our last communication we pointed out that the main question raised by Mr. Lane—viz., the heating power of coal gas, assumed by him to be limited to 700 standard thermal units—was being lost sight of in side issues concerning errors in the placing of decimal figures, &c. In Mr. Lane's reply there are again several trivial errors; but, keeping only to the point in which the public have a real interest, we crave your permission to reproduce the question in a form in which it can be discussed without imputation either upon Mr. Lane or ourselves.

Mr. Lane's observations were based on certain statements made by Mr. J. L. Bruce, an Architect, and Dr. Adams, both of Glasgow. Explanations have been made by both these gentlemen, mingled, however, with controversial matter, and we think it more likely to be satisfactory to all interested that we should quote the exact words of these gentlemen, as they were published at a date when no controversy existed or was in view; and in this way no imputation of garbled or incorrect quotation or error can be made.

Mr. Bruce, in the narrative of a series of elaborate investigations "On the Heating, &c., of Turkish Baths" (published in the Transactions of the Philosophical Society of Glasgow, April 30, 1879), incidentally stated "some very surprising results" he had "obtained lately in the examination of a new gas-stove, the invention of a well-known medical man of this city." After detailing his tests, and giving in full his figures of calculations, showing how he brings out the results in standard British thermal units, Mr. Bruce says:

"This shows that 93 per cent. of the gas was efficiently used, and that only 7 per cent. was lost in the necessary process of carrying the injurious products of combustion up the chimney to the outer atmosphere. It also appears that gas as burned by Dr. Adams's method—which I may remark, *en passant*, differs altogether from the ordinary method, or any that I have previously witnessed—yields far more heat than when burned in the usual way. According to Dr. Parkes, a cubic foot of gas is capable of warming 31,290 cubic feet of air 1° Fahr., which is equivalent to a heating power of 556·3 units of heat of the standard I have employed in these calculations; while in Dr. Adams's stove 854·8 units of heat per cubic foot of gas are utilized. . . . The stove I examined was a mere working model, and Dr. Adams says he can still further improve it; but in its present condition it is as far superior to the customary gas-stove as a compound steam-engine is to Newcomen's venerable original."

Some months after this date a controversy on the heating power of the gas-stoves exhibited at the Greenock gas exhibition took place in the Glasgow newspapers, and the capabilities of a certain stove were freely canvassed. Mr. Bruce was requested to submit it to test, and he did so, and in publishing the results showing that 510 units of heat per cubic foot of gas had been utilized, he added that with one exception [*i.e.*, Dr. Adams's] the stove in question was the best he had examined. So much for Mr. Bruce's statements.

In Dr. Adams's paper on "Improvements in Gas-Stoves" (published in the Transactions of the Philosophical Society of Glasgow, March 17, 1880*), he stated that as the test "had been published by the manufacturer of the stove in question as a testimonial of merit, his reference to published facts was legitimate." Dr. Adams added that, in conjunction with certain parties named, he had also tested this stove, and substantially corroborated Mr. Bruce, stating, moreover, that it was "the best hot-air stove I have tested, or that has been publicly tested, so far as I know." Dr. Adams then contrasted the performances of this special stove with his own in the following table:—

	Square Feet of Heating Surface.	Units of Heat utilized per Cubic Foot of Gas.	Temperature of Air warmed above Initial Heat.	Cubic Feet of Air warmed per Cubic Foot of Gas.	Temperature of Waste Products.
No. 1 stove (giving the best result of any gas-stove hitherto made) burning 10½ cubic feet of gas per hour	15	3,658	62° Fahr.	59	170° Fahr.
Do., burning 13½ cubic feet per hour	15	6,336	132° Fahr.	48	200° Fahr.
No. 2 stove (Dr. Adams's) burning 12½ cubic feet per hour.	42	51,300	180° Fahr.	285	244° Fahr.

To this table he appended the following statement, not previously alluded to in the present controversy:—

"In this table the units of heat utilized by radiation and contact of air from the external surfaces of the two stoves are not calculated; but as No. 2 has 3 feet additional external surface and a much higher temperature throughout, any mode of calculating the additional heat shows a very large increase due to No. 2 stove."

Here, then, we have the complete data on which a dispassionate consideration may be given to the question raised by Mr. Lane—viz., the possibility of coal gas yielding so much heat by the combustion of 1 cubic foot. It will be seen that Dr. Adams claims a still higher result than the amount to which Mr. Lane takes exception. He states that his tests and those of Mr. Bruce have been corroborated by other competent observers. We also have stated, and again state, that we corroborate and are willing to repeat the tests to Mr. Lane and to others, and we have detailed a test made with Glasgow gas, and for which we personally vouch. As Mr. Lane does not seem to have followed the details of the test we have already furnished, we will now give, with still greater precision, the details of a test made with Birmingham gas. An analysis of Glasgow gas is not to be had—as already stated by Dr. Adams—but the illuminating power may be taken at 26 candles, and Birmingham gas at 17 candles. The instrument employed by the writer as an anemometer is the most improved form of what is called "Biram's Anemometer." This instrument was

pronounced by Dr. Parkes, late Government Professor of Military Hygiene at Netley, as "the most perfect instrument in use"—a character which it still retains. The graduations of these instruments are found by experiment, and a table of corrections is given with each instrument. The identical instrument we use is the duplicate of the instrument selected by the Jurors appointed by the Glasgow Philosophical Society to make the tests in connection with the recent exhibition at Glasgow. These instruments were manufactured by a maker of most delicate instruments of various kinds, and who, we believe, supplies many of the leading scientific men of the day.

TEST WITH BIRMINGHAM GAS.

Inner Surface of Stove.

Gas consumption per hour	13 cubic feet.
Initial temperature of air entering the stove	63° Fahr.
Temperature of heated air discharged from the stove	226° "
Cubic feet of hot air discharged per hour	3,343 "
Degrees of temperature of heated air above initial temperature	163° Fahr.
Units of heat from vomitories	544,909

The above is the result of the inner surfaces of the stove, and is obtained by actual measurement. Now follow the results given by the outer surfaces, and which are a matter of calculation. In order to arrive at these results simply (and we think it is sufficiently accurate for the purpose) we assume the outer surface of the stove, which measures 16 square feet, as the equivalent of a 16-foot run of 4-inch hot-water pipe at the same temperature. [See Box's "Treatise on Heat," Table 90.]

Outer Surface of Stove.

Temperature of air heated by outer surface	180° Fahr.
Cubic feet of air heated and reduced to the same temperature as air from vomitories	1,430·5
Units of heat from outer surface	233,168

We have, therefore, 544,909 units emitted by the interior surfaces, and 233,168 units emitted by the outer surface, or a total of 778,077 units utilized by the stove, or 59,852·4 units utilized per cubic foot of gas.

Mr. Denny Lane need have no fear that any test made by himself would be discredited. For our own part we shall look forward to the publication of his results with a good deal of interest, as they will in some measure help to set forth the relative heating power of gases of low illuminating power as compared with those of high illuminating power. We have stated, as the result of our tests, that Dr. Adams's stove will yield the following results from the interior surfaces of the stove:—

	Units per Cubic Foot of Gas.
With Glasgow (26-candle) gas [see our previous communication]	51,938
With Birmingham (17-candle) gas [see tables given above]	41,916

The Cork gas has, we think, an illuminating power of 14 candles, and a test with this gas would show a ratio of heating power with gases of high medium and low illuminating power.

In conclusion, we may state that we would willingly submit the stove to the gentlemen named by Mr. Lane, but we think it is scarcely necessary, as the report of the Jurors on Gas Heating Stoves at the Glasgow Exhibition cannot now be long before it is published. From the eminence of the names of the Jurors, and their undoubted capacity to deal with such a question, it is to be hoped that some authoritative utterance will be made on the general question of the heating force of coal gas. Meanwhile, we venture to think that the present controversy, and the statements contained in this communication, should be sufficient to show that the heating properties of coal gas are very much in excess of the generally accepted standard.

Birmingham, Jan. 14, 1881. JOHN WRIGHT AND CO.

LEEK GAS-WORKS.—Mr. C. Henshaw, the Clerk to the Leek Improvement Commissioners, writes (in reference to our remarks last week) that "the contractor whose tenders were accepted was not 'a local man,' but resided near Manchester;" and that "the cost of reconstructing the tank has been borne by the contractor."

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, JAN. 11.

(Before Vice-Chancellor HALL.)

HARGREAVES v. FARNWORTH LOCAL BOARD.

In this case, which has been several times referred to in the JOURNAL, Mr. GRAHAM HASTINGS to-day moved, on behalf of the defendants, to stay the operation of an injunction granted by the Court in April, 1879—restraining the defendants from fouling the plaintiff's reservoirs—until the 30th of June next. His lordship had, he said, suspended the injunction until December last, but the defendants had been unable to complete the necessary works in time, and although they were proceeding with all despatch, the works could not be completed for four months. He had affidavits from the Surveyor and from the Chairman of the Board which bore out his statement.

Mr. INGLE JOYCE, for the plaintiff, said the affidavits were dated last month, and stated that the works could be completed in four months. He, therefore, had no objection to the time being extended until the end of April.

The VICE-CHANCELLOR accordingly suspended the operation of the injunction until the end of April.

COURT OF SESSION, FIRST DIVISION.—WEDNESDAY, JAN. 12.

(Before Lords CRAIGHILL and CURRIEHILL.)

THE VALUATION OF THE DUNDEE CORPORATION GAS-WORKS.

Judgment was given to-day on the question raised by the Gas Commissioners of Dundee, as to the valuation of their gas-works, which came before the Court on the 3rd inst., and was fully reported in the last number of the JOURNAL.

LORD CURRIEHILL, who delivered the judgment of the Court, said: As the questions raised in the present appeal are of general importance, and as we

* See JOURNAL, Vol. XXXV., p. 364.

were informed by the parties that our decision would regulate several other appeals, we thought it right to take time to consider our judgment. The first question raised by the Appellants is whether, in addition to the deduction allowed by the Assessor from the gross revenue, in estimating the real annual value of the gas-works, a further deduction should be allowed in the name of tenant's profits. We are of opinion that no such deduction ought to be allowed. The question which we have to determine under the Valuation Act is—What is the rent at which, one year with another, the gas-works might, in their actual state, be reasonably expected to let from year to year? The Assessor has arrived at his valuation by ascertaining the gross revenue of the gas-works, and by deducting therefrom the annual expenditure necessary to be incurred in producing and supplying gas to the community of Dundee, the surplus being taken to be the assessable annual value or real rent. It should be observed that this surplus might be indefinitely increased, as it would certainly be increased in the hands of a private company, by raising the price of the gas to the consumers, who are the constituents of the Appellants. But the Appellants are by their Act of Incorporation prohibited from making any unnecessary surplus by way of profit, and they are bound to apply their actual surplus in paying annuities due to the Shareholders of the Companies whom they have superseded, and in meeting interest on their mortgage debt, any further balance being directed to be employed in reducing the debt, or lowering the price of gas. It is plain, therefore, that the Appellants can never earn for themselves anything analogous to tenant's profits—that is, the profit which a tenant, or even a private company or individual, would expect to earn as recompense for the trouble and risk incurred in carrying on the manufacture. In the present case these profits are never earned, but remain in the pockets of the consumers, the constituents of the Appellants, in respect of the low price—as nearly as may be prime cost—at which the gas is supplied. Therefore it seems to be hopeless for the Appellants to contend that they are entitled to a deduction in respect of tenant's profits, which they do not and never can earn. The fallacy which underlies their claim becomes at once apparent if we simply assume that the Appellants were entitled to earn such profits and did earn them, or were entitled to let the works to a tenant who would expect to be remunerated for his risk and trouble by such profits. In any case the profits could be earned only by raising the price of the gas, the effect of which would be that, on the one hand, the gross revenue would be increased, while, on the other, the expenditure would be increased to a corresponding extent, leaving the net surplus the same as before. This surplus is, in our opinion, the real annual value of the concern, and represents the rent at which, in their present condition, the gas-works might be reasonably expected to be let from year to year, and we are clearly of opinion that no further deduction should be made from it in the name of tenant's profits. We may add that while we have formed this opinion after a careful consideration of the Valuation Act, and of the whole circumstances of this case, we are fortified in the view we have taken by finding that the principle upon which our judgment is founded was acted on by the Court of Queen's Bench in England in a somewhat analogous case—that of the Mersey Docks. The next question, which is raised alternatively to that which we have just decided, is whether, assuming the Appellants not to be entitled to a deduction for tenant's profits, they are entitled to a deduction in respect of repairs of buildings, salary of clerk and auditor, insurance against fire, and depreciation of buildings and plant. We are of opinion that no deduction should be allowed in respect of any of these items, and that none such are contemplated by the Valuation Act. We think these charges are such as fall to be defrayed by the owner of the heritage out of his rent, if let, or out of the real annual value, if unlet. Some of them may be necessary, some only expedient, and such as a prudent proprietor will incur; but none of these are charges which naturally or necessarily fall upon the tenant, or which the tenant would require as an element to be considered by him in offering a rent. The case is different as regards perishable plant, which, it would appear, the parties assume would, in the case of a lease of such works, have to be kept up by the tenant, and accordingly the Assessor has allowed an ample deduction in respect of such plant, on the footing that the expenditure is necessary for the production of the gas by the actual manufacturer, whether he be owner or merely tenant. The third and last question which was raised in the original appeal to the Magistrates is whether the Appellants are entitled to a deduction in respect of interest on capital required to buy coal and the like to enable them to carry on the manufacture during periods when no rates are being collected. This question is not now before us, as the Magistrates, apparently with the acquiescence of the Assessor, allowed the deduction, and we only notice it for the purpose of saying that although, in point of form, we affirm the decision of the Magistrates on all points, we are not to be held as having affirmed or expressed any opinion as to whether this last-mentioned deduction was or was not rightly allowed.

The appeal was therefore dismissed.

MIDDLESEX SESSIONS.—TUESDAY, JAN. 11.

(Before Mr. P. H. EDLIN, Assistant-Judge.)

CONVICTION FOR STEALING GAS.

John Russ, a brushmaker, was indicted for stealing (nominally) 1000 feet of gas, the property of The Gaslight and Coke Company, to which he pleaded guilty.

Mr. BURNIE, who appeared for the prosecution, stated that the prisoner kept a large double-fronted shop in the Kingsland Road, and had every night about 12 lights burning. He had made a surreptitious communication with the main supply-pipe, by which he could obtain gas for a large number of lights without it passing through the meter. This had evidently been going on for a considerable time, and it was almost impossible to tell the quantity of gas of which the Company had been defrauded. The mode by which the fraud had been carried out was most ingenious, a large wooden plug being driven into the place of the ordinary tap, and in the centre of the plug an india-rubber tube had been inserted which was attached to a metal tube, and so the different lights in the shop could be supplied. The apparatus could be easily removed; but the inspector went into the place on a day he was not expected, and found the apparatus attached as described.

The Assistant-Judge sentenced the prisoner to be imprisoned and kept to hard labour for six months.

CHESHIRE QUARTER SESSIONS.—WEDNESDAY, JAN. 5.

(Before Mr. HORATIO LLOYD, Chairman, and a Bench of Justices.)

APPOINTMENT OF AN AUDITOR OF THE HYDE GAS COMPANY'S ACCOUNTS.

Application was to-day made to the Court, under section 85 of the Gas-Works Clauses Act, 1847, upon two petitions—one signed by the Hyde Local Board and Mr. Thomas Ashton, of Hyde and Didsbury, both large consumers in the Hyde district; and the other signed by a number of manufacturers, all gas consumers in the district—for the appointment of an Auditor to examine into and report to the Court upon the accounts of the Hyde Gas Company.

Mr. MARSHALL, who appeared for the petitioners, stated that the Com-

pany were incorporated under the Hyde Gas Act, 1855, and were therefore subject to all the provisions of the Gas-Works Clauses Act of 1847. By their own Act the Company's authorized share capital was fixed at £25,000; and they were also empowered to raise additional share capital not exceeding £11,000, and borrow on mortgage or bonds any sum not exceeding £9000. The dividend on the original shares was not to exceed 10 per cent., and on the additional share capital 7½ per cent. The petitioners complained that the Company had recently converted £8990 of the money authorized to be borrowed into share capital of the like amount, by allotting the sum to certain Shareholders; and upon this, as the petitioners alleged, dividends of 7½ per cent. had been paid. They also complained that in the year 1879 the Company agreed for the purchase of a quantity of land for the extension of their works, and also promoted a Bill in Parliament in the session of 1880, which Bill proved abortive. The petitioners believed that the Company had charged the costs of the purchase of the land, and of the parliamentary proceedings, upon their profits, and thus the petitioners contended was illegal. They also complained that the Company had paid dividends without deducting income-tax, which was illegal; and had also paid large sums to certain of the Shareholders who were Managers and Directors of the Company. The price of gas was alleged to be too high, and the petitioners believed that if the accounts were examined by a competent person it would be found that the price could be materially reduced. The petitioners, therefore, prayed that Mr. William Aldred, of Manchester, should be appointed Auditor to report to the next sessions.

The CHAIRMAN asked who was to pay the costs of the Auditor.

Mr. MARSHALL said that the clauses of the Act of Parliament provided for this by saying that the appointment was to be at the "cost of the undertakers"—the Company; but there was the proviso in the next clause, that, "if the Court, upon the report of the Auditor, think there is no sufficient cause for his appointment, they may order the petitioners to pay such costs."

The CHAIRMAN said this was quite sufficient. The Local Board, who were petitioning, were a substantial body, and if he recollected rightly a similar application had been made with regard to the Stretford Gas Company.

Mr. MARSHALL said this was so, and the result in their case had been a great reduction in the price of gas.

The CHAIRMAN: Then the Court will make the order as prayed.

NORWICH POLICE COURT.—FRIDAY, DEC. 31.

(Before Mr. W. J. UTEN-BROWNE, Chairman, and a Bench of Magistrates.)

ILLEGALLY REMOVING A GAS-LAMP.

STRANGE PROCEEDINGS IN CONNECTION WITH THE GAS AGITATION AT NORWICH.

William Parker, a gas-fitter in the employ of a Mr. J. Bishop, of Norwich, was summoned, under section 19 of the Gas-Works Clauses Act, 1847, for illegally removing a lamp belonging to the British Gaslight Company, Limited, and used by them for supplying gas in London Street.

Mr. C. COOPER, who was instructed by the Clerk to the Company (Mr. Arthur Preston), said the Directors felt it necessary to take proceedings in this matter, as the act alleged was of so impudent a character. One of the clerks in the employ of the Company, on Thursday, the 23rd of December, was walking down London Street about four o'clock in the afternoon. When near Mr. Caley's shop he saw a ladder against a lamp-post, and observed defendant mounted against the post. He saw defendant lift the lantern off the post, and bring it down to the pavement. He then took up an oil-lamp and affixed it to the top.

Mr. F. E. LINGING, Engineer and Manager of the Company's Norwich station, said the lamps and lamp-posts were all the property of the Company, and no authority had been given to defendant to act as he had done.

Defendant admitted removing the lamp, but said he had received instructions to do so from his master. He naturally supposed it was an experiment, but he heard no remarks from his employer in addition to the order to remove the gas-lamp, and put the oil-lamp in its place.

In answer to the BENCH, defendant said the oil-lamp was lighted at night.

Mr. BROWNE said the defendant was rather to be pitied, as he was instructed by his employer.

Mr. COOPER: A man is not bound to obey illegal commands.

Mr. BROWNE said the question was whether defendant knew the act was an illegal one.

Mr. J. Bishop stated that he instructed defendant to remove the lamp.

Mr. COOPER: Whom did you receive your instructions from in this matter?

Witness: I received instructions from Mr. Willis.

Is he a Town Councillor?—I believe he is.

He has taken a very active part against the Gas Company, has he not?—I don't know. Mr. Willis is an employer of mine, and I therefore ordered defendant to do the work.

Do you mean to say that Mr. Willis instructed you to interfere with any of the Company's lamps?—Yes.

Mr. BROWNE: The witness has sworn it.

Mr. COOPER: Did you supply the oil-lamp?

Witness: No. My instructions were to send a man to a Mr. R. A. Cooper's, and fetch a lamp which should be put in the place of one of the gas-lamps.

You know Mr. Cooper has been strongly opposed to the Company?—I have heard so.

Did you not imagine you were doing an illegal act?—I was not aware but that the Company were cognizant of it. If I had not thought so, I should not have done it.

Can you suppose for a moment you had any right to interfere with the Company's gas-lamps?—I did under the circumstances.

What circumstances?—Well, I was led to understand that Mr. Willis had full authority.

Did Mr. Willis tell you so?—Yes.

What authority?—The authority of the Committee, the Mayor, or some of the Magistrates, I believe.

What Committee?—I believe the Committee of which he is Chairman.

Then Mr. Willis told you that he had the authority of some Committee for this act, or the Mayor?—Yes.

Mr. COOPER: The Committee may have great powers, and the Mayor may have great powers, but they do not extend to such an affair as this.

Mr. FIELD (one of the Magistrates): If you had not understood that Mr. Willis had some authority, you would not have removed the lamp, I suppose?

Witness: Certainly not.

Mr. BROWNE: Then you removed it in consequence of being told that Mr. Willis had authority?

Witness: I did.

Mr. COOPER: Did you understand why it was to be removed?

Witness: No.

Did you understand it was to be removed as an experiment?—No, I did not understand so.

Mr. BROWNE: Did you not understand that the object was to see if an oil-lamp would show as good a light as a gas-lamp?

Witness: No, I did not.

Mr. BROWNE: I think the case is proved; but the Company can hardly wish to press a conviction against the defendant, seeing how he is situated in the matter.

Mr. COOPER: We were obliged to proceed against the man.

Mr. BROWNE: The man did not know he was doing an illegal act; and although we are all bound to know the law, this is not so in practice.

Mr. COOPER: But gas-lamps might be removed to any extent.

Mr. BROWNE: There could not be much inconvenience in removing one gas-lamp.

Mr. FIELD drew attention to the Act, and suggested that the case might not come within the meaning of the statute.

Mr. COOPER, however, contended that the smallest removal of a lamp would bring the party doing it within the Act. He said that doubtless Mr. Willis and those who were acting with him in the gas agitation would be very glad to pay the penalty.

Mr. FIELD said the act was clearly not done with the object of damage; and the Company had really been benefited to the extent of a night's consumption of gas.

Mr. BROWNE thought the case was within the meaning of the Act.

Defendant said there was not the slightest damage done, or the waste of a farthing's worth of gas.

Mr. COOPER having remarked that the Company did not press for a large penalty,

The BENCH inflicted a fine of 5s., and the money was paid at once.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns—furnished to him by the London Water Companies—of the average daily quantity of water supplied to the Metropolis during last month. From them it will be seen that 134,710,832 gallons, or 612,053 cubic metres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily, or 224 gallons (101·8 decalitres), equal to about a *ton* by weight, to each house, and 31·6 gallons (14·4 decalitres) to each person, against 34·1 gallons during December, 1879:—

COMPANIES.	Number of Houses, &c., supplied in Dec., 1879.		Aver. Daily Supply of Water in Gallons* during Dec., 1879.	
	1879.	Dec., 1880.	1879.	Dec., 1880.
Total supply	573,792	601,150	138,810,743	134,710,832
From Thames	275,095	288,275	68,214,415	68,365,144
„ Lea and other Sources . .	298,697	312,875	70,596,328	66,345,688
THAMES.				
Chelsea	29,945	30,540	7,663,600	8,363,000
West Middlesex	53,534	56,251	10,115,828	10,383,428
Southwark and Vauxhall . .	88,502	92,340	24,440,378	22,954,136
Grand Junction	40,285	43,051	11,652,109	12,028,580
Lambeth	62,829	66,093	14,342,500	14,636,000
LEA AND OTHER SOURCES.				
New River	129,554	132,471	27,198,000	25,344,000
East London	120,459	128,722	34,877,000	33,107,700
Kent	48,684	51,682	8,521,328	7,893,988

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for December, 1880, as compared with that for the corresponding month of 1879, shows an increase of 27,358 houses, and a decrease of 4,099,911 gallons of water supplied daily.

Dr. Frankland's analyses of the waters supplied last month to the inner, and portions of the outer circle of the Metropolis, showed the following results expressed in parts per 100,000:—

Companies or Local Authorities.	Total Solid Mat-ter.	Or-ganic Car-bon.	Or-ganic Nitro-gen.	Am-mo-nia.	Nitrogen, as Ni-trates and Nitrites.	Total combined Nitro-gen.	Chlo-rine.	Total Hard-ness.
Inner Circle.								
Thames—								
Chelsea	30·32	·231	·058	0	·151	·209	1·5	24·6
West Middlesex	30·60	·368	·067	0	·198	·265	1·5	20·8
Southwark	31·68	·286	·048	0	·193	·241	1·5	22·4
Grand Junction	30·78	·323	·054	0	·197	·251	1·5	20·8
Lambeth	32·22	·327	·042	0	·226	·268	1·6	23·2
Lea—								
New River	30·96	·189	·040	0	·385	·425	1·6	22·7
East London	34·98	·291	·036	0	·214	·250	1·8	23·6
Deep wells—Kent . . .	44·60	·077	·016	0	·512	·520	2·6	27·8
Outer Circle.								
Colne Valley	14·56	·076	·015	0	·343	·358	1·5	6·9
Tottenham	38·26	·107	·020	·060	0	·069	2·8	25·0

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

THE PRICE OF GAS IN PARIS.

In the last number of the JOURNAL it was stated that a report on the subject of the gas supply of Paris had been presented to the Municipal Council by the Special Gas Committee; but, in view of the approaching dissolution of the Council, it was thought that the subject should be left to be disposed of by their successors.

The report referred to was a very interesting one, giving a *résumé* of the gas agitation in Paris from its commencement by the Syndical Chambers petitioning the Municipal Council on the subject. It entered fully into the reasons assigned by the petitioners for asking for a reduction in the price of gas, and referred to the nomination of a Special Committee of the Council to deal with the matter. The appointment, by the Minister of the Interior, of the Commission to inquire into the more technical portions of the question—the Commission whose report was presented towards the close of last year, and a translation of which appeared in the JOURNAL for the 28th ult.—was next alluded to, and their conclusions discussed. The report then dealt with the cost price of gas, which the Committee found to be as nearly as possible 12 c. per cubic metre, the price charged by the Company to the consumers being 30 c. This portion of the subject

was treated at some length, and the views of the Committee thereon were freely expressed, it being pointed out that when the City's share of the gas profits was deducted, the actual selling price was brought down to 19 c. per cubic metre. Then followed some remarks as to a suggested relinquishment by the City of a portion of their share in the Company's profits—a proposition which, in view of the Municipal Budget, the Committee did not consider they could recommend the Council to agree to.

The report concluded with a draft revised agreement proposed to be entered into with the Company, upon the acceptance of the provisions of which would depend the prolongation of their concession by 40 years—viz., till 1945. The agreement consisted of 12 articles, the first of which specified that from April 1, 1881, the price per cubic metre of gas was to be reduced successively from 30 c. to 25 c., in the following manner:—From April 1, 1881, till April 1, 1883, the price was to be fixed at 27 c. per cubic metre; from the latter date down to 1885 there was to be a further reduction of 2 c., bringing the price down to 25 c. per cubic metre. In case, during either of these periods, the Shareholders' portion of the profits at any time fell below 22,600,000 frs., the City undertook to relinquish a portion of their share to make up this amount. From Jan. 1, 1885, till the end of the concession, the consumers were to participate in the profits above a fixed minimum of 22,600,000 frs., and their share was to be estimated on three-year averages—in fact, a kind of sliding scale arrangement. To provide for the increased demand upon the Company's resources, which it was presumed would result from this reduction in price, they were to be allowed to increase their share capital by 42,000,000 frs., and any loans they might contract were to be met by the issue of shares or bonds.

The foregoing are some of the principal features of the revised agreement which awaits the consideration of the new Municipal Council elected on the 9th inst. If they agree to it, it will have to receive the approval of the Government and the sanction of a general meeting of the Shareholders of the Company before it can come into force.

GOOLE GAS AND WATER SUPPLY.

At the Meeting of the Goole Local Board on Tuesday, the 4th inst.—Dr. BELL in the chair—the chief subject for discussion was the Goole and District Gas and Water Bill, which has been deposited in the Private Bill Office for prosecution in the present session of Parliament. Some disagreement having arisen between the Aire and Calder Navigation and the Board in reference to the matter, the former deposited the Bill, on their own responsibility, in due course; and this proceeding has given rise to some strong feeling in the town, and led two of the members of the Board to stigmatize it as “vindictive” of, and “harsh treatment” by the Navigation. The following letter to the Clerk of the Board, from Mr. W. H. Bartholomew, the Engineer to the Navigation, shows what is the latest phase of the difficulty:—

Leeds, Dec. 24, 1880.

Dear Sir,—I duly received yours of the 11th inst. enclosing the following resolution of the Goole Local Board:—“Resolved, subject to a clause being inserted in the agreements requiring the Navigation to light the docks and the other property of the Navigation by gas, electricity, or any other artificial light supplied by the Company and purchased from them, the agreements be accepted.”

In coming to such a resolution, the Navigation cannot but feel that, at the last moment, the Board must have overlooked that the undertakers, under the agreements, proposed to retain an interest to the extent of one-third in the capital of the proposed Goole and District Water and Gas Company, and in certain events to the extent of one-half, with a twofold object—first, to lighten any possible burden upon the ratepayers; and, secondly, for the purpose of giving the Local Board and the Shareholders at large a reasonable assurance of their continued interest in the undertaking. More than this they cannot do. The proposed Company have lodged a Water and Gas Bill, giving the Local Board an opportunity hereafter of reconsidering their position, should they think fit to do so.

The understanding throughout the negotiations having been that the whole of the agreements stand or fall together, I must, in conclusion, ask you that they shall be so treated. (Signed) W. H. BARTHOLOMEW.

The CHAIRMAN, in reply to a question, said that the negotiations with the Navigation in respect to sewers also fell through with the other. They would not now be able to get an outfall for £2000, but would have to make one for themselves.

The CLERK, after some further conversation, pointed out that from the first Mr. Bartholomew had said the agreements must stand or fall as a whole. He considered the Bill put forward as fair a one for the town as could be expected under the circumstances.

It was afterwards resolved, on the motion of Mr. BENNETT, seconded by Mr. COUSE, that the Board meet in committee and go through the clauses of the Bill *seriatim*, with the view of determining whether or not it is their duty to oppose it.

BLACKBURN CORPORATION GAS SUPPLY.

DISCOUNTS V. A REDUCTION IN PRICE.

At the Meeting of the Blackburn Town Council on Thursday, the 6th inst.—the MAYOR (Alderman Harrison) presiding—the minutes of the Gas Committee were brought up for confirmation. These stated it had been resolved that, “on all gas accounts due in April next, and in every succeeding quarter, a discount of 5 per cent. be allowed, if such accounts be paid on or before the 7th day of the second month of each quarter; and that it be an instruction to the collectors to have all bills delivered before the 21st day of the first month of each quarter.”

Mr. TAYLOR moved, and Alderman DUGDALE seconded the adoption of the recommendation.

Alderman DUCKWORTH said he was constrained to oppose the passing of the minutes of a Committee of which he was Chairman, because he objected to making a great sacrifice of money—£2000 a year—without benefiting more than a few people. He wished the Council to refer the question back to the Committee in order that they might see, after making up the accounts for the year (which they had every reason to believe would be very satisfactory), if they could not, as he intended to propose, reduce the price of gas 3d. per 1000 feet instead of granting a 5 per cent. discount. He wished the reduction to be deferred until after the first quarter of the year, which was one of the two good quarters, so that they might have some money in hand to meet the deficiency which, at the end of the year, would arise from the reduction in price. The gas-works were the property of the ratepayers, and if they would deal with them fairly, honestly, and straightforwardly, they should make a reduction of 3d. per 1000 feet all round.

Mr. HOYLE said they had gone very carefully into the matter, and were desirous of giving the full benefit of any reduction to the general body of ratepayers. A reduction of 5 per cent., however, would only affect those who paid their accounts early. A reduction in price would be far more acceptable, for all the consumers would then be benefited.

Mr. BROOKS supported the amendment, and considered the explanation given was very satisfactory. As the gas accounts were, he said, collected quarterly, he did not see why any discount should be allowed for early payment. The only persons who would be benefited by the discount were those who needed it the least, and the benefit would come from the funds of the Corporation. The great bulk of the gas consumers were working men, and it would be very unfair to allow the capitalists to get all the advantage.

Mr. WHITTAKER said he would heartily support a proposal for a reduction in price all round, which he believed would increase the consumption of gas in the town and district. He did not understand why they could not have gas for 3s. 6d. per 1000 feet, or less, and the price would have been lower than this if they had not paid such an enormous price for the works.

Mr. BEADS said this was not a new proposition. The Chairman of the Gas Committee, a year or two ago, asserted that the collecting staff required strengthening, and he (Mr. Beads) then suggested, in order to prevent increased cost, that greater facilities should be given for the payment of gas accounts, and thus lighten the work of the collectors. The Chairman had now under consideration a scheme for increasing the staff, and he believed the collectors would not be satisfied with less than £150 per year more than was received at present. If the Council adopted a system which would induce people to pay their accounts very largely at the office, they would save at present £150 a year. Reference had been made to the admirable way in which the accounts were paid, but he (Mr. Beads) considered that they were very badly paid. At the end of January it would be found that out of £20,000 due at the close of December, not more than one-third had been paid; at the end of the second month a few thousand pounds would be found uncollected; and at the end of the third month there would be still owing from £800 to £1200. If the Mayor paid his gas account quarterly at the end of the first month, and he (Mr. Beads) paid his account at the end of the second month, he (Mr. Beads) had his gas 3d. per 1000 feet cheaper than the Mayor. This had been spoken of as a capitalist's and manufacturer's question; but it would pay him better, as a manufacturer, to have a reduction of 3d. per 1000 feet than 5 per cent. discount. The town had to pay at the rate of £6000 per year for the next 70 years for the redemption of the works, and the Council were urged to delay the reduction in the price or the granting of discount, on the ground that it was unsafe. In thinking the matter over, he arrived at the conclusion that if 5 per cent. discount was allowed, so many consumers would take advantage of it that it would perhaps cause a loss of £1500. Mr. Duckworth said £2000, but if this were so everybody would get the benefit. Taking the probable loss at £1500, they would have to set against this sum the interest accruing from early payments, which would amount to perhaps £200 a year, and £150 saved in collection; so they would reduce the loss to £1150, and would be able to propose a reduction perhaps twelve months hence of 2d. per 1000 feet all round. They would thus secure better collection, and a reduction earlier than could otherwise be expected. Under the present system, too, there was a possibility of partiality in collection. This would not be so under the discount system, which was commercially sound.

Mr. ABRAHAM said Mr. Beads had made a great point of the very small proportion of accounts which were paid at the end of the first month, but how could the Council expect much to be paid when consumers did not get their bills until the end of the month? Before the bills could be made out 19,000 meters had to be examined, minute calculations had to be made in connection with each, and all this had to be done before they could expect any payment. Mr. Beads's proposition was that those who paid before the 7th day of the second month should be allowed discount, and he expected that two-thirds of the whole amount would be paid by this time. As matters stood at present they received two-thirds of the amount due before the end of the second month, and before the end of the third month—or two months after the accounts were delivered—they had all the £16,000 or £17,000 paid except £800 or £1200. This showed that the accounts were well collected. Of the total revenue of £60,000 the average bad debts amounted to from £102 to £104 per annum during the last three or four years, and how could this be compared with the rates department, in which there were thousands of pounds lost every year? Some people would like to add a new gospel to their New Testament—the gospel of discount—by which the rich alone benefited. For the discount allowed, however, it would not be worth the while of tradesmen and workpeople to put themselves to inconvenience and the loss of two or three hours in the middle of the day for the purpose of deriving the small benefit that would be conferred, and he considered that it was unfair and unjust to cut off 8000 or 10,000 consumers from the benefit that it was intended to confer. He held that it would be better to make a reduction in price, and if at the end of twelve months they could do something more, they might give 2½ per cent. to those consumers who were so fond of discount. The recent gas exhibition was promoted for the purpose of encouraging the working classes to consume more gas than hitherto, and now they were giving them “a slap in the face” by proposing to grant discount which would alone benefit the large consumers. He hoped the amendment would be carried by a large majority.

Mr. SLATER said he did not see why the Gas Committee should make any bad debts, as consumers had to pay deposits before they were supplied with gas.

Alderman PARKER supported the amendment, because it was, he said, merely a matter of referring the subject back to the Committee, and he could not see a great deal of difference between the 5 per cent. discount proposed and the reduction of 3d. per 1000 feet, which would amount to about 6 per cent.

Alderman DUGDALE said that he advocated, with Mr. Beads, the discount principle, and still adhered to it; and he had not heard anything, with all due deference to the speakers in favour of the amendment, to alter his views on the subject. If gas was to be supplied cheaper, the gas department would have to be worked on true commercial principles, and discount would have to be considered in every transaction. It was true, as Mr. Beads had said, that it was in contemplation to increase the staff, as from all accounts the present collectors had to work both early and late.

Mr. TAYLOR, in replying to the remarks that had been made, said he strongly supported the discount principle because it was only just and right. A man who paid his accounts promptly should have some consideration shown to him; and one could not go into any business in life but it would be found that a man who paid promptly gained an advantage over one who did not. Giving a discount in the other departments of the Corporation had so far acted very well, and he strongly urged the Council to pass the resolution on the minutes, because he believed the gas department could not only afford a discount now, but a further reduction of 3d. per 1000 feet might be made in March. A profit of £4000 was made last year, and he did not see why they should not make £6000 this year, as the consumption of gas would be greater.

The amendment on being put to the meeting was declared to have been carried by 30 votes to 12; thus referring the question back to the Committee for re-consideration.

THE GAS QUESTION AT LINCOLN.—The poll which was demanded at the recent meeting of ratepayers of Lincoln—on which occasion the proposal of the Corporation to promote a Bill to purchase the Gas Company's undertaking was negative—has been fixed to be taken between next Friday and the following Wednesday. A meeting of the Town Council is to be held on the 29th inst. in regard to the matter.

THE SHEFFIELD TOWN COUNCIL AND THE WATER COMPANY'S BILL.

At the Meeting of the Sheffield Town Council on Wednesday last—the Mayor (Mr. A. Brooksbank) in the chair—the minutes of the Water Committee were brought up for confirmation. On a motion being made with this object,

Alderman BEAL drew the attention of the Council to a resolution on the minutes, to the effect that a deputation, consisting of Aldermen Pye-Smith and Mountain and Messrs. Hobson and Bramley, be appointed to wait upon the Directors of the Sheffield Water Company to ask them if they were disposed to consider some suggestions which, in the interests of the ratepayers, the Committee wished to make concerning the Bill deposited by the Company. He affirmed that the Water Committee were not instructed to go to the Company upon any such grounds as those stated in the minutes, and he wished to know what objections the Committee had to the Bill as it stood. The time had arrived when it was necessary for the Council to be very cautious in dealing with the Water Company, for the period was running out when the Company were allowed to charge the town an additional 25 per cent. He had a strong objection to any public company connected with Sheffield increasing its borrowing powers, and if they were ever to make a fair and reasonable bargain for the concern, they must hold the Water Company to their present position. The composition of the Water Committee would, he thought, be found inconvenient, because two of its members had interests in the Water Company, either directly or indirectly. He trusted the Council would not adopt this portion of the minutes, but confine the Committee to the duty imposed upon them—that of reporting to the Council on the Company's Bill.

Alderman HARVEY said he could have wished to see the Committee differently constituted, and he recommended the Council to watch closely the proceedings of the Company.

Mr. CLAQUE asked that a letter received from the Directors, after they had declined to receive the deputation, be read.

The MAYOR said the letter was simply a polite refusal to meet the deputation.

Alderman PYE-SMITH said there had been some correspondence with the Company, and the last letter came only a day or two previously, leaving no time for the Committee to meet and have it entered upon the minutes. The Committee, through the Town Clerk, asked the Directors to meet a deputation, and in reply Mr. Broomhead, on Dec. 28, wrote as follows:—

I am sure that I may vouch for the readiness of the Directors of the Water-Works Company to meet a deputation of the Town Council upon any matter in which the interests of the ratepayers and the Company are jointly involved. I must be allowed to say, however, that I cannot see the use of an interview merely to receive suggestions which, of whatever nature, must in the first place require time for consideration by the Board. If you will kindly state in writing the suggestions the Committee desire to offer, such suggestions shall be laid before the Board, and if the same can in any way be entertained by them, I shall then be glad to arrange for such an interview as you suggest.

The Committee, observing the absence from the Bill of any clauses bearing upon the interests of the ratepayers, more especially with regard to the baths question, forwarded the following suggestions to the Directors:—

(1) That the Directors should consider the propriety of inserting in the Company's proposed Bill clauses to carry out the spirit of the third clause of the parliamentary notice of the Bill referring to section 81 of the Act of 1853, especially in the hope that thereby the much-vexed baths question may be reasonably settled. (2) That the Directors should consider the question of the supply of water by hydraulic pressure, if the difficulty in the way of the Company on that subject is a legal one, which cannot be overcome without further parliamentary powers. (3) That the Directors should consider whether 16 years is not too long an extension of the time for making the Broomhead and More Hall reservoirs and the Wadsley service reservoir, having regard to the future wants of the town. (4) Whether the Company intend that the new preference shares to be issued shall rank after the preference shares already issued either as to capital or interest.

The reference to the preference shares was put in at the instance of certain members of the Committee, and was considered more a matter for the Shareholders than the ratepayers. After they had forwarded the suggestions, Mr. Broomhead wrote on Jan. 7 as follows:—

Replying to your communication of the 31st ult., which I have to-day submitted to the Directors, I am instructed to inform you that the Bill was not intended to contain, and does not contain, any matter affecting the rights and interests of the Town Council, or of those whom they represent. I am, however, to explain—(1) That the baths question is still *sub judice*, and is therefore not a subject for parliamentary action. (2) That for several years past the Company have been willing to afford supplies of water for motive power, subject only to such usual conditions as are necessary for the protection of domestic and other statutory consumers, and the proper conduct of the undertaking. (3) That the proposed extension of time does not limit the period within which any authorized additional works may be made. The Eadsen and other works will be made by the Company at any date at which they are likely to be required. (4) This matter is provided for by the 13th section of the general Act, the short title of which is the Companies Clauses Act, 1863, to which I beg to refer you. After these explicit explanations, you will probably think with me, that the proposed interview is unnecessary. You will be so kind as to regard our correspondence as being without prejudice, and as not to be used or referred to in any parliamentary proceedings.

Mr. HOBSON thought the correspondence ought to come before the Committee before being discussed by the Council. The Directors evidently regarded it as a money Bill, and one for an extension of time in the construction of their own works. The Bill did not propose any increase of rates, and all matters were left out which might make it an object of attack.

Alderman TOZER said it would be to the interest of the Council if they left the correspondence to the Committee, and ceased the discussion, which was doing more harm than good.

Alderman CLEGG approved of the course already taken by the Council, for it would be very unwise, he said, to present a petition against the Bill, without trying first to negotiate with the Company. Not to meet the deputation was, he thought, a very unwise proceeding on the part of the Directors. He strongly objected to the extension of time for the completion of the Company's works, and pointed out how the proposed increase of borrowing powers would result in a still greater amount of capital being swallowed up in interest, and consequently lead to greater expenditure on the part of the Council when the time came, as come it would, when the Company's undertaking would be transferred to the town. He thought that at all events they ought to see that the ratepayers were protected, and, if it was thought necessary, to oppose the Bill. He had no doubt the town would give them the power to do so. He trusted the Council would pass the minutes, and leave the matter with the Committee.

Mr. COUPE could not see how the gentlemen on the Committee who were interested in the Water Company could “serve two masters,” and he suggested that they should retire.

Alderman PYE-SMITH thought that as the members of the Committee who had shares in the Water Company had announced that fact before they were appointed, it would be ungenerous to ask them to retire. He thought the interests of the ratepayers were perfectly safe in the hands of the Committee as now constituted.

The minutes were then agreed to.

KLÖNNE'S GAS GENERATOR FURNACES.

We have received from Herr Aug. Klönne, of Dortmund, the following table of the results obtained from his system of heating retorts as employed at the under-mentioned gas-works, principally in Germany:—

Gas-Works.	Retorts per Furnace.	Coal Carbonized per Day.			Gas Made per Day.				Gas Production.			Coke Used as Fuel.												
		Kilos.	Hect.	Tons.	Per Furnace.		Per Retort.	Per 100 Kilos. of Coal.	Per Hecto- litre of Coal.	Per Ton of Coal.	Per Furnace Daily.				Per 100 Kilos. of Coal.	Per Hecto- litre of Coal.	Per Ton of Coal.							
					Cubic Feet, Eng- lish.	Cubic Mètres.					Cubic Feet, Eng- lish.	Cubic Mètres.	Cubic Feet, Eng- lish.	Cubic Mètres.			Kilos.	Hect.	Bushls.	Lbs.	Kilos.	Kilos.	Bushls.	Lbs.
Barmen.	9	8640	108.0	8.51	2592	91539	288	10171	30	24	10754	1373	34.3	94.3	3021	15.9	12.7	11.0	355					
Hanover	9	7889	98.6	7.78	2366	83592	263	9288	30	24	10754	1128	28.2	76.2	2482	14.3	11.7	9.8	320					
Leiden	2 of 8	6378	79.7	6.28	2016	71197	252	8900	31.5	25.2	11291	989	24.7	67.8	2176	15.5	12.4	10.8	347					
Utrecht.	6 „ 7	5600	70.0	5.52	1630	57565	233	8224	30	24	10754	812	20.2	56.3	1786	11.5	11.6	10.2	324					
Offenbach	2 „ 7	7000	87.5	6.9	2100	71163	300	10595	30	24	10754	1120	28.0	78.0	2664	16.0	12.8	11.3	354					
Minden	7	7685	96.1	7.57	2292	80808	327	11543	29.9	23.9	10657	1225	30.6	84.5	2695	16.0	12.8	11.3	357					
Zwickau	3 of 7	6675	83.4	6.58	1909	67118	273	9641	28.6	22.9	10260	1081	27.0	72.5	2378	16.5	13.2	11.6	361					
Guben	2 „ 6	5950	73.1	5.86	1902	67170	317	11195	31.9	25.5	11135	950	23.8	68.0	2090	16.6	13.3	11.6	354					
Bocholt.	6	4998	62.48	4.92	1572	55518	262	9253	31.5	25.2	11291	765	19.1	52.6	1683	15.3	12.2	10.7	342					
Duisburg	4 of 6	5714	70.14	5.63	1800	63570	300	10595	31.5	25.2	11291	897	22.4	60.8	1973	15.5	12.6	10.8	350					
Kaiserslautern	6	6037	75.46	5.95	1950	68868	325	11478	32.3	25.8	11608	981	24.6	67.8	2165	16.3	13.0	11.4	364					
Tübingen	6	6000	75.0	5.91	1800	63570	300	10595	30	24	10754	960	24.0	66.8	2112	16.0	12.8	11.3	357					
Bautzen	6	6250	78.1	6.15	1848	65237	308	10872	29.6	23.7	10593	1250	31	85.6	2750	20.0	16.0	13.7	447					
Dordrecht.	5	5820	72.75	5.73	1569	55411	313.7	11079	27	21.6	9876	960	24	66.8	2112	16.5	13.2	11.6	368					
Eisenach	2 of 5	4983	62.3	4.91	1500	52974	300	10594	30.1	24.1	10789	822	20.6	56.9	1808	16.5	14.1	11.6	369					
Wormerveer	5	5120	64.0	5.1	1500	52974	300	10594	29.3	23.4	10503	742	18.5	51.1	1632	14.5	11.6	10.2	325					
Bautzen	4	4347	54.34	4.28	1200	42380	300	10594	27.6	22.1	9891	869	21.7	60.3	1912	20.0	16.0	14.1	446					
Eisenach	2 of 3	3200	40.0	3.15	963	34008	321	11336	30.1	24.1	10789	665	16.6	45.7	1463	20.8	16.6	14.5	464					
Pirna	3	3000	37.5	2.95	774	27336	258	9112	27.4	21.9	9720	630	15.8	43.1	1386	21.0	16.8	14.6	470					
Ransdorf	3	2484	31.1	2.45	723	25533	241	8511	29.1	23.3	10422	474	11.8	32.6	1043	19.1	15.3	13.3	426					
Kettwig.	2	2220	27.8	2.2	671	23697	335	11831	30.2	24.2	10791	393	9.9	27.3	871	17.8	14.2	12.4	396					
Meran	2	2531	31.6	2.5	772	27264	386	13632	30.5	24.4	10906	400	10.0	27.6	880	15.8	12.6	11.0	352					
Meran	1	1350	16.9	1.33	432	15257	432	15257	32	25.6	11471	375	9.4	25.9	835	27.8	22.2	19.5	620					

PROGRESS OF ELECTRIC LIGHTING IN AMERICA.

(FROM OUR OWN CORRESPONDENT.)

Dec. 22, 1880.

The Maxim electric light is now being exhibited in operation at the Equitable Buildings, New York City, where the small lights, rated at 15 candles, are used to illuminate the rooms of the Safe Deposit Company; the larger lights being employed to light the Company's vaults. As the lights were not in use the day I went to examine them, I can only give the opinions of those who have seen the lamps in operation, and the weight of such opinions is that the light afforded by the lamp is not so pleasant as that produced by gas. According to a series of tests made by Professor Morton, the results of which are published in the *Sanitary Engineer*,* it would seem that the Maxim electric system develops about 120 candles per horse power when giving a light of 50 candles.

It has been an open secret since the fall, that the Brush Electric Light Company had secured permission to light up with their lamps a section of the Broadway in New York City. The conditions under which the Company gained the privilege were, that the experiment was to be conducted at the Company's own expense, and the City Authorities could compel the Company to remove the lamps whenever they chose. The scene of the experiment is Broadway from 14th to 34th Streets, a distance of about a mile. This is the fashionable shopping quarter of New York City; the street being lined on either side by large stores. Two parks or open spaces are included in this portion of Broadway. In the early part of this month work was commenced by the erecting of the lamp-posts, 20 feet in height, the lower portion of them resembling gas lamp-posts, while on the upper part projections are cast to aid the workmen in climbing to the lamps. The posts are placed about 300 feet apart on alternate sides of the street. Each post is surmounted with a Brush light rated at 750 candles. The lamp is of the same construction as the smaller ones used by the Company in lighting buildings, the main part of the globe being of plain glass, while the lower part—for perhaps one-fifth of its height—is frosted. Thus an observer standing within a circle of 10 feet from the foot of the post sees the light through ground glass. The automatic arrangement for keeping the carbons apart consists of a magnetic mechanism connected with the upper carbon carrier, which raises or lowers it as is necessary. The wires connecting the lamps with the central station are carried on the telegraph posts. In each of the two parks or open spaces on the route, larger lamps are used, being placed on the same posts as the gas clusters. While it is intended to extend the line of lamps to 34th Street, at present the distance covered is only from 14th to 26th Streets, about three-quarters of a mile; and within this district are placed 17 Brush lamps. The central station is established on 25th Street, about two blocks from Broadway, where a Corliss engine of 100-horse power and three electric generators have been placed in position. Each of the latter are said to be able to supply sixteen 750-candle lights. The extreme distance from the station to the farthest lamp is about four-fifths of a mile. Thus all the preparations for the experiment were completed on the 18th inst., and a preliminary test, to try the connections, was made, on the following evening—Sunday, Dec. 19. The lights were kept going more or less for a few hours, but the first regular trial was made on Monday evening, the 20th inst. Half-past five was the hour appointed for the test, and everything was in readiness before the hour arrived. It was intended that the young daughter of the Treasurer of the Company should turn on the generator, and a large number of persons were present to witness the ceremony. A change in the programme was, however, made so that Engineer McGrath had the honour of turning on the current for the first public illumination by electricity in New York City. At first the lights appeared as mere bright dots, but gradually assumed the full dignity of an electric light—burned irregularly at first, but soon settled down to a comparatively steady light, brilliantly illuminating the thoroughfare. At this early day authentic figures in regard to the cost of the light cannot be obtained. The remarks occasioned by the novel spectacle when the lamps were first lighted, were varied, some predicting the early ruin of gas companies, while others turned with relief from the dazzling electric light to the soft, mellow gaslight. While it is admitted that the street is brilliantly illuminated by the new light, it may justly be asked, *cui bono?*—what purpose is served by having such a surfeit of light? It is also to be noted that the gas-jets are kept lighted during the experiment, so that it is not a dark street, but one already lighted, that the new light shines upon.

* See ante, p. 24.

The number of gaslights in this section of Broadway, including a couple of clusters in the two parks, is about 70. Besides the electric lights on Broadway, 18 additional ones were, it is said, in operation on the evening of the first trial, in order to test the capacity of the engine and generators. The lights will be kept going every night until the City Authorities come to a conclusion in regard to their adoption permanently.

The "Edison Illuminating Company of New York City" is the name of a recently incorporated Company, having for its object the illumination of the streets and houses of New York City with the "perfected" Edison light. This Company are desirous of procuring an ordinance from the Board of Aldermen, granting them full power to lay their conductors through the city. As an aid to this object, the Aldermen were invited by the Company to visit the inventor's abode at Menlo Park, and see the light in operation. The invitation was duly accepted, and on the evening of Dec. 20 the City Fathers had an opportunity of seeing the place lit by the Edison light, and were permitted to examine the laboratory and machine shops of the inventor. I will not, however, follow the gentlemen in their ramble around the premises, but will note the figures reported to have been given by the inventor. The most important one is that he will give as much light for 1 dol. 50 c. (6s.) as that afforded by 1000 feet of gas, the New York price for which is 2 dols. 25 c. (9s.). When, however, I state that the bids received by the Department of Public Works of New York City for supplying gas to the markets and public buildings for the year 1881 ranged from 1 dol. 75 c. (7s.) to 1 dol. 80 c. (7s. 2½d.) per 1000 feet, it will readily be seen that there is yet some hope for the gas companies. An 80-horse power engine drives the five dynamo-electric machines which generate the electricity for the 290 lamps in use at Menlo Park. I also gather from the report of the Aldermen's visit that some small lights of 4 and 6 candle power are to be made for use as night-lights in sick-rooms. The part of New York where the inventor says his Company will commence operations is down-town—the business portion of the city. It is odd that this section should be selected, as no lights, comparatively speaking, are required there, save in the streets. The motive power to be required is based on seven lamps to the horse power.

THE BIRKENHEAD TOWN COUNCIL AND THEIR GAS AND WATER BILL.

A Meeting of the Birkenhead Town Council was held on Wednesday last—the Mayor (Mr. W. Laird) in the chair—for the purpose of considering the clauses of the Birkenhead Corporation Gas and Water Bill, to the promotion of which in Parliament the ratepayers of the borough have already given the necessary consent.

The Mayor having opened the proceedings, a discussion arose on the preamble of the Bill, the adoption of which was moved by Mr. T. S. DEAKIN and seconded by Mr. RAWCLIFFE.

Mr. BOOTH held that before going to Parliament for additional powers, the Council ought to be thoroughly satisfied that their present powers were fully exhausted. He went on to give figures for the purpose of showing that there were ample resources in both the gas and water works for ten years to come.

Mr. E. DAVIES, although not wholly agreeing with Mr. Booth, urged that there was no immediate necessity for an extension of the water-works.

Mr. RAWCLIFFE defended the action of the Gas Committee, whose patience, he said, was nearly exhausted. It had been conclusively shown that at the end of 1880 the retort capacity of the gas-works would be exhausted, and unless further powers were obtained there was great danger that a section of the ratepayers would be deprived of a proper supply of gas. With regard to water, he had to urge the expediency of the Corporation keeping ahead of the consumption. They had been saving water for some time, but all their saving merely enabled them to keep abreast of the increase of population; and if they neglected the proposed extension, a time would come when a section of the inhabitants would be without water.

Mr. LITTLE objected to a clause of the preamble declaring the expediency of acquiring all or part of the undertaking of the Wirral Water-Works Company. Pointing out that the price asked for the undertaking would be about £120,000, he urged that, although the sum would be fixed by arbitration, the Corporation would find themselves saddled with a large expenditure. He therefore moved as an amendment that the clause be not inserted in the Bill.

Alderman MORRIS seconded the amendment.

Mr. T. H. JACKSON said the advantages to be derived from the purchase of such an undertaking were incalculable, for the Council would not only have the pipes and fittings over a large district, but also an immediate annual income of £3000 or £4000.

On a vote being taken, the amendment was lost. It was then decided to postpone the adoption of the preamble until after the discussion of the clauses.

Mr. BOOTH moved the rejection of a clause which bound the Corporation to an agreement entered into by the Commissioners, in 1867, and Mr. R. Vyner, the owner of lands near Bidston, required for the purposes of water-works, and in respect of which the Bill provided for certain extensions. He held that the effect of the clause would be to give away 50,000 gallons of water, and to saddle an annual cost of about £3510 upon the Corporation.

Mr. DAVIES seconded the motion.

Alderman MORRIS protested against the proposal, and wished to state publicly that Mr. Vyner, not being able to keep his tenants owing to the deficient supply of water, was compelled to come to terms with the Corporation.

Mr. T. S. DEAKIN, calling the attention of the Council to the circumstance that they were in want of an additional supply of water, asked where, failing purchase of the Wirral undertaking, they were to go for a supply. He pointed out that the gratuitous supply to the district in question would only amount to about one-tenth of the quantity of water which the land was expected to yield, and urged that there was nothing unreasonable, when draining Mr. Vyner's land of its water, which would be inevitable when the wells were sunk, to give him a suitable return.

On a vote being taken, the amendment was lost.

The clauses and preamble of the Bill were then passed, but subject to confirmation by a subsequent meeting of the Council.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the American Gaslight Journal.]

(Continued from p. 64.)

After the discussion that followed the reading of Mr. Pearson's paper on "The Working of the Lowe Process at Toronto," the PRESIDENT called on Dr. E. G. Love, the Gas Examiner to the Department of Public Works of New York, for some remarks he had promised to make on the subject of

GAS-BURNERS.

Dr. Love said he regretted that the duties of his position had prevented him completing the series of experiments he had planned, and a short account of which he gave at last year's meeting of the Association.* He had made certain experiments to determine what burners should be adopted in testing for illuminating power the gases supplied to the city of New York, where the conditions were somewhat peculiar, and did not exist throughout the country. Three years previously the photometrical stations of the Department of Public Works were established, and the burner question received considerable attention. The contracts which the city made with the Companies contained a clause—taken from English contracts—to the effect that the burner to be employed should be an Argand of 15 holes, with a 7-inch chimney, by which burner the gas should give the light of 16 candles. The best burner corresponding with this specification was the Sugg-Letheby, and consequently it was used, although he stated that it was out of date, and earnestly recommended that a change should be made. It took considerable time to bring about the change, as it was not effected until January last year. The Companies were now allowed to select such burner as they found best suited to their gas, provided it was within the reach of the consumers. As the proposed change would show the gas to be of higher illuminating power by at least 2 candles, and so allow the Companies to lower the quality by this amount, it was necessary either to raise the standard from 16 to 18 candles, and test by the improved burner, or to allow the Companies to use the improved burners, provided the illuminating power did not fall below the 16-candle standard as indicated by the Sugg-Letheby burner. As some Companies preferred the latter plan, it was adopted. The coal gas throughout the country would probably average from 14 to 16 candles, while the average illuminating power of the coal gas of New York was from 18 to 20 candles. He made a series of experiments with Argand burners, having in mind the requirement that the burner adopted should be one that could be used by consumers. For this reason he thought best to leave out the Argands of foreign manufacture, on account of their high price; and as the Argands of American manufacture gave results little or no better than the flat-flame burners on this quality of gas, he decided that, on the whole, it would be better to adopt a flat-flame burner. As he stated in the paper read at last year's meeting, coal gas and naphtha gas should not be tested by the same burner, and as the flat-flame burner was decided upon for coal gas, it seemed clear that the flat-flame burner should, with even greater reason, be used for naphtha gas. There were to be found in America a great many flat-flame burners, a large proportion of which possessed no specially redeeming feature. In regard to the flat-flame burners of foreign manufacture, there was one made by Mr. Bray, of Leeds, which, at about the time the question arose in New York, was attracting considerable attention, and with which he (Dr. Love) made a number of experiments. He learned that the burner was to be put in the American market at a comparatively low cost, in the hope that it would replace burners of home manufacture. A comparison of the Bray burners with the better burners of American make showed, in the testing of coal gas, very little difference in the results; but with the naphtha gases the Bray burner proved somewhat superior. Before adopting a burner, he addressed a communication to the several Gas Companies of New York, giving the results of his experiments, and asking them if they wished to express any choice as to a burner. The Manhattan Company was the only one which offered any suggestions on the subject. They recommended a burner called the "Empire," which was being introduced by them for their consumers, corresponding with No. 4 or No. 5 of the Bray series. It was a brass burner with a screw check, and in the present instance was provided with a 5-foot tip. The burner was now used in testing the gas of the Manhattan and Harlem Companies. The burner decided on for the naphtha gases was Bray's slit union, No. 7, and, so far, he had not had reason to regret the choice. As to getting the maximum amount of light from the gas, he thought the burner did it as satisfactorily as any he had seen. The experiments of the past year strengthened the opinion he had expressed, that no one burner could be adopted for the various illuminating gases made in America. With a coal gas of from 14 to 16 or 17 candles, better results could be obtained by the use of some improved form of Argand; but with the various gases involving the use of naphtha, there was great advantage in employing a flat-flame burner.

Mr. ALLEN, on the invitation of the President, then gave some statistics and figures in reference to the working of the Allen-Harris process of water gas manufacture, which has been in use for the past five years at

Poughkeepsie; and, in the course of the subsequent discussion, made the following statement as to the cost of the gas:—

August, 1880.

Gas manufactured	1,760,600 feet.
Average daily consumption	57,213 "
illuminating power	17' 63 candles.
Materials used—	
14,287 tons of stove coal, at 4'75 dols.	67'00 dols.
41,422 " grate coal, " 4'45 "	183'34 "
1,317 " chestnut coal, " 2'71 "	3'10 "
7760 gals. of naphtha, at 34 cents.	271'60 "
Labour in works, four men	201'50 "
Total	726'54 dols.

September, 1880.

Gas manufactured	1,937,300 feet.
Average daily consumption	61,577 "
illuminating power	17' 89 candles.
Materials used—	
14 tons 59 lbs. of stove coal, at 4'75 dols.	66'62 dols.
44 " 1098 " grate " 4'45 "	198'00 "
7 " 2200 " chestnut coal, " 2'71 "	21'65 "
8561 gals. of naphtha, at 34 cents	290'63 "
Labour in works, four men	195'00 "
Total	780'90 dols.

Mr. GOODWIN, also at the request of the President, made the following remarks in regard to

HEATING BY GAS.

I have frequently been asked as to the heating power of gas-stoves, and as to the best form for utilizing the heat produced by the combustion of gas in them. These questions cover considerable ground. In order to answer them as intelligently as possible, I have made a few experiments, and will give you the result.

I constructed a portable room, so arranged that the walls could be set up in a large room and removed at pleasure. Its size was 8 feet by 8 feet and 10½ feet high—equal to 672 cubic feet of space. The entrance to the room was through a door. A space of 1 inch was allowed round the room, between the bottom of the walls and the floor, for the free circulation of air from the outside; the walls of the room were supported on blocks at the four corners, the doors and windows of the large room in which this room was placed being thrown open.

My tests were to determine the difference in heating capacity between stoves containing atmospheric burners and those containing burners for illuminating gas and copper reflectors, and an arrangement of drum through which air passed and was heated before entering the room. The form and construction of the stoves tested will be seen in the accompanying illustrations. Fig. 1 shows the internal construction of the atmospheric burner stove; and fig. 2, that of the stove using the illuminating gas and having a reflector.

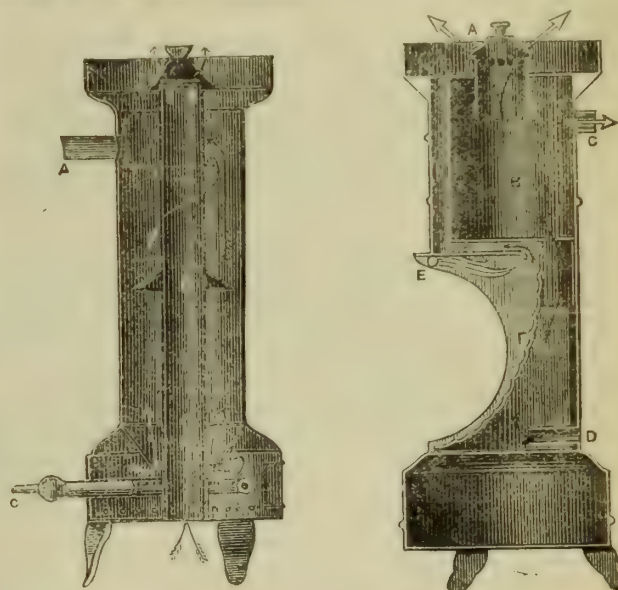


FIG. 1.
A. Pipe to flue.
B. Current of heated air.
C. Gas supply.

FIG. 2.
A. Heated air outlet to room.
B. Drum. C. Burnt gas outlet.
D. Fresh air inlet.
E. Gas-burner. F. Reflector.

The following is the result of the tests with stoves 8 and 9 inches in diameter:—

The 8-inch plain heater, atmospheric burner, connected with outside room to carry off the products of combustion:—

Time.	Temp. Outside.	Temp. Inside.	Meter Register.
2 h. 0 m.	70°	71°	479 feet.
2 h. 37 m.	70°	84°	485 "

Time, 37 minutes; consumption of gas, 6 feet; increase of temperature, 13°; pressure, 1½ inches; 672 cubic feet of air heated 13° = 1 cubic foot heated 8736°.

The 8-inch reflector heater, with illuminating burner, connected with the outside of the room to carry off the products of combustion and convey fresh air to the stove:—

Time.	Temp. Outside.	Temp. Inside.	Meter Register.
9 h. 17 m.	70°	70°	426 feet.
9 h. 55 m.	71°	91°	432 "

Time, 38 minutes; increase of temperature, 21°; consumption of gas, 6 feet; pressure, 1½ inches; fresh air admitted to the room through the stove, 40 cubic feet; temperature on entering stove, 70°; temperature on leaving stove, 280°; 672 cubic feet of air heated 21° = 1 cubic foot heated 14,112°. This shows an increase of 5376° per cubic foot over preceding test = 61 per cent.

Test of a 9-inch heater, with atmospheric burner, connected with the outside of the room to carry off the products of combustion:—

Time.	Temp. Outside.	Temp. Inside.	Meter Register.
12 h. 52 m.	71°	72°	472 feet.
1 h. 28 m.	71°	84°	478 "

* See JOURNAL, Vol. XXXV., p. 95.

Time, 36 minutes; increase of temperature, 12°; consumption of gas, 6 feet; pressure, 1½ inches; 672 cubic feet of air heated 12° = 1 cubic foot heated 8064°.

Test of a 9-inch reflecting heater, with illuminating burner, connected with the outside of the room to carry off the products of combustion and convey fresh air to the stove:—

Time.	Temp. Outside.	Temp. Inside.	Meter Register.
10 h. 28 m.	67°	70°	455 feet.
11 h. 5 m.	69°	90°	461 "

Time, 37 minutes; increase of temperature, 20°; consumption of gas, 6 feet; pressure, 1½ inches; fresh air admitted to the room through the stove, 50 cubic feet; temperature on entering stove, 67°; temperature on leaving stove, 280°; 672 cubic feet of air heated 20° = 1 cubic foot heated 18,440°. This shows an increase of 5376° per cubic foot over the preceding test = 66 per cent.

The stove (fig. 2) is constructed so as to take a certain quantity of fresh air from the outside of the room, by means of a pipe connected to the lower part of the stove. The air is conducted to an internal drum, heated at the bottom and side by the gas, the products of combustion from the gas being passed out of the stove through a pipe, and thence conveyed to a flue, or outside the room, thus preventing the contamination of the air, and the unpleasant odour so often noticed where gas-stoves are used in close rooms. In the plain heater (fig. 1) first tested the increase of temperature resulted almost entirely from radiation, whereas with the stove shown in fig. 2, there was the benefit of reflected and convected heat. Thus it will be seen that the 8-inch reflector showed an increase of 61 per cent., and the 9-inch 66 per cent. over the plain stoves of the same outside dimensions, consuming the same quantity of gas in practically the same time—the actual difference being a minute in each test—with an introduction of fresh air into the room through the stove after being elevated to 280°, and all the products of combustion removed from the room. *It is all wrong, in my judgment, to undertake to put a gas-stove into a close room without providing some means to carry off the products of combustion.* It prevents the increased use of gas heaters more than anything else you can do.

I have made some tests as to the amount of heat developed, and the quantity of gas consumed, in a given time in gas-cooking stoves. The time of each test was 10 minutes:—

Number of Stove.	Capacity of Oven. Cubic Inches.	Gas Consumed. Cubic Feet.	Temperature. Degr. Fahr.
5	780	1.9	420
7	1122	2.3	360
8	1635	3.1	390
9	1635	3.8	480
10	3465	5.1	460
11	3153	5.7	420
12	4752 (large oven)	4.2	360
12	2016 (small oven)	3.3	360

It will be seen by examining the above figures that the large stoves are more economical than the small ones, when the size of oven, quantity of gas consumed, and temperature are computed together and compared with the Nos. 5 and 7.

I will state that three No. 10 stoves do the cooking for the patients in the Cincinnati Hospital. When I visited that institution some time ago these stoves were cooking the food for 450 patients and their attendants, at a cost of 35 cents per day. The Superintendent of the Hospital made a test of the following character. The stoves were placed in the Hospital, with the understanding that they were to be tested in competition with the coal range then in use. I did not know the cost of coal used, but resolved to make the trial, with the distinct understanding that unless the gas-stoves proved more economical than the range they were not to be accepted.

The test was as follows:—The coal used in the ranges for 7 days was carefully weighed. At the end of this time the same weight of coal was placed in the retorts of the gas-works, and turned into gas and coke. I do not remember the figures exactly, but, whatever the amount of coal consumed in the stoves, all the cooking was done with 50 per cent. of the gas made from the coal, the other 50 per cent. being used for illuminating purposes; besides this they had all the coke remaining after the gas was made. It is only necessary to say they took the stoves.

Another question I have frequently been asked is this: Why do you not use atmospheric burners altogether in heating the ovens, instead of illuminating gas? The same question has been considered in Europe. Having read in the London JOURNAL OF GAS LIGHTING of some tests that were made, bearing on the subject, I resolved to make similar ones. For this purpose I had a box constructed of tin, of a width and length to fill a No. 7 heating oven, depth 1 inch. On the front edge were placed, at an angle of 45°, two pipes, for filling the box with water and for inserting thermometers. The first test was with an atmospheric burner fixed in the roasting chamber, and the box placed about 2 inches below the burner. In the test the tin top of the box was left bright. Amount of gas consumed, 14½ cubic feet; time, 55 minutes, at which time the water was brought to the boiling point. The second test was under the same conditions with an illuminating burner. Time 55 minutes; gas consumed, 14½ cubic feet, at which time the water reached the boiling point. I then blackened the tin, and the water was made to boil in 20½ minutes, instead of 55 minutes, with a consumption of 5.3 cubic feet in each case. The tin box being within 2 inches of the burner, gave every chance in favour of the atmospheric burner.

These tests were made the day before leaving for this meeting. Had time permitted, I would have placed the vessel at the usual roasting distance, in which case the result would have been largely in favour of the illuminating burner. I think this proves quite conclusively that the atmospheric burner has not the advantage over the illuminating burner, for roasting purposes, that is supposed to exist.

Some time ago I was called upon by parties engaged in the manufacture of cigars to undertake to heat a close room, and keep up a temperature therein of about 140°, and to maintain a moisture in the room sufficient to steam tobacco placed therein. I mention this because some of you gentlemen may have in your cities manufacturers of cigars who may be disposed to try the plan, which, if adopted, helps to increase the consumption of gas. The room was about 8 feet wide, 16 feet long, and 10 feet high. The temperature was maintained at about 150°, with sufficient moisture from the evaporating apparatus to thoroughly steam the tobacco; and it proved a success. Another party, whose factory had been destroyed by fire, called upon me for the same purpose, desiring to adopt the plan in his new factory. The room was about 12 feet wide, 30 feet long, and 10 feet high. The apparatus was placed therein, and since then has maintained a sufficient moisture, and a temperature of 145°, without a variation of over 2° to 3°. The air is conducted to the burners in the heaters by a flue from the outside, the products of combustion being carried out of the room. A large evaporating-pan is placed over the heater, and circulation maintained by a considerable quantity of pipe brought into contact with the products of combustion. The water is maintained at a uniform level from the outside, by a suitable arrangement designed for the purpose. Tobacco men tell me that heretofore they have had considerable trouble in maintaining

the temperature to within 20° to 30° of what they desired, the object being to colour the leaf; and since gas has been called to the aid of the tobacco men, it has proved a success.

Mr. LITTLEHALES asked Mr. Goodwin if he had any idea of the relative cost of the gas employed, as compared with the cost of coal that would have been necessary to have accomplished the same result.

Mr. GOODWIN said the amount of gas used by the first firm was about 15 feet per hour until the temperature desired was reached, after which the gas was lowered to probably 8 or 10 feet per hour. In the large room, two burners, of 15 feet each, were placed in the heater, making a total of 30 feet per hour. After the desired temperature was attained, one of the burners was dispensed with, the other being sufficient when lowered to from 10 to 12 feet per hour.

Mr. LITTLEHALES: Was the room specially constructed for the purpose of heating by gas?

Mr. GOODWIN said it was. He told the parties that if they would construct the room in the way he suggested he would undertake the work. There was not the least difficulty in getting the heat up to 150°, which was all they required, and constantly maintaining it at this point.

(To be continued.)

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

An order has just been issued by the Chief Inspector of Meters in Edinburgh to the effect that, on and after the 2nd of May next, meters tested and found correct will bear the year and month in which they may be stamped. In order to effect this change, the stamp will require to be enlarged, and the Inspector gives the sizes for the caps for sealing.

On the evening of the 10th inst., the employees of the Edinburgh Gas-light Company held their annual supper in John's Coffee House—the establishment which has been immortalized by Sir Walter Scott, and which, in the olden times, was the place where the clerks of the Court of Session daily assembled for their "meridian." The chair was taken by Mr. G. Cuthbertson, the Outdoor Inspector, and after supper he made a few remarks. He mentioned that it was ten or eleven years since the employees had ceased to meet annually to have supper, and to spend a few pleasant hours together, and within this period several old familiar faces had disappeared. His own predecessor was amongst the number; and his father, whose lengthened experience was at the service of the Company or any of their servants in all emergencies, and who was never happier than when meeting such a company as that then assembled. Then there were Robert Macfarlane, W. Brown, and W. Miller, who used to enliven the proceedings with their presence and songs. But while good men were passing to the unseen world, there was no lack of other good men to fill their places. In room of Mr. Henderson, who had just retired from the arduous duties of Superintendent, they were to have Mr. Mitchell, whose indomitable perseverance and ability had raised him to a position only second to that of Mr. Watson. Mr. Mitchell, he was sure, would find willing coadjutors in the gentlemen in the inspectors' office. He then made reference to the nature of their profession, and showed how gas was threatened by the electric light; but he said he did not anticipate that the new mode of lighting was quite at hand yet, and there was a degree of comfort to the capitalist to know that, from the £30,000,000 sterling invested in gas-works, there was an average return of fully 6½ per cent. He concluded by proposing "Success to the Edinburgh Gaslight Company," coupled with the health of Mr. Watson, their esteemed Treasurer. A number of other toasts followed, and the evening was spent in a most enjoyable manner.

The town of Portobello, the Brighton of Scotland, which is about as far behind in the matter of street lighting as its big neighbour Edinburgh, is seriously thinking of adopting the Burghs (Scotland) Gas Supply Act, and acquiring the present works from the Company. It appears, however, that some of the civic dignitaries have fears regarding the electric light, and they wish that Mr. Thomson, who has had the hardihood to propose the adoption of the Act, should fortify himself with the opinion of the leading authorities on the subject, and also with details of what has been done in burghs similar to their own. This Mr. Thomson has so far done. He has compiled statistics to show that in Kirkintilloch the Gas Commissioners had been able to reduce the price of gas from 5s. to 4s. 7d. per 1000 feet; and in Perth the balance to the good on the manufacture and sale of gas for 1879-80 was £1038. In this city the price had been reduced to 4s. 2d. per 1000 feet, and the consumption had increased 50 per cent. since 1873, the date when the Commissioners acquired the works. In Dundee the balance to the good was £1764, and the price of gas was 3s. 8d. per 1000 feet. The profits in Glasgow during the year were £7000, and the total profit since taking over the works ten years ago was £48,000. Mr. Thomson also mentions what the Manchester Corporation have been able to do with their surplus gas profits, and he concludes his statement by saying that the price of gas in Edinburgh is 3s. 10d. per 1000 feet, and that the dividend paid by the Company was 8 per cent. In Portobello the same dividend had been declared, and the price of gas was 4s. 7d. per 1000 feet. Scotchmen are proverbially cautious, and it is perhaps but right that cautious men, filling responsible public positions, should acquaint themselves with all the pros and cons of electric lighting. When they have done this thoroughly in Portobello, they will immediately take the requisite steps to acquire the gas-works.

A friend has sent me a copy of a periodical rejoicing in the not very euphonious title of "Sow and Reap; or, How to Make Money." There are many ways of making money, but from the extract I am about to give from this publication, it is plain that they have not as yet all been made known. The writer refers to the progress of the electric light, and concludes thus:—"No one will pity the gas companies. They did as they liked with the public, both as regards the adulterated article that they sold, and the supply. They never dreamed that their turn would come. It has. All over the country the stinking, explosive thing will disappear, with its sickly yellow flame, to make way for the clean daylight innovation. Investors in gas companies should therefore accept present prices as the highest ever likely to be offered to them. Gas lighting, indeed, will get into such disrepute before long that gas shares may become unsaleable." This appears in a paper published in Plymouth! It is impossible to treat such statements seriously. The writer of the above paragraph would be an interesting and invaluable addition to the paraphernalia at Menlo Park.

The appointment of Mr. McCrae to the office so long and so worthily filled by his father as Manager of the Dundee Gas-Works, seems to have been the last straw to break—not the camel's, but the ratepayer's back in that town. Last week I made reference in my "Notes" to the squabbling at the meetings of the Gas Commissioners and the Town Council on this subject, and this week I have to report that a meeting of the ratepayers was held on Wednesday evening last, to consider the "gross waste of public money" relative to various municipal matters, and that in the course of the proceedings the "hasty appointment of a Gas Manager at a high salary, and the departure from the usual competition and publicity," were condemned. Ex-Councillor W. P. Mitchell presided, and a quotation from his remarks will be quite sufficient, not

only to indicate his opinion, but the temper of the meeting. He said "he had a note asking if the Commissioners could rescind the appointment of Mr. McCrae. It was not the Commissioners who had to do with the appointment—it was the public; and he held it was a scandal to give a young man of 27 the position of Manager of the gas-works. Assuming that the young man could not complete his education till he was 18, this only gave him nine years to master the details of his important situation. He considered that the thing was a piece of clap-net, and if he had been a member of the Gas Commission he would not have sanctioned such a thing." So far as I can hear, the question of salary would not have figured so prominently in these discussions, if, indeed, it would have appeared at all, had the appointment of Mr. McCrae been less hurriedly carried through. Possibly the Committee thought that by making this appointment they were showing the esteem in which they held their late Manager; but I am of opinion that had the matter come before the Commissioners, with a strong recommendation from the Committee, the same result would have been arrived at without any of the unseemly discussions which have occurred.

For some time past complaints have been made about defective street lighting in the town of Galashiels, which has obtained a certain amount of notoriety for the excellence of its tweeds and the cheapness of its gas. Bailie Burns, at a recent meeting of the Town Council, stated that when the shops were lighted up there was no ground of complaint; but late at night, after business hours, and on Sunday evenings, each light was more like a glow-worm than a public lamp for lighting streets. A remit has been made to the Lighting Committee, to see what alterations can be made in the size of the burners.

At a meeting of the Dumfries Gas Commissioners on the 6th inst., it was reported that there was at the debit of the gas account £1730.

The Committee appointed, at a recent meeting of the ratepayers of Whithorn, to consider the proposals of the Board of Supervision, relative to the water supply of the town, have drawn up a memorial on the subject, to be presented to the Board. The object of this memorial is to show that, except for a few weeks in summer, there is no lack of water in the town; that cases of fever have been few and far between; and that, as Whithorn is situated on a hill, with the country all around sloping towards the sea, there being no locks for miles distant from it, the town cannot, except at such expense as would affect its prosperity, enjoy the privilege of a water supply by gravitation. In such a state of matters the memorialists ask the Board of Supervision not to interfere with the *status quo*.

The village of Carnoustie is greatly in need of a water supply, and the people are really anxious to obtain it; but it is in the position of the proverbial house divided against itself. Two different parishes intersect the place—namely, Panbride and Barry—and their respective interests in the village are shown by the proportion of inhabitants which each parish contains. Panbride parish has 629 of the inhabitants of Carnoustie, and Barry has 2435. As I pointed out last week, the Local Authority employed two Water Engineers to report upon competing schemes, and, as might have been anticipated, these reports were contradictory of each other. The Local Authority of Barry, backed by the opinion of Mr. McCulloch, of Dundee, are desirous of tapping certain springs not far off; but the Panbride Local Authority have resolved that, rather than take a supply which Mr. Gale, the Engineer employed by them, thinks may prove defective, they will endeavour to obtain a supply of water to flush their drains and do without a domestic supply in the meantime. All these delays and "bickerings" mean expense to the ratepayers, and as it is not at all unlikely that the Board of Supervision will step in and compel both parties to agree upon a scheme, much expense and excitement would be obviated by the exercise of a little common sense.

At a meeting of the Edinburgh and District Water Trust on Thursday last, it was reported that the total quantity of water in store was 2,344,729,000 gallons, as compared with 1,750,536,000 gallons on the corresponding date last year. A discussion took place as to the quantity of *débris* found in the pipes bringing in the new supply. Planks of wood and old shoes are among the dainties brought to town in this fashion. The matter has been remitted to the Works Committee.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the last meeting of the Town Council of Kilmarnock it was reported that the Gas Committee had appointed a Sub-Committee to co-operate with the Watching and Lighting Committee in making certain tests on the various burners in use in the street lamps, with the view of ascertaining whether or not any improvements in the lighting of the town could be suggested.

Certain members of the Hamilton Town Council had another rather unpleasant "shindy" at their last meeting, in reference to the gas minutes. Mr. Tainsh, the former Convener of the Gas Committee, was very anxious to learn what was the illuminating power of the gas which was being obtained from Auchinlea shale, as also the quantity of gas produced from the raw material. Bailie Cassels, his successor in office, replied that the illuminating power was a little over 32 candles, while the quantity of gas yielded was 9000 odd feet per ton. Mr. Tainsh was not satisfied with the reply, and as he had previously been unable to get the information which he desired, either from the Convener or the Manager, he had gone elsewhere for an analysis—namely, to Dr. Wallace. Then followed a discussion as to the value of laboratory analyses, which Bailie Cassels remarked were very misleading, and got up for advertising purposes. He then referred to the opinions expressed by certain members of the West of Scotland Association of Gas Managers as to the worthlessness of such analyses. One member had urged that he would never buy gas coal from a laboratory analysis without deducting 15 per cent., while another had said that a deduction of even 25 per cent. would be nearer the proper mark; and Bailie Cassels further stated that so far as the opinions of gas managers were concerned, Dr. Wallace's analysis went for nothing. The discussion broke off like a knotless thread, having practically no result.

The Town Council of Paisley sat as the Corporation Gas Commissioners last Tuesday, when it was reported that a special meeting had been held on the 4th inst., for the purpose of appointing a Treasurer in room of Mr. William Nairn, deceased. But before proceeding to transact the business of the special meeting, the Provost moved, and it was seconded by Bailie McGown, that they record on the books their sincere regret at the death of Mr. William Nairn, who had for 57 years been Treasurer to the Gas Trust, and had discharged his duties in a faithful and painstaking manner. The Clerk was instructed to send an excerpt of the minutes to Mr. Nairn's relatives. Mr. Alexander McKenzie Ross, of Chamberlain, was appointed Treasurer *ad interim*.

The Police Commissioners of the town of Johnstone are now beginning to look more hopefully on the prospects of their gas supply undertaking, notwithstanding the high price which, in their opinion, they had to pay for it to the now defunct Gas Company. Ex-Provost Johnston referred to the matter last night, when addressing a meeting of the electors. He said that after the gas-works came into the hands of the Commissioners, they had some little anxiety, and he had no doubt there was some

anxiety on the part of the consumers as well, which arose from the fear that they would not be able to manufacture gas and give it out at the same good quality and price as the old Gas Company. And he might add that the Commissioners went to work in a manly way, and courageously faced all difficulties, sparing neither time nor attention to overcome them. Their books had been closed, and accounts made up and audited by an efficient and respected gentleman, in whom every one must have the utmost confidence; he referred to Mr. McGown, accountant, Paisley, and Convener of the Corporation Gas Committee of that town. They had been supplied with gas of the same quality as under the old Company, and at the same price, while at the end of the year there was a balance in favour of the Commissioners—which was all to their credit—of £510 15s. 5d. Their representatives did not sit down to rest after finding such a result at the end of the year. They continued to put forth every exertion in the interest of the gas consumers. After making reference to some improvements in progress at the gas-works, he said the Commissioners had every reason to suppose that instead of a saving of some £500 last year, there would be a saving this year of between £900 and £1000. With further improvements, the Commissioners would very soon be enabled to furnish the consumers with gas equal to any supplied to the inhabitants of the surrounding towns, and this probably at a still cheaper rate than at present. The reduction in the price of gas was now only a matter of time. Mr. Hunter, also a candidate for re-election as a Police Commissioner, followed with some remarks in an equally hopeful strain.

The Committee of the Fourth Municipal Ward of this city had the gas surplus of £5000 under serious consideration at a meeting which they held on Thursday last. After a long conversation, it was agreed that the three representatives of the ward be requested to oppose any motion which may be made in the Town Council to take £5000 from the funds of the Gas Trust for improving George Square; and further, that any profits which may be realized from the manufacture of gas should, in the meantime, be allowed to lie as a reserve fund for the reduction of the price of gas, or for any other contingency which might crop up in which the ratepayers were interested. This resolution will doubtless have some weight when the matter is again brought forward in the Town Council.

At one time it was the intention of the proprietors of the *Glasgow Herald* to have the front entrance to their new buildings in Buchanan Street lighted with two of the most improved forms of gas-lamps—a "Sugg," and a "Bray." But instead of carrying out that intention, they have resorted to the use of an electric lamp, of the form invented by Mr. Brodie, formerly of Glasgow. A Gramme dynamo-electric machine is used for generating the light, but it is driven by an "Otto" gas engine of 8-horse power, which was shown in operation in the recent Exhibition of Lighting and Heating Appliances, &c. The light has on some nights been very fitful, but whether this circumstance has been due to the lamp or to the engine I am unable to say.

The Glasgow pig iron warrant market has been comparatively steady during the week. Business was done at the close at 53s. 6d. cash and 53s. 8d. one month. A number of makers have advanced the price of No. 1 iron 1s. per ton.

Household coals are in very brisk demand just now, and prices are somewhat firmer all round in consequence of the great cessation of labour in the mining districts of Lancashire.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The stoppage of work at the Lancashire collieries, to which I referred in my last report, has since become most serious, and at the time of writing there is scarcely a pit throughout all the chief colliery districts at which the men have not come out. The questions at issue between the masters and the men are, as I have previously pointed out, the adoption of the Employers' Liability Act, and the demand for an advance of wages where this has not already been conceded, and the men seem most determined to carry their points. With the exception of the Manchester district, there were very few large stocks held when the pits stopped, and this general cessation of the output has, of course, thrown the market into a complete condition of disorganization. Consumers in most cases are experiencing the utmost difficulty in obtaining supplies, and any classes of coal are being resorted to in order to keep works going; but up to the present there has not been any very serious actual stoppage of individual operations. Gas companies are being put to considerable inconvenience. The local colliery proprietors are unable to make deliveries on account of their contracts, which are for the present set aside by the usual strike clauses, and very little gas coal is now being delivered from the Lancashire pits. Already some of the companies have been compelled to come into the open market to purchase coal obtained from outside districts, for which special rates have to be paid according to circumstances, and with a continuance of the strike it is feared many of them will be placed in an extremely difficult position. The principal firms in the Manchester district, who are still supplying as far as possible their regular customers out of stock, have advanced their quotations 10d. per ton all round, but it can scarcely be said that there are at present any really fixed prices, merchants and dealers taking advantage of the state of the market to put on extra rates to buyers who are compelled to seek temporary supplies in the open market. Large quantities of coal are being brought into the district from South and West Yorkshire, Nottinghamshire, and Derbyshire; but the sudden and enormous strain thrown upon the Railway Companies coming into this district renders it doubtful whether the mere matter of carriage may not become a serious difficulty in the way of obtaining all the coal that could otherwise be sent out of these outside districts to meet the present pressure here.

The local iron market has during the week been only quiet, and the result of the quarterly meetings has not tended to produce increased activity. Buyers, being well covered for the present, are as a rule only willing to do business where deliveries are spread over long periods, and for these they are not willing to pay higher rates. Makers, on the other hand, do not care to sell forward, except at an advance upon present prices, and the result is that the actual business doing is only limited in extent. Prices are without material change for delivery into the Manchester district, local pig iron being quoted at 46s. 6d. to 47s. 6d., less 2½, and bars at about £6 per ton.

(BY TELEGRAPH.)

MANCHESTER, Monday Evening.

At some of the Manchester collieries a few men have returned to work to-day, and in the Skelmersdale district the principal pits are now working; otherwise there is no material change in the position of affairs. The continued stoppage of the output is causing increased pressure for supplies of coal, for which double the usual prices are, in some cases, being paid. Gas companies have been much inconvenienced by recent events, and have had to use up what stocks they have had on hand. It is thought, however, that the strike will be over this week.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The pressure for coal at Cardiff does not abate, and prices remain firm at from 9s. 6d. to 10s. 6d. per ton, colliery screened, for steam coals. It has been rumoured that at the latter price a quantity of coal has been sold for delivery over the year, and, if true, the transaction is an important one, as showing the existence of a belief in the permanence of the present state of things. A reference to the figures below will show that good work has been done during the week, but in some cases colliery proprietors have been suffering considerable inconvenience, in consequence of a diminished output and a restlessness on the part of the men. There have been 98,345 tons of coal shipped during the last week—an increase over the previous week to the amount of 8794 tons. Of iron 2954 tons were cleared, and about 1000 tons of patent fuel. The coal trade at Newport appears to be fully participating in the activity which prevails at Cardiff, and the demand for coal still continues very strong, most of our shippers being quite full of orders, and the prices being firm, with an upward tendency. The clearances for the past week show a large increase as compared with the shipments of the previous week. House coals are in very good request, and prices are moving upwards.

The iron-works are in full operation, and further contracts are reported to have been recently obtained by local masters. In regard to tin plates there is no change worthy of note. Chartering business is not very active just now, and tonnage is somewhat difficult to place. During the week the shipments of coal were 21,639 tons, against 15,612 in the previous week. The clearances also include 1761 tons of iron. I am informed, upon good authority, that colliery proprietors in this locality anticipate a greater demand for coal than they have experienced for years, in consequence of the great lock-out of some 50,000 miners in Lancashire.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The condition of the local coal trade is steady at late rates. There is perhaps a slightly increased demand for manufacturing fuel, but prices are unimproved. A larger tonnage of domestic sorts is being raised, owing chiefly to the continued severe weather, though the demand is not of so satisfactory a character as might be expected. From the Cannock Chase Collieries an increased quantity is being consigned to the London market; but, owing to the severe competition, rates are very low and almost unremunerative. Locomotive and gas coals sell rather better, and the contracts now in hand are finding an increased amount of employment. As regards rates generally, but little variation is expected, unless the present state of the weather continues for any length of time, when there will doubtless be a further alteration in those for domestic requirements.

The iron trade continues to show a steady and growing improvement, both in the raw and finished departments. The quarterly meetings held at Wolverhampton on Wednesday, and at Birmingham on Thursday, were well attended by buyers and sellers from various parts of the kingdom, and a more satisfactory and healthy tone prevailed. Prices were firm, and in some cases showed an upward tendency. In the finished department makers booked good orders for bars, sheets, hoops, angles, rods, and the like. The former were unaltered at £7 10s. for marked qualities, but unbranded bars were slightly higher, realizing £6 10s. and £6 15s. In galvanized sheets an unusually good business was done, as much as £7 15s., and in some few cases a point more, being reached. Singles, girder-plates, gas-tube strip, and hoops sold more freely. The pig trade may be reported in a more active condition, and prices are generally higher. Those blast-furnaces now in working order are well employed, and several smelters throughout the district are preparing additional ones. Great faith exists in the upward tendency of the market, and the prices in favour prior to quarter-day are now refused for parcels in bulk. Many of the leading all-mine makers refuse lower prices than £3 5s. for hot-air, and £4 5s. for cold-blast iron. Sales of common cinder pig, delivered at the furnaces, were made at £2 2s. 6d., which rate, however, is rather under market quotations, though a few transactions took place for inferior qualities at a few shillings below this figure. Part-mine pig is in fair request, and prices run from £2 5s. to £2 15s. At these rates smelters are refusing to take orders for extended deliveries, having full confidence that the markets will have a higher tone. Speculators are eager to secure orders in bulk for all kinds of pig at recent rates. Stocks in the hands of makers are not large, and for this reason a disposition exists to withhold. With a continuation of the present improved demand an additional number of furnaces to those already in blast may be expected. Ironstone is experiencing a better call, and prices are firm. In most branches of heavy ironfoundry a steady trade is being done, and a little improvement is experienced in the export trade.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Although likely to be only of a temporary character, the strike of miners in Lancashire has beneficially interfered with the coal trade throughout both the South and West Ridings. Manufacturing coal, in particular, during the latter part of last week was in good request, and prices as a rule increased, but the unsettled state of affairs in South Yorkshire prevents coalowners from entering into contracts.

So far as the gas coal contracts are concerned, the alteration in the tonnage rates by the Manchester, Sheffield, and Lincolnshire Railway Company is seriously perplexing colliery proprietors. Most of the contracts with gas companies are said to be for coal delivered at the works at so much per ton; so that it can readily be conceived that an increase of 4d. or 6d. per ton at a time when the margin of profit is very small, seriously interferes with the business. There is, however, a large tonnage of gas coal leaving both districts; that sent from the South Yorkshire pits finding its way to the Eastern and Midland counties, as well as to other places.

The demand for house coal at most of the Yorkshire collieries towards the close of last week was increased by the weather, which exhibited a somewhat sudden change; the chief outlet for the best qualities of coal being the Metropolis. Attention is being drawn to the fact that whilst seaborne coal showed an increase during the past year, there was a falling-off in the quantity sent by rail. Of the total decrease—357,066 tons—no less than 268,434 tons are set down to the Great Northern, which, through the Manchester, Sheffield, and Lincolnshire, receives the greater portion of the coal raised in South Yorkshire at Doncaster. The quantity of the thick-seam coal sent during last month by the Great Northern Railway showed a falling-off, six of the largest pits sending only about 2000 tons each, whilst eight of the principal collieries working the well-known Silkstone bed only mustered 14,000 tons. The London and North-Western Railway are forwarding a fair tonnage from St. John's, New Sharlstone, and other West Riding pits.

Steam coal, considering the period of the year and the quiet state of the export trade, is fairly active. The new rates will seriously interfere with the placing of new contracts, some of which, including one for Sweden for 50,000 tons of hard coal, is now in the market. Hitherto the Associated Steam Coalowners of South Yorkshire have been able to quote a price per

ton for their coal, and the rate being uniform—viz., 3s. 1d. or 3s. 2d. per ton—to Hull and Grimsby, the contracts have usually been fairly distributed throughout the coal-field; but, under existing circumstances, the tenders are certain to be more varied than was ever known before, as scarcely any two collieries are alike in rates.

The coke trade, upon which some of the pits have of late had to depend for what small profits have been made, is in a pretty active state, considering the large output, many firms producing fully 500 tons per week. The North Lincolnshire iron trade displaying a fair amount of activity, the demand for coke is large. Out of the 82 ovens at work at the North Gawber Hall Colliery early in the week, 52 have been put out, owing to an order from the Directors, but some of these were re-lighted during Thursday and Friday.

The wages agitation may be said to have assumed a harmless aspect. The officials of the Union, knowing they were powerless to enforce the advance, have issued a circular asking the owners to meet the men and confer with them on the matter. At several collieries where notices have been given, the owners have intimated their intention of discharging the top men.

A fairly active business is passing in several branches of the iron trade, so that, on the whole, things seem to have assumed a more promising aspect. The make of pig iron is fully up to the average of the past year. The number of furnaces in blast in the West Riding at the close of the December quarter was 31 out of 49 which are erected, as compared with 32 at the end of September, 31 at the close of June, and 33 at the end of the March quarter. In the North Riding during three quarters of the year there have been 101 furnaces in existence, and of these 82 were in blast during the first half of the year, as compared with 89 at the close of September, and 90 at the end of the December quarter. The foundries are rather better off for orders, and there is a fair amount of activity at the Bessemer steel-works producing railway material.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

There was an active business transacted in gas coals again last week, and the shipments by steamers from the Tyne Dock were very large. Contracts continue to be made by the leading gas companies. The snow-storms of last week, though they occasioned some delay, did not greatly block the colliery waggon ways, and the traffic was fairly manageable. The exportations of gas coals, which were to a very large extent coastwise, were a full average. The further contracts which have been concluded have been made on the lines already indicated—viz., for the very best sorts an advance ranging from 3d. to 6d. per ton, according to collieries. The house coal trade, which is intimately connected with the second-class gas and manufacturing trade improves in value a little, as the cold weather has quickened the demand. Nut coals are in strong request at from 6s. 6d. to 7s. 9d. per ton. The supplies of coke are well taken up, and small coals used by the local factories command an excellent market.

There is an abundance of coasting tonnage on offer. Stocks of all descriptions of coals are well upheld in the southern markets. Notwithstanding the fact that intensely cold and wintry weather prevails in the North, and the snow-storms and intense frost are as likely as not to continue over January, there is no special inquiry for steam or sailing tonnage. There is no advance in rates; 3s. 10½d. per ton by steamers, and 5s. 10½d. per ton by sailing vessels, the latter to discharge at the wharves, being the rates to London, and other southern ports are in proportion. There is an abundance of steam tonnage at the command of shippers at these rates.

A small amount of business was completed last week, in several instances at somewhat advanced prices, in the sale of fire-bricks for forward delivery. The contracts have not been numerous, second-class brick manufacturers, who, in many instances, in the transactions of last year, made a loss, anticipate that with present rates they will establish a profit. The ice is extending above bridges on the Tyne. It is probable that this week the channel in the upper reaches will be closed with ice, and the river traffic therefrom with craft stopped for a while.

There is little to report of the finished iron trade of the North of England. Prices are firm all round, the tendency being upwards. The steel trade is brisk. A quantity of foundry work is on hand. A moderate trade is transacted in gas and water pipes.

The timber business is quiet, the demand being small for all classes of wood. There are not any alterations in price. The lead trade is steady, with a slight improvement in prices, but sales are difficult to arrange. Copper is somewhat quieter.

REDUCTION IN THE PRICE OF GAS AT WEST BROMWICH.—At the last meeting of the West Bromwich Improvement Commissioners, the Gas Committee reported that they had resolved to make a reduction of 2d. per 1000 feet on every account where the quarterly consumption of gas is a million cubic feet.

RICHMOND (SURREY) WATER SUPPLY.—The result of the Local Government Board inquiry which was held at Richmond on the 10th ult., and which it may be remembered was relative to an application by the Select Vestry of Richmond for sanction to borrow £18,000 for purposes connected with the water supply of the town, was reported at last Tuesday's meeting of the Vestry. The Local Government Board stated that they considered £8000 would be sufficient for the proposed new well and machinery, and accordingly they limited their sanction for the purpose to this amount. As regarded the loan required for works of temporary supply, the Board would, under all the circumstances of the case, allow £8000 to be borrowed, to be repayable in 20 years from the present time.

REJECTION OF THE SALFORD IMPROVEMENT BILL.—At an adjourned meeting of the ratepayers and property owners of Salford, held under the provisions of the Borough Funds Act, on Wednesday, the 6th inst.—the Mayor (Alderman Robinson) in the chair—a motion—"That the owners and ratepayers of the borough of Salford consent to the promotion by the Council of the borough, in the next session of Parliament, of the Bill which has been deposited by them or on their behalf, intitled, 'A Bill to enable the Mayor, Aldermen, and Burgesses of Salford to make new streets, street improvements, and other works, and to make further provision for the good government of the borough and for other purposes'"—put by the Chairman and seconded by Mr. Jackson, was lost by a very large majority. The Bill cannot, therefore, be proceeded with during the present session.—At a meeting of the General Purposes Committee of the Town Council, on the following Monday, an extract was read from the report of the proceedings of the meeting above referred to. The Committee then took into consideration the present position of the Corporation as affected by the decision of the meeting, and the state of their borrowing powers. The Borough Treasurer (Mr. Hall) explained the state of the borrowing powers of the borough as a whole, and also of the three districts of Broughton, Salford, and Pendleton. It was then resolved that the Council be recommended not to proceed with the application for any parliamentary powers, or any further borrowing powers under a Provisional Order, during the present session; but that the whole question be brought up for consideration in due time for the session of 1882.

THE USE OF THE ELECTRIC LIGHT IN THE HOUSE OF COMMONS.—Last Thursday Mr. D. Grant asked the First Commissioner of Works whether any steps had been taken to test the electric light and its fitness to illuminate the House, and with what results. Mr. Shaw-Lefevre, in reply, said that experiments were made a few days before the meeting of Parliament, at the expense of the Anglo-American Electric Light Company, in lighting the House with the electric light on the Brush system. Six globes were suspended for the purpose a few feet from the roof. On personal inspection he came to the conclusion that the glare of light was far too strong, and felt certain that it would not be approved by members. The Company have since then offered to make a further experiment by placing the lights above the present glass roof, and he proposed, as soon as the arrangements were complete, to have the experiments tried on some Wednesday evening shortly after the sitting of the House, so that members might have the opportunity of themselves forming an opinion upon it.

THE NEWPORT (MON.) TOWN COUNCIL AND THE WATER COMPANY'S PROVISIONAL ORDER.—At the meeting of the Newport Town Council on Tuesday last—the Mayor (Mr. J. R. Jacob) in the chair—a report was presented from the Parliamentary and Improvement Act Committee, in which it was stated that the Committee had examined and considered the draft of the Provisional Order to be applied for this session by the Newport and Pillgwenly Water-Works Company, to enable them to raise £100,000 additional capital. The Committee were of opinion that representations should be made to the Board of Trade with a view to causing some modification of the proposed Order, and they laid their proposition before the Council. The Mayor remarked that he thought the present a good opportunity for ensuring that a thoroughly wholesome water supply should be provided by the Company for the inhabitants, and perhaps they would never have such another opportunity. Besides as it was likely the Corporation might some day wish to acquire the water-works as public property, he thought this a proper time to go before the Board of Trade, and make such representations to them on the subject as might be deemed desirable. The report was adopted.

ROCHDALE CORPORATION GAS SUPPLY IN THE PAST YEAR.—During the past year the Rochdale Corporation sent out from their works the largest quantity of gas ever supplied by them. According to published returns, the quantity of gas made from March 25, 1879, to the same date last year was 250,460,000 cubic feet. The quantity made since then up to Dec. 25, 1880, was 167,882,000 feet against 157,420,000 for the corresponding period of the previous year, or an increased production of 10,462,000 feet. The total quantity of gas consumed in the official year, ending the 25th of March last, was 222,816,000 feet. The 5th of December, 1879, witnessed the largest quantity of gas supplied on any one day in the year ended in March last—viz., 1,681,000 feet. This was, however, eclipsed last year, for on Wednesday, the 15th ult., no less than 1,778,000 feet were supplied, or the largest amount ever sent out from the works in any one day. As a

contrast to this it may be mentioned that the smallest quantity sent out in any day last year was 187,000 feet, delivered on Sunday, the 27th of June. The coal and cannel carbonized for gas-making in the year ending the 25th of March was 25,000 tons, and since then, up to the 25th ult., there were 16,000 tons carbonized, or an increase of 500 tons as compared with the corresponding nine months of 1879. There is at present spare productive power, over the largest average demand, to the extent of 400,000 feet per day of 24 hours, and this suggests that if with returning prosperity the trade and population of the town increase, much provision will have to be made for an extension of the works.

THE WATER SUPPLY OF RUGELEY.—At the last meeting of the Rugeley Local Board, the Chairman (Mr. S. Timmis) said that, at the December meeting, a deputation was requested to wait upon the South Staffordshire Water-Works Company with reference to a supply of water for Rugeley. Mr. Landor (the Clerk) and himself met the Company's Board of Directors, and found that they were anxious to supply the town with water, and that their terms were 10 per cent. on the outlay incurred. They were told that the cost of bringing water to the town would be about £5000, and the Directors said they would be quite willing, in the exercise of their powers, to reduce their terms to 6 per cent., or about £300. This, he (the Chairman) thought, would almost debar the town from obtaining the Company's water for the present. They, as a Local Board, could not guarantee the cost, the speculation being purely a private one, and he thought that, unless the water could be brought for a considerably less sum, there was no hope of getting it, at all events for some time to come. The Company were willing, however, to send an official over to Rugeley to ascertain who would take the water if the Board would appoint some one to canvass with him. Mr. Woodroffe thought it should be made perfectly clear that this was in no sense a ratepayers' question; the Local Board had no power in the matter, and the persons who took the water would have to pay for it. No action of the Board could make the ratepayers responsible; it was only the individuals taking the water who would have to pay for it, and before the Company engaged to bring it to the town they wanted to see if they would get anything like a fair return for their outlay. As regarded the terms, he thought they would have the effect of shelving the question for the next 2½ years, which was the limit of time named in the Company's Act of Parliament. The Clerk advised that the matter should not be allowed to drop. He thought if the Company sent some one over to wait upon the owners and householders to ascertain who would take the water, and they only obtained a promise of a return of £100 or £150 a year, it would be a stepping-stone towards getting the thing done. His opinion was that the outlay would not be anything like £5000, and he thought a guarantee of £200 a year instead of £300 would be sufficient to induce the Directors of the Company to commence supplying water at Rugeley. Other members spoke in favour of a canvass of the town, and the Clerk was then instructed to arrange for one.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Jan. 12, 1881.

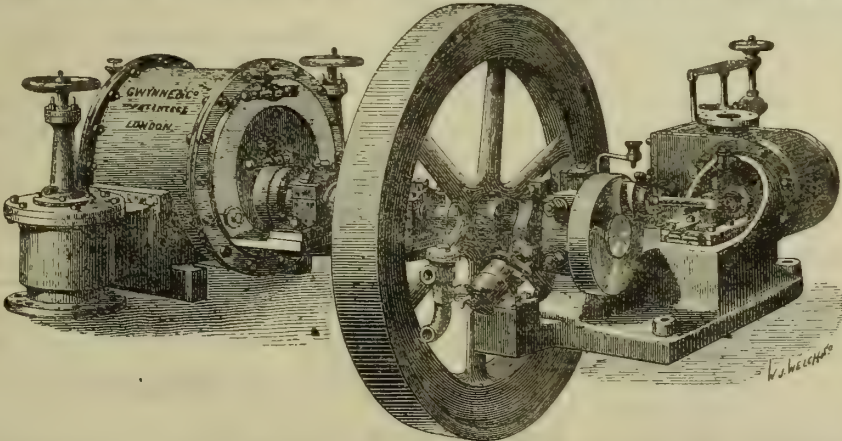
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company	Notting Hill				Station	closed	for	repairs				
	Camden Town	17.6	16.6	17.1	19.8	14.9	17.3	0.1	0.0	0.0	None.	In excess.
	Dalston	17.0	16.2	16.6	17.6	13.5	14.9	0.0	0.0	0.0	"	"
	Bow	16.9	16.4	16.7	15.1	12.4	13.5	1.0	0.6	0.7	"	"
	Chelsea	17.2	16.2	16.7	20.3	16.2	17.5	0.4	0.0	0.2	"	"
	Kingsland Road	17.4	16.0	16.6	14.3	10.9	12.3	0.2	0.1	0.2	"	"
	Westminster (cannel gas)	21.4	20.8	21.1	20.1	16.2	18.1	0.3	0.0	0.1	"	"
South Metropolitan Gas Company	Peckham	17.3	16.2	16.9	11.9	10.3	11.0	0.5	0.0	0.3	"	"
Commercial Gas Company	Old Ford	17.7	17.1	17.3	15.1	11.0	12.8	0.2	0.0	0.1	"	"
	St. George-in-the-East	17.7	16.9	17.2	11.1	6.9	8.2	0.1	0.0	0.0	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of a Pamphlet, pre-
pared for Gas Companies to distribute to Gas Con-
sumers—"Cooking & Heating by Gas;" on Burners, &c.
Copies, by post, Threepence, direct from the Author,
MAGNUS ORREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

TO GAS MANAGERS.

ASSISTANCE given in Alterations and
Extension of Works and Gas Apparatus, by an ex-
perienced Draughtsman. Good testimonials. Terms
moderate.
Address No. 711, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, a competent Foreman to
take charge of MAKING and ERECTING a
GASHOLDER, 130 ft. diameter.
Apply, stating wages required, references, &c., to CLOSE
AND AYRE, Phoenix Iron-Works, YORK.

WANTED, a Pupil at a Country Gas-
Works. Small premium or no salary. Exceptional
opportunities for learning Secretary's work, in addition to
Gas Management. Can reside with the Manager.
Address No. 712, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

BOROUGH OF COLCHESTER.

THE Office of Analyst for this Borough,
under the Sale of Food and Drugs Act, 1875, is
VACANT, and the Council are willing to receive APPLI-
CATIONS for the APPOINTMENT, which must be sent
in on or before the 29th of January inst., addressed to me
as below.

The duties are those specified in that Act as those to be
performed by Analysts to be thereunder appointed; and
the pay will be £1 1s. for each analysis up to 100, and
10s. 6d. each beyond that number in each year, and reason-
able travelling and other out-of-pocket expenses in addition.
The qualifications of each candidate will be subject to
the approval of the Local Government Board. The
appointment will be made according to the Act, and will
require confirmation by that Board to give it final validity.

FRED. B. PHILBRICK, Town Clerk.

Town Clerk's Office, Town Hall, Colchester,
Jan. 7, 1881.

TAR FOR SALE.

THE Directors of the Newmarket Gas-
light and Coke Company, Limited, are prepared to
receive TENDERS for the Purchase of the Surplus TAR
made at their Works for Two or Three years from
Feb. 1, 1881. The quantity is estimated at 25,000 gallons
per annum.

Tenders, stating price per gallon delivered on rails at
Newmarket Station, to be sent, on or before Saturday,
Jan. 29, 1881, to the undersigned, from whom any further
information may be obtained.

The Directors do not bind themselves to accept the
highest or any tender.

THOMAS WILKINSON, Manager.

THE Gravesend and Milton Gas Com-
pany have FOR SALE, Four 12 ft. square PURI-
FIERS, 4 ft. deep, with 12-in. Connections and eighteen
12-in. Donkin's VALVES, together with Lifting Apparatus,
all in fair condition, and can be taken possession of imme-
diately; also one 8-in. GOVERNOR, by Sugg, of West-
minster.

For further particulars apply to the undersigned.
S. Sowood, Manager.

GASHOLDER FOR SALE.

THE Directors of the Sleaford Gas Com-
pany, Limited, invite TENDERS for GASHOLDER,
32 ft. diameter, 14 ft. deep, including Inlet and Outlet
Pipes and Syphons, Valves, and Stone Coping of Tank.
The whole in good condition, and as the room is wanted
at once no reasonable offer will be refused.

For further particulars, apply to HARRY WIMHURST,
Engineer and Manager, Gas-Works, Sleaford, Lincs.

GAS PLANT FOR SALE.

THE Buxton Local Board have for Sale
One EXHAUSTER Engine, Bye-pass, &c., complete,
with 8-in. Connections, for 10,000 per hour, two 8-in. Brad-
dock's Compensating Governors, with bye-pass to serve
for one or both, and one circular-cased Station-Meter, by
Newton, of Oldham, 60 ft. per revolution, bye-pass, &c.,
complete.

For price and particulars apply to Mr. Geo. Smedley, Gas
Office, Buxton.

JOSEPH TAYLOR, Clerk to the Board.

AMMONIACAL LIQUOR AND SURPLUS TAR FOR SALE.

THE Penrith Local Board of Health
invite TENDERS for the AMMONIACAL LIQUOR
and Surplus TAR produced at their Gas-Works for One or
Three years from March 1, 1881.

Tenders, stating price per 100 gallons at the Works, to be
sent to me on or before the 7th of February next.

The Local Board do not bind themselves to accept the
highest or any tender.

WILLIAM E. ATKINSON,

Clerk to the said Local Board.

Public Offices, Penrith, Jan. 5, 1881.

CORPORATION OF SOUTHPORT—GAS DEPARTMENT.

EXHIBITION OF GAS APPARATUS.

THE Gas Committee of the above Cor-
poration will hold an EXHIBITION consisting of
Gas Cooking Ovens, Heating Stoves, Burners, Engines;
also other Appliances and Inventions for the Economic
Use of Gas for Domestic, Manufacturing, and other pur-
poses in the Cambridge Hall, Southport, commencing
Feb. 17, 1881, and continue the same for seven days.

Persons desirous of forwarding Exhibits are requested
to communicate with the undersigned.

JOHN BOOTH,

Manager and Exhibition Superintendent.

Gas Manager's Office, Jan. 1, 1881.

THE Gloucester Gas Company have the

undermentioned APPARATUS for sale:—
About 150 feet of D-shape Wrought-Iron Hydraulic
Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped
Wrought-Iron Hydraulic Main, size 20 in. by 20 in. An-
nular Condenser, consisting of six Vertical Pipes, 24 in.
diameter, 19 ft. high, with three 12-in. Slide-Valves and
12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power,
with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and
four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves
and 12-in. Connections.

Gasholder, Double Lift, with Cast-Iron Tank, capacity
37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in.
Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned,
R. MORLAND, Engineer.

NEWPORT (MON.) GAS COMPANY.

THE Directors of the above Company
hereby invite TENDERS for the Supply of all the
Cast-Iron MAIN-PIPES and other CASTINGS necessary
in Laying Mains, required by them during a period of Two
years, commencing from Feb. 1, 1881.

Specifications and forms of tender may be obtained from
the undersigned.

Tenders, endorsed "Tender for Pipes," to be sent to the
Chairman, Gas Company, Newport (Mon.), on or before
Wednesday, Jan. 19, 1881.

The Directors do not bind themselves to accept the
lowest or any tender.

By order,

THOMAS CANNING, Engineer.

Gas-Works, Newport (Mon.), Jan. 7, 1881.

AMMONIACAL LIQUOR.

THE Directors of the Bristol United Gas-
light Company invite TENDERS for the Purchase
of the AMMONIACAL LIQUOR made at all or either of
their three stations, situate respectively at Avon Street,
Canons' Marsh, and Stapleton Road, in the Borough of
Bristol, for a term of Five or Seven years, commencing
July 1, 1882.

The annual quantity of Liquor produced at present at
the three stations is about 24 million gallons.

Conditions of contract and other particulars may be
obtained of the Secretary, at the Office of the Company,
Canons' Marsh, Bristol.

Tenders to be delivered on or before Tuesday, May 3
next, addressed to the Chairman of the Company, and
marked "Tender for Ammoniacal Liquor."

The Directors do not bind themselves to accept the
highest or any tender.

HENRY H. TOWNSEND, Secretary.

Gas Offices, Canons' Marsh, Bristol, Jan. 8, 1881.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH

Wrought-Iron Spindles and ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT, PAGE 118.]

Phoenix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

NEW PATENT GAS-EXHAUSTERS.

[J. BEALE'S.]

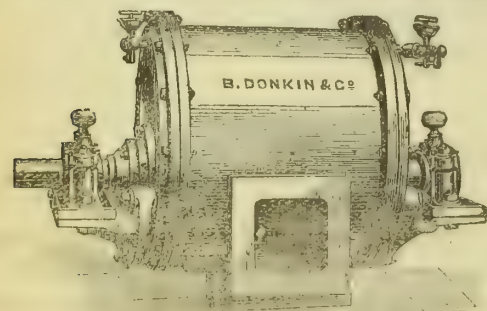
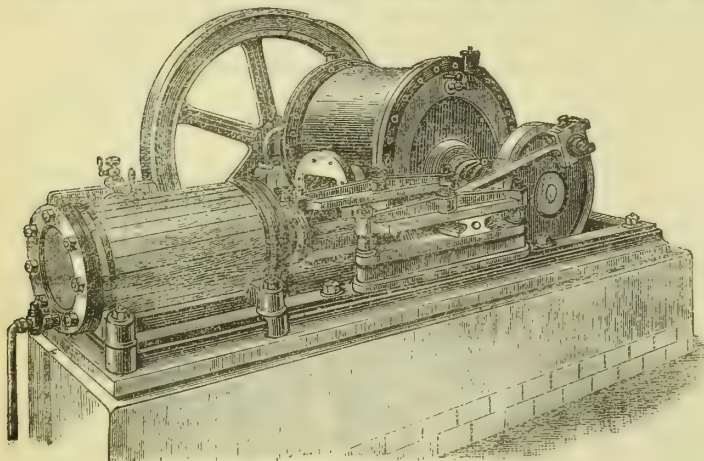
MESSRS. B. DONKIN & Co. possess the sole right to manufacture J. Beale's
Exhausters under his new patent.

MADE WITH TWO OUTSIDE BEARINGS AND LATEST IMPROVEMENTS.

ALSO MANUFACTURERS OF

IMPROVED GAS AND WATER VALVES, STEAM-ENGINES, &c., &c.

B. DONKIN & CO., BERMONDSEY, LONDON.



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NOTICE TO SUBSCRIBERS,

AS TO PAYMENT OF SUBSCRIPTIONS IN ADVANCE.

SUBSCRIPTIONS at the advance rate (21s. per annum) are now due, and must be paid during the present month to entitle Subscribers to the advantage over the credit price of 25s. a year.

Post-Office Orders should be made payable at the Chief Office, St. Martin's-le-Grand; Cheques crossed "Union Bank of London"—both drawn to the order of WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to the PUBLISHER, as above.

TO CORRESPONDENTS.

J. D.—1. You cannot recover for the leakage, in default of some agreement covering such an eventuality. The meter should have been fixed at the entrance to the private property, and the special pipes should not have been connected to your main without this provision, unless a rate for the gas to cover leakage had been previously settled upon. 2. Nothing particular.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 25, 1881.

COLD WEATHER AND GAS SUPPLY.

It is an ill wind that blows nobody any good, and, as Mr. Latimer Clark has just pointed out in a letter to *The Times*, the intense cold and heavy snowstorms which have been lately experienced all over the country will be fruitful of employment for a number of British workmen. Unfortu-

nately, the activity of the classes of operatives in question, comprising plumbers and builders' men in general, is usually attended with infinite discomfort to the unfortunate householders who have to employ them. But householders, as a body, are remarkably long-suffering, and are accustomed to submit to the inroad of the mechanic and his mate at more or less regular intervals, without any more effectual protest against the tax and intrusion than the most purposeless grumble at the iniquity of house builders and their satellites. In this climate a winter of some kind is of yearly recurrence, and in it frosts of varying intensity are certain to happen. Yet how often do persons, otherwise fairly reasonable, take possession of houses built apparently as if these elementary meteorological truths were non-existent. To say nothing here of such matters as outdoor water-cisterns and puerile rain-water fittings, it is too common a practice to have gas-pipes and meters fixed in such positions in dwelling-houses that annual trouble therefrom is almost inevitable.

Fortunately for gas consumers generally, coal gas is not itself liable to serious deterioration from cold; at least when the cold is not exceptionally severe, and the vessel or pipe containing the gas exposed to its effects in an extreme degree. We should hear of much more grave and irremediable interruption to gas supply in winter if some of the patent gas schemes of which so much was heard a few years since were in operation now, instead of the present system of lighting by coal gas. Still there is much trouble with ordinary gas when the thermometer is down among the twenties, or even lower. While naphthaline exists as a thing of dread alike to consumers who scarcely know its name, and to gas managers who know it only too well, it cannot be said that the much-abused builder and his gas-fitter are wholly to blame for the suspension of gas supply from which consumers occasionally suffer in winter and at other times. But there is no doubt that a vast amount of unnecessary trouble and loss is caused to gas consumers and to manufacturers as well, by the senseless way in which house-fittings are too often arranged.

It is most important that the gas-pipes throughout a house should be of ample capacity and well laid, to say little of the first essentials of soundness and safety from liability to accidental injury. The situation of meters, too, is an old sore with gas-makers, who have so frequently to grope for their property in unimagined holes and corners, where these delicate appliances are stowed away as if they never needed to be inspected from the time when they are so buried alive to the day of their removal in a premature state of decay. None of these points are, as a rule, looked to by the occupiers, who are in reality the chief parties concerned. Deceived and imposed upon again and again by builders, the householder who is also a consumer of gas trusts in these insidious tradesmen every summer, when, if he has any choice in the matter, he is mostly in the habit of changing his place of abode, only to find, as certainly as the new year comes round, that his meter freezes fast, and his gas-pipes get stopped up as before.

The trouble of having a wet meter frozen is a well-known infliction which has in times past led to the attempted introduction of various "patent meter liquids," warranted not to freeze, evaporate, clog the meter, or injure its material construction; but most of these preparations have gone the way of the philosopher's stone and the universal solvent, which latter, indeed, some of them were calculated to approach in their effect. The best and only way to prevent a meter from freezing is to keep it warm; and this has been discovered by many people who have, moreover, found that to ensure this condition also involves the rescue of the meter from the chill darkness of the cellar, where nothing else would keep, and its installation in a kitchen cupboard, where a constant supervision is as easy as it is in its teaching economical. Mr. Latimer Clark very truly says in the before-mentioned communication, that all pipes should be buried two feet in the ground, except in necessarily exposed situations, such as crossing areas, &c. It is a lamentable fact that a great many houses are in these times run up with the ground-floor joists almost resting on the soil, and this state of affairs inside a house is not favourable to a deep service-pipe being laid from without, and the consequence is that gas, like water, in passing into the house gets thoroughly chilled before reaching the front door, and thereupon the usual inconveniences follow in due time.

The remedy for the worst troubles of frost in the matters more particularly referred to here is the same as is alone competent to deal with that other form of annoyance to the dwellers in towns—smoke—and is to be found in an educated public opinion. A reform is more hopeful in the present case than in that whereof we have lately spoken, since in this the pre-

cise nature of the required relief is known. We have sufficiently indicated it in the foregoing remarks, and although not usually partial to compulsory legislation in the surroundings of social life, we sincerely trust that at no distant date an enlightened public feeling may render possible the enactment of Building Acts worthy of the name of laws for compelling the wilfully backward to conform to the requirements of health and comfort, as materially expressed in our dwellings. Meanwhile, those who know the weak points of such structures, wherein they are exposed to the attacks of the common enemies, frost and cold, will do good service not only directly to themselves, but indirectly to their less acute neighbours, by persistently refusing to have anything to do with houses in which the common structural precautions against these or other notorious evil influences are absent.

THE POLL ON THE LINCOLN GAS BILL.

As this number of the JOURNAL appears, the fate of the Lincoln Corporation Bill is trembling in the balance, for the poll of the ratepayers is being taken on the question of its prosecution. The principal object of the Bill is to sanction the transfer of the undertaking of the Gas Company to the Corporation; but other matters are included, which will stand or fall with the main proposition. In view of the impending vote, the Corporation have issued a statement of the circumstances under which the transfer, if acceptable to the ratepayers, will take place; from which it is difficult to imagine that the bargain will be permitted to drop through. Better conditions for the purchasers could never exist. The Company's works are in splendid order, and they are enabled to pay maximum dividends, and have an annual surplus with a low selling price for gas; they have also an invested reserve fund of about £11,000, which will be handed over with the property, and the whole will pass into the hands of the Corporation, in the terms of the agreement, for a grant to the Shareholders of perpetual annuities equal in value to their present dividends, and without other money consideration. The current accounts clearly show that the undertaking would have paid the town a profit of over £2000, after discharging all capital obligations, for the year that has just expired, and there is every reason to suppose that this surplus will be exceeded during the present year. There is thus nothing to be paid by the Council, if they get the consent of the ratepayers to the bargain, for the right of acquiring one of the finest properties ever offered to a corporate body. And yet there is violent opposition to the whole scheme, led, too, by the Mayor, whose signature is formally appended to the statement just referred to; and his Worship is reported to have taken the chair at a lecture given on Wednesday last, under the auspices of the opponents of the scheme, by the irrepressible Mr. St. George Lane Fox, who braved the prevailing inclement weather in order to tell the people of Lincoln that gas is about to be superseded by electricity. Mr. Fox intended to show how he meant himself to contribute to this desirable result by introducing his electric lamps; but the elements were against him, and he could not manage to get his apparatus delivered in time for the occasion, and as the lecturer was also suffering from an indisposition which rendered him almost inaudible, the whole thing was barely the success anticipated.

Mr. Fox, of course, advanced all the threadbare arguments in favour of electric lighting, and told his audience that he had had diagrams prepared to show them how electricity could be generated at a single station the same as gas; how it could be distributed through the streets by means of conducting mains; and how it could be laid into houses, and could be there applied for every purpose for which gas is supplied, and even with greater facility. Unfortunately, these diagrams had not been sent down from London, and he was apparently unable to say anything about them. This is to be regretted, because everybody else is anxious to possess the information which Mr. Fox's diagrams were to have given; and their absence is the more surprising as one would have thought that if Mr. Fox and his staff could reach Lincoln, the precious diagrams and other apparatus might have come in the guard's van of the same train. However, Mr. Fox says that with his diagrams he can tell us all about the practicability of the electric light, and, to settle the question of economy, he also informed his hearers that whereas a jet burning five feet of gas per hour, and giving the light of twelve candles, costs about one farthing, when gas is worth 3s. 6d. per thousand cubic feet—this light representing one-horse power—as much energy can be got from electricity for half a farthing per hour! The lecturer was careful to use the word *energy* instead of *light*, but there can be no doubt that the latter form of energy was what he meant his hearers to understand is

obtainable at the cost named. This being so, we distinctly state that neither Mr. Fox nor any one else can produce an electric light at all similar or comparable to twelve-candle gaslight for half a farthing per hour, or even at any price. Let us be clearly understood, the light must be as convenient, regular, reliable, simple, and universally suitable as the light of gas. Neither Mr. Fox nor any other electric light enthusiast would go about the country lecturing, if half the assertions made by him to his Lincoln audience, regarding the practicability and economy of the system, could be substantiated, not merely by diagrams, or by laboratory experiments, or even by showing an arc-light in a lecture-hall, but in the only way calculated to carry conviction; that is, by continuous working on a large scale, and in the manner of all other commercial enterprises.

As to the policy of stump agitation of this kind against a proposal which is solely intended to benefit the citizens, those who take part in it must satisfy their consciences in the best way they can, if they should be successful in their short-sighted endeavours, and afterwards live to see the gas shareholders pocketing profits that might, but for them, have been enjoyed by the gas consumers and ratepayers. We are not particularly anxious for the transfer, but we look upon the present example of Lincoln as a test case, not of the value of gas property—for that, fortunately, does not depend upon a popular vote, and is not yet at the mercy of Mr. Fox and his fellows—but rather of the intelligence of a community entrusted with their own government, and of the efficiency of the legal machinery by which the ultimate appeal to the people is made. For these reasons we shall regard the fate of the Lincoln Bill with an interest exceeding that otherwise due to its local importance.

THE RECENT ISSUE OF BIRMINGHAM CORPORATION STOCK.

THE tenders for the Birmingham Corporation Stock, the issue of which has been already discussed in these columns, were received at the Bank of England on the 18th inst. The amount of stock offered was £2,000,000, to bear interest at the rate of £3 10s. per cent. per annum, and redeemable in 1946. The minimum price of £98 for £100 worth of stock, at which tenders were invited, was sufficient to cause the whole amount to be taken up, for although a maximum of £101 15s. per cent. was reached, the reserve figure was also touched. Consols closed on the same day at 98½, so that the disposal of the Birmingham stock at the prices given must be considered fortunate for the Midland borough. It is stated that considerably over one-half of the stock was allotted to applicants on the morning of the day named, and that the remainder was taken up by a syndicate before the evening, and therefore the list was closed on the same day. The stock was quoted at one-half premium after the last-mentioned financial operation had been concluded, whereby it would appear that the astute body of gentlemen who took part in it found their enterprise abundantly rewarded. We congratulate the Finance Committee of the Birmingham Town Council on their success in floating this first instalment of their municipal debt. Hereafter they will experience more advantage from being able to draw their supplies of money from the open market than they could expect from the first allotment. The value of a loan when it first appears is subject to influences quite different from those that afterwards settle its status on the Stock Exchange. It has been proved, to the sorrow of many people, to be quite possible to endue a new loan with fictitious advantages upon its introduction to the notice of the speculative public; while, on the other hand, many a good thing slips up into a commanding position in the list of sterling investments, with but little notice except from those who, like the syndicate in the present instance, make a profitable business of looking after such quiet financial openings. A considerable load of anxiety must now be lifted from the minds of Mr. Powell Williams and the other members of the Finance Committee of the Corporation, who will be able to proceed to the realization of the projects for dealing with the existing Corporation loans which depended upon the favourable result of the appeal that has just been made.

PROPOSED EXPERIMENTS IN STREET LIGHTING AT SWANSEA.

SWANSEA is the latest addition to the respectable list of towns wherein the ratepayers' representatives are bent upon "experimenting" in electric lighting with the ratepayers' money. In this case, however, the authorities are unable to satisfy their zeal for research in street lighting with the one strange system of electricity; they have also determined to purchase two petroleum lamps wherewith to amuse them-

selves and the Gas Company. For it is evident that the conjunction of the two extremes—petroleum and electric lighting—will be more diverting than otherwise. It is said that the oil-lamps are of a new and improved pattern, and we think they should be very much so indeed if they are to compete with, say, Siemens's lamps, in the attack upon the position of the Gas Company. We are also told that petroleum lamps for street lighting have been found in other places to be cheaper than gas. It is a pity that these places were not more definitely specified, for we should like to know where they are, and how the other conditions of street lighting besides cheapness are observed in them. The reason for the proposed experiment with electric lighting is, of course, to obtain more light than is at present given by the gas-lamps, and at a cheaper rate. This being so, it is only logical to assume that the Corporation, as a preliminary step in this direction, are prepared to expend perhaps half as much as the public gas lighting of the whole of the borough now costs, in the superfluous illumination of three streets by means of electricity. This brilliant stroke of town councillors' genius is expected to "put pressure upon the Gas Company." In what way does not appear so clearly as might be wished. Rational considerations must be disregarded in such cases as these, or we should never know why it is that public authorities, who will haggle with a Gas Company over the fraction of a penny in the price of a light which can be relied on, will go out of their way to lavish the funds entrusted to their guardianship upon "experiments" which can be of little real good to them. There appears to have been only one member of the Swansea Town Council—Dr. Rogers—who had the common sense to protest, at the recent Council meeting when these experiments were discussed, against reverting to the use of petroleum, or rushing experimentally into electric lighting. As he pointed out, other people are spending time and money in the effort to perfect the electric light and to benefit electricians, and it is not consonant with the straitened state of the Corporation finances to follow such an idle example. They might do just as much good by waiting, and perhaps eventually reaping the advantages of the experiments of others. This sage counsel passed unnoticed, and so in one more locality a penny will be saved in gas and at least fourpence thrown away on electricity. It will, meanwhile, be a pleasing subject of thought to the authorities of Swansea, and similarly affected local magnates elsewhere, to find out how to justify the extra expense to their constituents, when the day of reckoning arrives.

THE NEWCASTLE-UNDER-LYME GAS ARBITRATION.

THE arbitration proceedings in reference to the transfer of the undertaking of the Newcastle-under-Lyme Gas Company to the Corporation were held at Westminster, on Tuesday and Wednesday last, before Sir Henry Hunt, sitting as Umpire, and Mr. G. W. Stevenson and Mr. R. P. Spice, Arbitrators. The subject matters of the arbitration were primarily two, the more important being the price to be paid to the Company by the Corporation for the property, and the other being the time when the transfer should be considered as taking place. There was no question as to accounts, a statement prepared by Mr. Alfred Lass having been accepted by both parties, so that the time of the Arbitrators was not taken up by matters of detail of this character. In the course of the proceedings, it was also agreed that the vesting of the undertaking in the Corporation should date from June, 1880, the Company to be treated as having been the agents of the new proprietors since that date. This left only one question to be decided by the Arbitrators, and respecting it there was considerable dispute. The Company called several professional witnesses to prove the value of the works, and the reasonableness, among other claims, of assigning the capital value of the Shareholders' maximum dividends at 27 years' purchase, chiefly on account of the high value of equally good securities of a different nature. Claims were also made for back dividends, and for winding-up expenses. The Corporation did not call any witnesses, but contended through their Counsel that the capital value claimed by the Company for the Shareholders' interest in their dividends was excessive, especially in view of the fact that the Company had recently raised a small amount of new capital under the provisions of the auction clauses, when the prices realized did not exceed 16½ years' purchase. It was further contended that the Company were not entitled to back dividends at all, as a point of law, and that the proposed allowance for winding-up costs was illegal. It having been stated that the Corporation had offered 25 years' purchase before the arbitration commenced, the proceedings were brought to a close.

Water and Sanitary Affairs.

ON Tuesday last, in reply to Mr. Ritchie, the Home Secretary gave a somewhat faint intimation concerning the expected Water Bill. Sir W. Harcourt "hoped to be able" to introduce the measure. He did not even go so far as to say that the Bill was ready, or nearly so, or was in hand at all. But the Water Companies must nevertheless stand in readiness, for the Government are fairly pledged to do something, or at least to make a show of action. Irish troubles stand in the way, and it is difficult to forecast the effect of political disturbances; but delay does not mean abandonment, and Parliament will not be unwilling, when it can find time for the purpose, to busy itself with the question of the Metropolitan Water Supply. In the smaller sphere occupied by the civic authorities, there are rumours of negotiations being afloat for the purchase of the New River undertaking by the Corporation. The City has no desire to come under the sway of an outside body, and obviously would like to have its water supply subject to its own command. Mr. Rudkin is warm on the subject, and there is a Special Water Committee which is apparently seeking to copy the example of the late Mr. E. J. Smith in bringing about terms of purchase. To buy up the undertaking of the New River Company will be no easy task, and Sir W. Harcourt will not be likely to favour the City scheme.

Captain Shaw's annual report of London fires speaks of four cases of short supply of water during the past year. What explanation may be forthcoming on the part of the Water Companies we do not know. Possibly we have some reference here to the small mains which suffice for the ordinary demand among the Southwark warehouses, but which occasionally prove insufficient when a fire breaks out. In such cases the river is near at hand, and it is to be hoped that no serious mischief is occasioned. Still, there ought never to be a lack of water at fires, and where such a state of things presents itself, or is likely to do so, the matter should be thoroughly investigated, and better arrangements made. Four instances out of 1871 is a very low percentage, but we should like to hear of none. In all these cases it is generally assumed that if the supply were in the hands of that immaculate organization, "a responsible public authority," everything would at once be rectified. We venture to doubt the conclusion, and experience might prove that nothing was gained by the change. Unfortunately the best use is not always made of existing resources. If the Metropolitan Board were so disposed, the water arrangements of London might undergo some improvement. Captain Shaw speaks of thirty-four cases in which there was a late attendance of turncocks, and six of "no attendance." These are defects which might long ago have been remedied, had the Metropolitan Board accepted the proposals of the Companies for the turncocks to reside on the premises of the Brigade, the Companies paying rent for the lodgings so occupied. That Captain Shaw does his work well is beyond question, and we have no doubt that the gallant Chief of the Fire Brigade would be glad of every possible improvement in the system for supplying water at fires. He has an anxious duty to perform, and is zealous in the doing of it.

The fate of Plymouth during the recent frost may serve as a warning to the Metropolis. Let us conceive London dependent for its water supply on an aqueduct from the Lakes. If it takes a strong force of soldiers, marines, and volunteers to free a watercourse ten miles long from the fetters of the frost, what amount of energy and skill would be requisite to clear a channel, wider than the Plymouth leat, and some two hundred miles in length? Under such circumstances, what might be the result of the many outbreaks of fire to which London is subject in the course of a week? Little fires would become large ones, and the Metropolitan Fire Brigade would be both baffled and worn out. Nothing could be more perilous for the Metropolis than to make it dependent on one centre for its supply of water. Even the big volume of the Thames, supposing it not to be frozen over, would not afford a practical resource at all adequate to the need that would arise in the event of the customary supply ceasing for a while to flow through the mains. It is true that there have been loud complaints of a failure of the water supply in some parts of the Metropolis during the last few days. But the grievance thus expressed is quite independent of the actual source of the supply. Service-pipes and cisterns on the premises of the consumers have become frozen, and some better organization seems wanting with reference to the employment of stand-pipes. People trying to make use of the latter have been in some cases

menaced by gangs of roughs, who have levied blackmail on the helpless, and who have behaved altogether in an outrageous manner. The police appear to have left the public at the mercy of these vagabonds, notwithstanding the fact that an appeal was made to the authorities by the Water Companies.

The Rural Sanitary Authority of Kingston recently took proceedings before the Magistrates to compel the closing of a private well, the water of which was declared to be unfit for drinking purposes. The defendant took a "preliminary objection," by requiring that the Magistrates should first of all have proof that he was the right party to be summoned; but the Chairman decided that proof could be best obtained by hearing the case. The evidence showed that the defendant was in the first instance called upon to provide a proper supply of water within a given time, and was not then required to close the well, as it could be used for other purposes if a wholesome supply were provided for domestic use. The defendant having neglected to provide a proper supply, the Rural Sanitary Authority resolved that he should be called upon to close the polluted well, so as to strengthen their hands in getting a proper supply of water laid on. Dr. W. Price Jones deposed in court that the water of the well was polluted over a hundred times more than was necessary to call for its condemnation. It was not fit to drink, even when boiled. The defendant thereupon said he had "no doubt at all" that the water was "really bad;" but he contended that there was a water supply to the house, inasmuch as the inmates had the use of a spring at Hampton, the quality of which must be good, seeing that "people of eighty or ninety years of age" drank it. Here, however, he found himself at issue with Dr. Jones, who stated that the spring in question "percolated through all the cesspools of Hampton, and was a very filthy water." The Magistrates made an order for the total closing of the well within fourteen days, and directed the defendant to pay sundry costs, which he declared he would not. Having taken a copy of the items, in order to see "how the amount was made up," it is believed he afterwards relented, and paid the money. The ideas which some landlords have with regard to water supply are peculiar, and occasion considerable trouble both to Sanitary Authorities and Water Companies.

The Local Board of Wednesbury have received an intimation from the Birmingham Town Council that the sewage of their town seriously pollutes the River Tame, a stream which the Council are entitled to use as one of the sources of the water supply for Birmingham and the surrounding districts. "Prompt and effectual measures" are demanded, in order to stop the pollution, and if these are not adopted, the Birmingham authorities threaten legal proceedings—a course which they would take "with very great reluctance." The Wednesbury authorities say that whether they contaminate the Tame or not is of very little consequence, for the water is so utterly bad before it reaches them, that no efforts on their part can make it fit for the inhabitants of Birmingham to drink. The Wednesbury Board are accordingly going to send their Chairman, Clerk, and Surveyor, to talk the matter over with the Water Committee of the Birmingham Corporation.

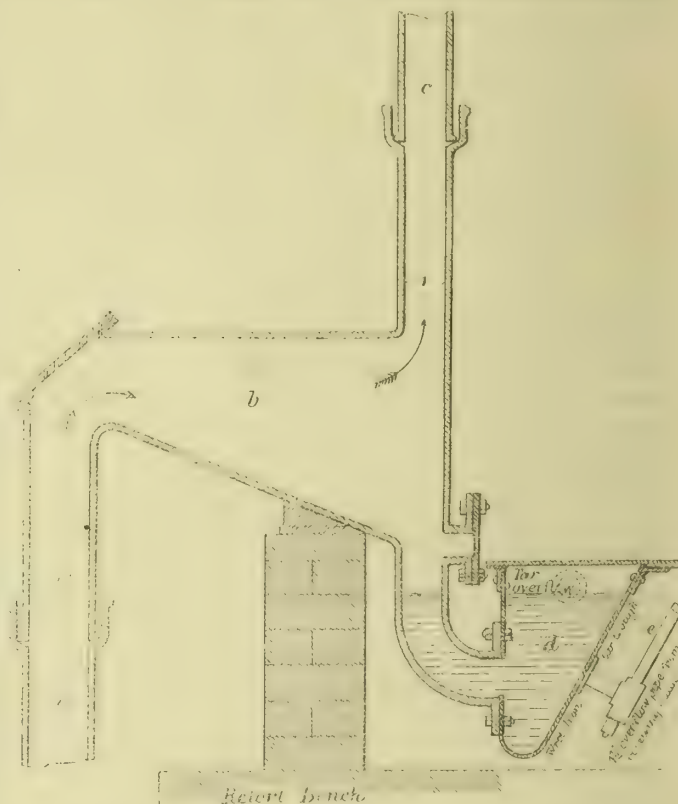
The history of the Ipswich sewerage works is perhaps not altogether singular, but can scarcely be called satisfactory. The original estimate was £41,000, to which £3500 was added for compensations, and parliamentary, legal, and engineering expenses. The contract exceeded the estimate by £2500, and the sum thus far expended on the contract works amounts to £28,480, but in addition to this there are extras claimed by the contractors, amounting to no less than £11,161. A loan of £44,500 was raised with the sanction of the Local Government Board in order to pay for the works, but it is now deemed necessary by the Town Council to make application for a further loan of £20,000. "Unforeseen difficulties" appear to have presented themselves at every step. The large intercepting sewer was to be carried along the bed of a stream called the Gipping, which was supposed to be an artificial river, and was so described in the specifications; but it turned out that the channel was the bed of an old tidal creek, with a thin bottom of a concrete character, and when the latter was broken through there was nothing to be found but soft mud or silt. About £4000 appears to have been expended in remedying this mistake, the silt being removed, extensive piling adopted, and a mass of concrete thrown in. There was also a little extra trouble with the foundations of a bridge. Further on, upon the foreshore of the river, there was again a lot of treacherous subsoil, "gravel here, and mud there." Considerable timbering was

accordingly necessary to avoid damage to the Custom House and a large gasholder. Rather oddly, the outfall works were left to the last, the sewerage works being commenced at the upper end instead of starting from the outlet. The Town Council have held a long discussion on the subject, and see no way to help themselves, except to get the further loan, and to take very great care how they spend it.

SOUTH METROPOLITAN GAS-WORKS.

THE retorts in No. 9 retort-house of the Old Kent Road station, which are heated by gas generator furnaces, as described in p. 14 of the present volume of the JOURNAL, are provided with an arrangement for the fractional condensation of the tar, &c., evolved with the gas, and this arrangement will form the subject of the present article.

For a complete account of this system of condensation, from its inception to its earliest complete adoption at these works, we must refer to the paper read by Mr. J. Somerville, before the British Association of Gas Managers, at their meeting in London in June last year, a report of which appeared at the time in the JOURNAL.* The illustration given below shows the latest form of apparatus as used at the Old Kent Road, and at the other stations of the Company. In the figure, *a* is the upper end of the ascension-pipe, which is con-



nected to the peculiarly-shaped chamber, *b*. This chamber takes the place of the usual H-pipe, which it generally resembles in form, although in function it is very different. The chamber, which is provided with two cleaning-doors as shown, terminates at the top in a socket for the 4-inch pipe, *c*, which leads to a receiving-main, and at the bottom it leads by a quadrant bend into a wrought-iron tar-trough, *d*, which, like the ordinary hydraulic main, runs from end to end of the stack. This trough is covered with a loose plate to keep out dust, and receives, at intervals equal to the width of the settings, the 1½-inch wrought-iron pipes, *e*, which are overflows from the receiving-main above mentioned.

The gas rising with the tar and water from the retort first parts with the thickest and heaviest of the tar in the chamber, and this deposit thereupon immediately flows through the bend into the tar-trough. The gas, in its subsequent upward passage through the pipe, *c*, throws down a quantity of a lighter tar, which also passes directly into the trough. The pipe, *c*, may be carried up vertically as far as practicable, and is then led inward by a bend to the centre of the bench of retorts, where it is connected by a T-piece with the corresponding pipe from the other end of the through retort. The outlet of the T-piece leads upwards through the bottom of a receiving-main, in which it is fitted with a Livesey's retort-valve, thus avoiding the use of the hydraulic seal. One receiving-main, therefore, serves for both sides of the bench, and the overflow from it is carried down to the tar-trough, as already described. The Livesey's valve is so delicately balanced that it does not throw any appreciable pressure on the retorts; while the main is worked at zero by the aid of a special throttle-valve and governor, fixed at its point of junction with the foul main which serves the other retort-houses, and which is generally worked with a vacuum of about 15-10ths. The aforesaid valves have not given any trouble in the way of sticking or otherwise since they have been used for this purpose, and they fully answer their primary object of

* See JOURNAL, Vol. XXXV., p. 1052.

effectually sealing the pipe when the retort-lids are slackened. The tar which becomes condensed in the chamber weighs on an average 12.75 lbs. per gallon, and is so thick that in spite of the addition of the lighter tar, weighing 11.5 lbs. per gallon, from the pipe, it is apt to clog in the trough, and therefore the overflow from the receiving-main is brought into it, merely to cause it to flow freely, and this device has been entirely successful. Originally the tar was taken from the chamber at the point where the cleaning-door is shown, and the tar-trough was relatively so much higher. It was found, however, that the consequent presence in the chamber of a quantity of tar corresponding to the level of that in the trough was an evil, and the present form of chamber and its connection with the trough were designed to surmount the difficulty.

It is evident that the extra lengths of 4-inch pipe required on this system cause additional expense in the fittings of a retort-house as compared with the usual methods of taking off the gas and tar. It is therefore necessary to show that the extra outlay is justifiable by results. The principal object sought to be attained by this arrangement is the removal, at the earliest possible moment, of thick tar from all contact with gas. Beyond this, the precipitation of light tar and water is also assisted, and the inconvenience of the hydraulic dip is avoided. But the first-named operation is the most important, and governs the design of the apparatus, for a very sufficient reason. From experiments with heavy tar and gas it appeared plain to the Engineer of the Company that a very short contact of ordinary 16.5-candle gas, such as the Company are in the habit of supplying, with tar weighing 12.75 lbs. per gallon, was sufficient to reduce the illuminating power of the gas to 12.5 candles, thus diminishing its value by about 25 per cent. Similar tests with the lighter tar failed to show any deterioration of the gas. Obviously, then, it became of the highest importance to prevent the contact of gas and heavy tar during the process of condensation. It was not supposed that, in the ordinary way, the influence of the thick tar, as made in conjunction with the gas, was so deleterious to the latter as appeared in the specially organized experiments; but that some bad effect is due to the presence of thick tar in an ordinary hydraulic main was considered proved. As this heavy tar is always the first to be thrown down, it was thought advisable to try to remove it at the bridge-pipe—the first point at which, in the ordinary style of retort-fitting, any special appliance can be introduced. Experience with the new arrangement has proved that, at a distance from the retort represented by the length of the ordinary ascension and bridge pipes, the greater portion, if not the whole of the heavier tar is in a condition for removal; and it is even probable that it would be readily deposited at the end of a much shorter ascension or eduction pipe. When it is remembered that, in addition to its injurious effect upon the illuminating power of gas, the thick tar of over 12 lbs. per gallon is the matrix of the naphthalene elements, its abstraction from gas as soon as formed will appear still more desirable.

The retort-house at the Old Kent Road wherein these fractional distillation arrangements are in operation is not absolutely separated from the other houses, and therefore the positive results of its work under the described conditions cannot be stated so definitely as might be desired; but this deficiency in the means of accurate comparison will probably soon be made good in the works of the Company either at this or some other station. A sufficiently clear idea of the benefit derivable from the new system may be gathered from the fact that *no cannel has for some time been used in this house*. The same coals as are carbonized in the other houses are used here, but in them with a regular mixture of cannel, to make 16½-candle gas, which has not been proportionately increased in consequence of its discontinuance in this house. Hence the whole of the cannel, representing about 2 candles in the gas, that would otherwise have been consumed here, has been saved, without diminution of the illuminating power of the total gas production. We do not say that no more minute tests of this effect have been made, but the general result stated is perhaps the most convincing that, under the circumstances, could be adduced; and it is not surprising that a rapid extension of the system is about to follow this practical and prolonged demonstration of its economy. A slightly diminished yield of tar may be expected from coal carbonized in this manner, due to the fact that the thick tar will not be diluted and swollen by the addition of hydrocarbon oils from the gas; but a gallon of tar may well be spared if it is only to be obtained at such a cost—at least, while gas is the chief product of gas-works.

In conclusion, we may add that the balance gasholder, mentioned in Mr. Somerville's paper before referred to, is still used with good effect in conjunction with this and other retort-houses; but this part of the new condensing arrangements at the Old Kent Road works was so fully described in the paper alluded to, that only the fact of its continued employment need be noticed here.

Notes.

ELECTRICAL GAS FLAMES.

Mr. Watson, of St. Marychurch, South Devon, has patented an arrangement for using electrical currents in conjunction with gas or other flames, with the object of obtaining increased illuminating power from such flames. In carrying out this idea, flat flames such as those of fishtail or batswing gas-burners, or flat-wick lamps, are preferred. Into these flames electrodes of metal or carbon are introduced in such a manner that the discharge of electricity between them may embrace in its action the largest area lying within the flame, and assist in the dissociation of the carbon from the hydrogen of the burning material. To ensure this, the first action of the dis-

charge is made to take effect within the blue portion of the flame. Or groups of flames may be constructed to form themselves electrodes by being placed in juxtaposition, and the electrical discharge being led through them. The source of electricity is either an ordinary galvanic battery or a machine. The inventor also proposes to create a carbon arc-light within a flame, or to effect the dissociation of its elements by the heat resulting from the resistance of certain refractory metals to the passage of electrical currents, such metals being enclosed in the dark portion of the flame. The increase in illuminating power is therefore intended to be effected by the more complete, or rather the quicker dissociation of the carbon and hydrogen due to the direct electrolysis, or to the heat to be derived from the arrested current.

A NEW ELECTRIC LAMP.

MM. Bouteilleux and Laing, of Paris, have introduced a new electric lamp, described in a recent number of *l'Electricité*. This lamp somewhat resembles that of Werdermann. The diameter of the upper carbon is four or five times that of the lower, and is made annular, the central space being filled with a refractory insulator. The distance between the upper and lower carbons is maintained uniform by means of a magnetic regulator placed in an annular chamber around the holder of the lower carbon. The insulating core of the upper carbon appears to play an important part in maintaining the steadiness of the arc, which has a regular movement around its periphery always in the same direction from left to right, the surface of the upper carbon being evenly consumed, and it burns at a rate four or five times slower than that of the lower one. Lamps of this kind have, it is stated, developed a light of about 125 Carcel burners (1187.5 standard candles) with perfect steadiness and regularity, the diameter of the small carbon being 0.16 in. and that of the larger 0.79 in., with an insulating core 0.16 in. diameter. The consumption of the smaller carbon is from 1.42 in. to 1.81 in. per hour, or about 20 in. in twelve hours, and that of the larger is less than 4 in. in the same time, the cost being under a halfpenny an hour. The lamps are worked by a Meritens machine, and can be sold for about 16s. each.

A HEAT REGULATOR FOR HIGH TEMPERATURES.

It is stated in the last number of *Engineering* that M. D'Arsonval, whose heat regulator for temperatures below 100° C. was exhibited to the French Academy four years ago, has recently invented another for temperatures as high as 1200° C., intended for use with gas furnaces, &c. The regulating body is a constant volume of air, and the variations of pressure in it due to changes of temperature are utilized for the regulation. Regnault's formula gives the relation between the pressure and the temperature. The apparatus consists of an air reservoir of glass or porcelain plunged into the medium to be kept at constant temperature; a capillary manometer containing mercury, and indicating the air pressure in the reservoir; and the regulator, properly so called, which acts upon the flow of gas intended for the burner. A capillary pipe of copper runs from the reservoir to a hollow stem, from which two other pipes lead to the manometer and the regulator respectively. The three parts of the apparatus thus communicate, and by means of a screw-cock on the stem, the air can be let in. In the regulator there is a membrane which is subjected on its under side to the pressure of the air in the reservoir, and this pressure is equilibrated by a counterpoise sliding along a lever arm, and at the same time varying the supply of gas. When the manometer indicates that the desired temperature is reached in the reservoir immersed in the substance, the weight is moved along the lever until the air pressure raises the membrane and reduces the flow of gas to the burners.

Mr. J. COATES's paper, on "Applications of Hydraulic Machinery to Mines, Gas-Works, Grain Warehouses," &c., which was to have been read last Thursday before the Civil and Mechanical Engineers' Society, was postponed till March 17.

Mr. W. D. SCOTT-MONCRIEFF—whose proposal for rendering towns smokeless, by burning half-carbonized coal, was referred to in last week's "Notes" column—is to read a paper before the Society of Arts to-morrow (Wednesday) evening, at eight o'clock, on "Suggestions for Preventing London Smoke."

MR. C. GILBERT WHEELER, of the University of Chicago, U.S.A., describes the following as an interesting lecture experiment, illustrating the glowing of platinum in a current of illuminating gas, with the rendering luminous of a Bunsen burner flame, when the gas is previously heated:—An ordinary Bunsen burner is increased in length to the extent of, say, 3 or 4 inches, by adapting to the upper end a platinum tube, of such a calibre as to snugly fit it. On placing the latter in a horizontal position, and opening the cock, the ordinary flame is first obtained; thereupon, with another burner, the platinum tube is heated to bright redness, the non-luminous flame now becoming the ordinary luminous one. The change is most marked when the cock is not more than half open. Now remove the second burner and place the first upright. The platinum then begins to glow at the upper edge, which glowing soon passes down and extends throughout nearly its entire length. On closing the cock and opening, after incandescence has entirely ceased, it will again glow as before; this time, however, without flame at its extremity.

WYMONDHAM GAS COMPANY.—A meeting of this Company was held on Friday, the 14th inst.—Mr. J. Cann in the chair. The balance-sheet was produced and criticized by several of the Shareholders, and after an animated discussion, it was resolved that a Committee of three Shareholders be appointed to investigate the affairs of the Company, with power to employ an accountant, the expense to be paid out of the Company's assets. Under these circumstances, therefore, no dividend was declared. It was determined that the retiring Directors, Messrs. J. and W. Cann, should be re-elected, but the filling up of the vacancies caused by recent deaths in the directorate was adjourned to a future meeting. It is understood that the Committee will at once commence their investigation, and report to a meeting of Shareholders at an early date.

Communicated Article.

OBSERVATIONS ON GLASS AS AN OBSTRUCTOR AND REFLECTOR OF ARTIFICIAL LIGHT.

By Mr. F. W. HARTLEY, A.I.C.E.
CONCLUDING ARTICLE.

ELEVATED OR OVERHEAD LIGHTS.

In order to carry out the experiments necessary to ascertain the effects which ensue with overhead lights, I was obliged to devise and construct a special photometer—so styling the complete instrument. Instead of the usual bar, two truly planed and blackened planks were employed. These were united at their ends, but separated from each other intermediately by a space forming a slot 1 inch wide. At one end of the compound bar thus formed, a pillar 1½ inches in diameter and about 4½ feet long was erected vertically and firmly. Attached to a collar which accurately fitted the outside of the pillar was an arm having a regulating cock and an elbow nose-piece at its extreme end to carry the burners; the arm with the pillar forming a right angle. A binding screw in the collar enabled me to fix the arm at any desired height within the length of the pillar. The gas was supplied to the burners through a flexible tube attached to a nose-piece in the arm. The arm being raised to its greatest height and there fixed, a plumb-line was dropped from the centre of the nose-piece, through the slot in the photometer bar, and when oscillation had ceased, the cutting point of the line was marked on the bar. From this point a length of 24 inches was laid off on the bar, and at this distance the photometer disc was fixed. The Methven standard was fixed upon a slide, the lower part of which fitted the slot in the bar. The gas was supplied through a second flexible tube attached to a brass pipe passing through the slide and terminating at the top with a socket which received the Methven standard. The pipe below the slide and photometer bar formed a handle by which to move the slide, which at the end facing the disc carried a broad black screen of sheet iron, having a central slot for the light from the standard to pass through. A tall black screen having a wide slot in the centre was also interposed between the operator and the lights to be tested, so that the eyes were not distressed by direct rays. Next an accurate scale of inches and parts was laid down from the fixed disc towards the end of the bar opposite to that at which the pillar was fixed. Finally black curtains were suspended from the ceiling at each end of the bar, and the ceiling was coloured dull black. The pillar and sliding arm enabled me to bring the flames on the same plane as the disc, and also to raise them above that plane. As the operating-room was rather low in pitch, I adopted 2 ft. 3 in. above the centre of the disc to the centre-length of the flames as the elevation to work with; thus the length of the “slant” line, or third side of the triangle, from the centre of the flame-length to the centre of the disc, was 36·1248 inches. At this elevation the flames burned perfectly. The whole of the first series of experiments—nearly 40 in number—were completed before any attempt was made, by squaring and dividing the numbers representing the distances, to ascertain their significance, and, as in previous experiments, the powers of the unshielded flames were repeatedly ascertained.

At the outset of the experiments it became strikingly apparent that the generally accepted dictum—viz., *that an object at a certain distance from a flame is illuminated to the same degree, irrespective of its position in relation to the flame, is entirely erroneous*. The law that light diffuses itself equally in every direction is true only when the source of light is infinitely small, or at so great a distance that the divergence in angle becomes immeasurable; but is not true with flames such as are universally employed. Although I expected to find differences between the amount of light falling on the photometer disc with flames horizontal and at an angle, I was at first greatly surprised at the enormous differences.

In the first set of experiments with an Argand and with a batwing burner, the results were—

Argand horizontal light	13·32	=	100
„ angular „	6·00	=	45
Apparent reduction in light			55 per cent.
Batwing horizontal light.	10·938	=	100
„ angular „	6·062	=	55
Apparent reduction in light			45 per cent.

In the second set the results were—

Argand horizontal light	13·49	=	100
„ angular „	6·04	=	45
Apparent reduction in light			55 per cent.
Batwing horizontal light.	9·784	=	100
„ angular „	5·766	=	59
Apparent reduction of light			41 per cent.

These two sets of experiments were conducted on different days, and without the slightest effort to make the second set conform with the first during the observations or afterwards.

The reasons for the differences or lesser amount of illumination of any special object in an angular position in respect to and below the level of a flame are, it appears to me, as follows. I will first deal with the Argand. When an Argand, of the type generally used, is in an elevated position, and the light is received from it at a moderately large angle, as was the case in my experiments, when the height was 2 feet 3 inches to the mid-length of the flame, and

the photometer disc coinciding with a radius of 2 feet, the body of the burner cuts off part of the flame, as shown by line A in the annexed diagram, fig. 1. Moreover, a great part of the luminous flame is above the mid-length, and hence farther removed from the disc or object to be lighted. As the angle grows smaller—i.e., as the disc or object is moved farther away on the same level—the percentage of obstruction caused by the burner must grow less, as indicated by line B, fig. 1, although, of course, the actual intensity of power of the incident light will also decrease.

With a flat-flame burner the percentage of reduction is less than with the Argand, and doubtless because the burner itself cuts off none of the rays, except directly downwards. The great cause of the effects found remains, however, to be explained, and can be best done in an abstract way. Let it be supposed that A, diagram No. 2, is a source of light exactly two inches square or four inches in area, and that B is a vertical object placed at a lower level, and of exactly the same size and shape as the source of light. Extending lines (1, 2) from base to base and apex to apex respectively of the object and the source of light, and the depth of a channel is defined which must include every possible ray of light which can reach the object from the source. The lines represent the upper and lower parts of a tube, the cross section of which is of less area than the source of light or of the receiving object. The width of the tube is the same—viz., 2 inches; its depth is less. In the positions I adopted the depth of the tube would only be 1·375 inches as against the 2-inch lengths of the source and of the object, and the area of such tube is only 2·75 inches as against 4 inches. Dividing 2·75 by 4, the result indicated is 68·75 per cent. of the actual light yielded from the source. This percentage of the light with the batwing in horizontal line—viz., 10·938 and 9·784—equals 7·52 and 6·73, instead of 6·062 and 5·766, the experimental results being about 12·4 and 11·7 per cent. inferior to the calculated ones. But if we regard the cross rays (3, 4), much of this is accounted for; the rays proceeding from the upper part of the batwing, which is the most intensely luminous, have a longer path to travel, while the way is shortened only for those rays which issue from the base, and for the most part non-luminous portion of the flame. I cannot attempt to demonstrate this matter exhaustively, and I feel, moreover, that at present, at all events, it will be sufficient to give the results of my experiments, and indicate possible and probable causes for what might otherwise appear surprising or even incredible.

If my reasoning be correct, it follows that, *if the relative power of two opposed flames at the same elevation, but of unequal strength, be estimated by the aid of a photometer placed at a lower elevation, an injustice would be done to the weaker flame; because its “tube” of rays would be reduced to a greater degree in area than that of the more powerful flame*. Again, *if the two contrasted flames were at different elevations a similar error might arise*.

5 GLOBES WITH OVERHEAD LIGHTS.

TABLE No. 14.

Indicated power of Argand flame when overhead = 6 candles.	
Loss with ground glass moon	21·00 per cent.
„ albatrine „	23·00 „
„ clear glass „	2·77 „
Gain with German opal half globe behind	30·00 „
„ ground glass „	6·60 „

Batwing Burner.

Indicated power of flame when overhead . . . = 6 candles.	
Gain with ground glass globe	9·0 per cent.
„ German opal „	21·0 „
„ albatrine „	23·0 „
„ clear glass „	5·5 „

Dealing first with the Argand flame—with the same globe (“entire,” Table No. 12), and with a flame equal to the power of 13½ candles, the loss on the horizontal line was 19 per cent., or 2 per cent. less than with the overhead light when taken to be equal to 6 candles—truly the flame was equal to more than 13 candles when horizontally tested; but it appears to me correct in every case to estimate the loss or gain on power of overhead lights in an angular line. The loss with the albatrine Argand globe (Table No. 13) was 33 per cent.; the loss shown in Table No. 14 is only 23 per cent. This, however, is by no means such a contradiction as it may appear to be. As already shown, when the light from an Argand falls in a downward slanting line, part of the flame is obscured by the burner; but the interior of the globe receives rays from every part of the flame; hence the upper part of the back half of the globe must reflect a greater number of rays than are due to the portions of the flame which are visible in the “slant” line. These extra rays—so to call them—would be very sensible with the albatrine globe, which combines translucency with a high reflection power—qualities which are not combined to anything like the same extent in an ordinary ground moon. The percentage loss with the clear globe is the same as with a horizontal light, Table No. 10. The reflection power of the half of the ground moon was (Table No. 12) 9 per cent.; at 2 ft. 3 in. height, it is only 6·6 per cent. The power of the half globe, German opal, was 60 per cent.; with the “slant” light it is only 30 per cent. I should state that all the section or divided globes had 4½-inch openings at the base, and 4½-inch openings at the top. The power of an Argand globe to reflect light angularly would doubtless be greater than that of those employed. Turning attention to the batwing burners, it will be remarked that in every instance the wide-opening globes increase the power of the overhead light, the clear glass, of course, least, but by about the same percentage as stated at the end of my second article for horizontal light.

The angle and position elected for the experiments was such that, on placing the eye in the position occupied by the centre of the photometer disc in the experiments, the whole of the flame was

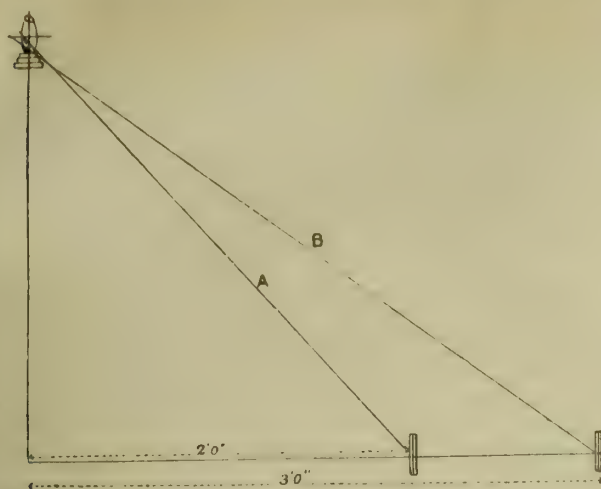


FIG. 1.

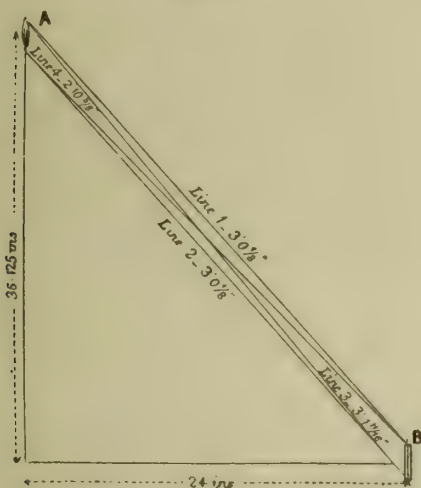


FIG. 2.

visible except a mere fringe of the top; hence the light impinging on the disc consisted of direct rays, reflected rays, and such other rays as were refracted through the globe. The power of these reflected and refracted rays was, as might be expected, less than with the half globes, ground and opal, with batwings (Tables Nos. 12 and 13), being in each case about 65 per cent. of the power found with horizontal light.

REFLECTORS WITH OVERHEAD LIGHTS.

TABLE NO. 15.

Indicated power of Argand flame when overhead	6 candles.
Gain with semi-globe reflector, 7 1/2 in. diameter (A) . .	52 per cent.
Gain with conical reflector, diameter at base, 10 in.; at top, 3 1/2 in.; depth, 3 1/2 in. (B)	86
Gain with conical reflector, diameter at base, 9 in.; at top, 2 1/2 in.; depth 3 in. (C)	92
Loss with reflector A and a spherical-shaped albatrine screen (D) 5 in. diameter and 1 1/2 in. deep, around the top of the burner	20
Loss with reflector B and the screen D	6
Loss with reflector C and the screen D	15

The effects obtained with reflectors are very suggestive, as they indicate the importance of the form of a reflector even applied over an ordinary gas-flame. Thus A produced a much more brilliant effect within a radius of 2 feet than either of the two others; the second (B) tended to spread the light widely; while C concentrated the largest number of rays upon the disc. The large loss with C when the screen D was used was due to the fact that there was but little space between the reflector and the screen for the reflected rays to escape, and in consequence the major part had to penetrate the screen. The large reflector B and screen induced little loss, for a reason contrary to that just given; but C being less wide, operated in a similar manner to A.

Screens placed at the base of an Argand gas-flame render the light more soft and agreeable, but, without the use of a reflector above, cut off a tremendous amount of light; so much, indeed, that although my scale was 34 inches in length from the centre of the disc, it was not long enough to measure the loss, but even at 34 inches the reduction in light would have been more than 60 per cent. One of the impressions created in my mind by these experiments is that for the general lighting of rooms and offices with Argands, reflectors should be more obtuse—flatter, in fact, than those commonly made, and be not less than 9 or 10 inches in diameter. The determination of the composition of the various kinds of glass in the market—sheet, globes, &c.—together with their light-obstructive powers, would be an interesting subject of inquiry, but is one which I cannot venture upon. Sheet glass looked at edgewise differs very much in colour. Some samples are a pale green, some bright green, some dark green, and some green tending to black—the latter tinge being due, possibly, to the use of an excess proportion of manganese oxide in the process of manufacture—while none of them, when held between the eye and a

flame, differ to any appreciable degree in transparency. There seems scope for improvement in opal glass, which, in the form of moons, reflectors, &c., is the most agreeable to vision. What is wanted is an opaline glass which, while cutting off the glare of a flame, shall be less obstructive to the passage of light than even the best now made.

The broad general conclusions which I deduce from my experiments are as follows, and if some of them appear to be mere truisms, I think that character will cease to be manifest if the reader will, while reading, refer to the various tables of results which I have given, the summary being only a general index to those tables.

HORIZONTAL LIGHTING.

Sheet Glass.

1. That ordinary sheet glass, apart from thickness, varies in its obstructive power to the passage of light. That the percentage loss increases with the distance of the glass from the flame, and increases also as the light grows stronger.
2. That ground sheet glass, apart from thickness, also varies in obstructive power. That the percentage loss increases with the distance of the glass from the flame, and decreases as the light grows stronger. That the percentage loss depends on which side, clear or ground, is presented to the flame.
3. That with flashed opal the losses follow the same law as ground glass for distance from, and for power of light.
4. That with clear glass as an *obstructor* of light in front of the flame, and clear glass behind the flame as a *reflector* of light, the reflected light reduces the loss to a degree dependent on the distance of each glass from the flame.

Globes.

5. That a clear glass globe obstructs light from an Argand flame, but increases the sensible light from a flat flame.
6. That globes of ground glass obstruct less light than sheets of ground glass. That the percentage loss diminishes as the light grows stronger; and is, for an average light, from 18 to 20 per cent.
7. That opal globes obstruct an amount of light equal to 33 to 65 per cent.

OVERHEAD LIGHTING.

8. That the amount of light yielded by a flame in an angular direction is much less than it yields in a horizontal direction.
9. That glass globes with elevated or overhead Argand flames reduce the power of the light—clear globes, about 3 per cent.; ground globes, about 21 per cent.; and albatrine globes, about 23 per cent.
10. That glass globes with flat-flame burners, at a certain elevation and within a certain radius, increase the power of the light—clear globes, about 6 per cent.; ground globes, about 9 per cent.; albatrine globes, about 23 per cent.; and German opal globes, about 21 per cent.
11. That reflectors greatly increase the power of the light, within a radius dependent on the shape and size of the reflector; the range in the experiments being from 52 to 92 per cent.
12. That screens at the base of an Argand flame cause a reduction in the power of the light, whatever be the size and form of the reflector.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE OXIDATION OF SULPHUR IN COAL GAS.

SIR,—As a slight contribution to the discussion on the above subject, now taking place in your columns, I may state the results of some experiments made a few years back, in Mr. Keates's laboratory, during the period that I was acting as his assistant. These experiments—which I may here state were made prior to those of Messrs. Heisch, Wigner, and Young, mentioned in Mr. Grimshaw's last letter—were intended to determine whether the immediate product of the combustion of sulphur in gas was sulphurous or sulphuric acid.

In the first place, it was found that the amount of sulphur converted into sulphuric acid in the Referees' test (in the absence of ammonia), was in the proportion of somewhat less than 1 grain per 100 cubic feet, for gas giving about 15 grains by the ordinary method. At the same time sulphurous acid could be detected throughout the test at the exit of the condenser tube. Iodine was then placed round the burner, with the effect that sulphuric acid was produced in such quantity that the sulphur obtained by the test exceeded in amount that found in the ordinary way where ammonia is used. The inference from these experiments is obvious, and proves that the immediate product of the combustion of the sulphur in coal gas is sulphurous acid, for the iodine experiments showed that where suitable measures are taken for forming sulphuric acid, it is wholly arrested by the apparatus, and therefore where it is not found in the condensed liquor, it is reasonable to assume that it is not formed. The experiments likewise demonstrate something further—viz., that sulphurous acid does not, in the ordinary way, suffer oxidation to any appreciable extent during the period of its transmission through the Referees' test; although I consider that the temperature, the moist condition of the atmosphere, and the large extent of the condensing surface, are all favourable to promoting oxidation.

Mr. Grimshaw mentions that the atmosphere in the apparatus contains only half the normal quantity of oxygen, but I submit that where all the other conditions are so favourable to oxidation, an atmosphere containing only 10 per cent. of oxygen would be quite competent either for the direct production of sulphuric anhydride, or for the oxidation of sulphurous acid. I cannot altogether explain the failure of all attempts to detect sulphurous acid in the atmosphere of gas-lit rooms, but considering the extreme dilution of the combustion products, it is

doubtful whether, in spite of the delicacy of the iodide of starch test, it is sufficiently delicate for the purpose. Taking a moderate-sized room, say 16 ft. by 16 ft. by 12 ft., lit with three 5-foot burners, consuming gas containing 20 grains of sulphur per 100 cubic feet, it would need two hours before the sulphurous acid amounted to 0.001 grain per cubic foot of air, and this is supposing the room to be hermetically sealed so that no change of atmosphere occurred. There is no doubt that a particular class of articles, more especially those of a porous nature, are found to be charged with sulphuric acid after being continually exposed for some time to the action of the combustion products from sulphur-laden gas; but I consider it far more probable that the impregnation is due to the oxidation of sulphurous acid in the pores of the material than to the actual deposition of sulphuric acid.

Finally, I believe, firstly, that the immediate product of the combustion of the sulphur in coal gas is *sulphurous acid*; and, secondly, that the conversion of sulphurous into sulphuric acid, under the most favourable conditions which are likely to occur in the ordinary way, requires an appreciable, and as yet unascertained interval of time. I believe also that good ventilation would greatly lessen the evils complained of from the presence of sulphur compounds in gas.

Stepney, Jan. 22, 1881.

H. LEICESTER GREVILLE, F.I.C.

THE SIZES OF SERVICE-PIPES AND METERS.

SIR,—I am in a difficulty in reference to the laying on of gas and the supply of meters; and my search through the various Acts of Parliament controlling gas companies does not seem to help me out of my difficulties. I do not in any place find a clause that I consider definite enough to compel consumers to lay services of sufficient internal diameter, or have meters of the necessary capacity.

In the 16th clause of the Sale of Gas Act, there is a provision in reference to any one finding his own meter, and requiring it to be of such a capacity that the gas consumed may not exceed the quantity to be measured per hour, as shown on the badge. I am told, however, by legal gentlemen, that this is not sufficient. A consumer applies for gas, and the usual question, of "How many lights do you require?" is put, and invariably answered untruly by the applicant, who desires to have as small a meter as possible, so as to reduce the rent; and, having employed a gas-fitter (?) who has been cut down to the lowest shilling in his tender for fixing the meter, he puts in the smallest possible sized pipe. In vain I point out the size of the cap and lining on the meter, and beg that at least this may be a guide. The pipes are mostly laid before the gas company are applied to, and a refusal to go to further expense on the consumer's part either results in a refusal by the company to lay on the gas, or a defiance and threat by the consumer if it is not connected. It is all very well to say, "Why do not gas companies lay services up to the meters?" This may be a very inexpensive job in a commercial town; but where there are numbers of villas lying back from the road, 70, 80, or 100 feet of service-pipe is needed between the meter and the main. In the Gas-Works Clauses Act, 1847, the only part that bears on the supply of gas appears to be the 13th section, where it says, "in such manner and upon such terms as may be agreed upon;" but I doubt very much if any magistrate—under the clause that defines the failure to supply consumers, as in the Metropolis Gas Act of 1860, section 17, after they have signed their agreements with the gas company—would not compel them to lay on the gas after the expiration of the fourteen days therein named.

If any of your readers can point out any means of insisting on consumers complying with the reasonable requests of gas companies, it will be a great assistance, not only to myself, but to managers who are in a similar situation, and who have the ignorance of the so-called gas-fitters of the town (who are, as a rule, really nothing but ironmongers, plumbers, or glaziers) always pitted against them, to the discomfort of the consumers and themselves.

Jan. 19, 1881.

D.

THE AITKEN AND YOUNG ANALYZER.

SIR,—Referring to the statement made by Mr. Cassels, Convener of the Gas Committee, Hamilton, in your JOURNAL of the 23rd of November last, I beg to enclose copy of correspondence I have recently had with Mr. Cassels.

If you think that the subject is of interest to your readers, or that all or any of it should be published, I shall be glad that you do so.

Darroch, near Falkirk, Jan. 17, 1881.

HENRY AITKEN.

[It is only fair to our esteemed correspondent to publish the letters to which he refers, and which need no comment from us.—ED. J. G. L.]

[ENCLOSURE.]

Copy of Correspondence between Mr. Henry Aitken, of Falkirk, and Mr. Andrew Cassels, of Hamilton.

Andrew Cassels, Esq., Falkirk, Nov. 25, 1880.
Convener of the Gas Committee, Hamilton.

Dear Sir,—Under reference to your letter contained in the GAS JOURNAL of Nov. 23, 1880, in which you say, "or how many of them were personally interested in the sale of the apparatus, as Directors of the Company," I will feel much obliged if you will write me the name or names of the gentleman or gentlemen to whom you refer. (Signed) HENRY AITKEN.

Andrew Cassels, Esq., Falkirk, Nov. 29, 1880.
Convener of the Gas Committee, Hamilton.

Dear Sir,—I wrote you on the 25th inst. as annexed; but not having got any reply, I presume that my letter has not reached you. I hope to be favoured with an early reply. (Signed) HENRY AITKEN.

Henry Aitken, Esq., Falkirk, Hamilton, Nov. 30, 1880.

Dear Sir,—I am in receipt of yours of Nov. 25 and 29. In answer, I decline meantime to submit names of any gentlemen, but will feel obliged if you can furnish me with the names of parties who have reported favourably of the analyzer; also the names of your Directors. (Signed) ANDREW CASSELS.

Andrew Cassels, Esq., Falkirk, Dec. 4, 1880.
15, Townhead, Hamilton.

Dear Sir,—I have yours of the 30th ult. The names of the gentlemen who have reported favourably upon the working of my process are Dr. Wallace; Mr. Wm. Smith, Gas-Works, Helensburgh; Mr. James McGilchrist, Gas-Works, Dumbarton; Mr. S. Stewart, Gas-Works, Greenock; Mr. R. S. Carlow, Gas-Works, Port-Glasgow; Mr. L. Monk, Gas-Works,

Lanark; Mr. R. Bell, Gas-Works, Gibraltar; and I beg to enclose copies of their respective reports. If you read the GAS JOURNAL, you will find many notices by able chemists and gas managers in favour of my process. The names of the Directors of the Universal Gaslight Improvement Company, Limited, were Messrs. M. E. Robinson, Robert King, Alex. Donaldson, S. Stewart, and myself, as per enclosed prospectus. I will now be glad to receive your answer. (Signed) HENRY AITKEN.

Henry Aitken, Esq., Falkirk.

Hamilton, Dec. 6, 1880.

Dear Sir,—I am this morning in receipt of yours with enclosures, for which accept my best thanks. The documents afford an answer to the questions which the correspondent of the London JOURNAL was unable to give, as to how many of the parties recommending the use of your analyzer had made use of it themselves; also as to some of the parties interested in the sale of the apparatus. (Signed) ANDREW CASSELS.

Andrew Cassels, Esq.

Falkirk, Dec. 6, 1880.

Dear Sir,—I have yours of the 6th inst., and am sorry to see that your letter does not answer the question which I put. You have accused one or more of the Directors of the Universal Gaslight Improvement Company of being personally interested in the sale of the apparatus, and I think it is due to yourself as well as to the gentlemen you refer to that you give the name or names of the parties who were interested in the manner you state. (Signed) HENRY AITKEN.

Andrew Cassels, Esq.

Falkirk, Dec. 13, 1880.

Dear Sir,—Please let me hear from you soon. It is necessary for the defence of your own character that you should withdraw the statement you have made, if you are satisfied that you have committed an error in making it. If, on the other hand, you are satisfied of the correctness of your statement, you are equally bound to give me the names of the parties you refer to.

Kindly let me hear from you soon, and let us be done with the matter. (Signed) HENRY AITKEN.

Henry Aitken, Esq., Falkirk.

Hamilton, Dec. 13, 1880.

Dear Sir,—Kindly say what is the specific charge you refer to, made by me against some party unnamed. As to the protection of my character, you may trust that to myself. (Signed) ANDREW CASSELS.

Andrew Cassels, Esq.

Falkirk, Dec. 14, 1880.

Dear Sir,—I have yours of the 13th inst. I wish you to give me the names of the gentlemen you refer to, in your letter of the 12th ult. to the GAS JOURNAL, as being those who "were personally interested in the sale of the apparatus as Directors of the Company." (Signed) HENRY AITKEN.

Henry Aitken, Esq.

Hamilton, Dec. 16, 1880.

Dear Sir,—In my letter of Nov. 12, to the GAS JOURNAL, I ask for information which I have not yet received. Possibly you can supply the want. If not, our correspondence may cease. (Signed) ANDREW CASSELS.

Andrew Cassels, Esq.

Falkirk, Dec. 17, 1880.

Dear Sir,—I have yours of the 16th inst. In your letter of the 12th ult., in the GAS JOURNAL, you ask the correspondent of that paper certain questions, and it is for him to answer if he sees proper, and it is for me to ask you the question which I did in mine of the 14th inst., and it is for you, if you think proper, to answer that question. If the imputation that you make is true, let us have evidence of its truth. If, on the contrary, there is no truth in your imputation, let it be withdrawn. In this, surely, I do not ask what is unreasonable. (Signed) HENRY AITKEN.

Andrew Cassels, Esq.

Falkirk, Dec. 29, 1880.

Dear Sir,—If I do not hear from you in answer to my letter of the 17th inst., I must just publish our correspondence as it is. (Signed) HENRY AITKEN.

DR. ADAMS'S GAS-STOVES.

SIR,—The discussion on this subject has run to such a length already that, in justice to your readers, I will add very few words to it.

The difficulty I find in discussing the question is that I do not know which statement I must answer. The ground seems shifting under my feet. Statements previously made were disowned by the persons to whom they were attributed, and the very same statements are now repeated on the authority of the very same persons. Dr. Adams, for example, denied that he had stated that his stove was from 8 to 14 times better than the best, and Mr. Wright now gives an extract from a paper of his, in the "Transactions of the Philosophical Society of Glasgow," specifically making this statement.

We have now, however, an experiment vouched for by Mr. Wright, that a cubic foot of ordinary coal gas, at Birmingham, can heat 59,852 cubic feet of air 1° Fahr. This is equivalent to 1084 ordinary thermal units. If we add to this 7 per cent. of the total heat, which Mr. Bruce says passed away by the chimney (a singularly low proportion), we find 1165 thermal units produced by the burning of 1 cubic foot of ordinary coal gas.

Now, Mr. Vernon Harcourt gives the whole heat of combustion of such gas as 756 units; and I am slow to believe that any stove can produce 54 per cent. more than this amount. If such heat can be produced, Dr. Adams is entitled to the thanks of all gas manufacturers for proving it; and if other stove manufacturers can only utilize from 66 to 115 units where he produces nearly 1200 units, it is a serious reflection on their capacity.

Mr. Wright is in error in thinking that the gas supplied in Cork has an illuminating power of only 14 candles. This is the parliamentary minimum, but the quality supplied is usually about 17 candles.

If Mr. Wright will favour us with an analysis of the Birmingham 17-candle gas, it will be easy to calculate its heating power by the usual formula.

Cork, Jan. 21, 1881.

DENNY LANE.

THE DESTRUCTION OF TOWN REFUSE AT BRADFORD.—The members of the Sanitary Committee and other members of the Bradford Corporation recently visited their refuse-works for the purpose of inspecting a "destructor," which has been erected there at a cost of £5000. Alderman Blackburn, Chairman of the Sanitary Committee, explained the working of the apparatus. At present there are six retorts, which are charged every two hours with about 3½ tons of refuse matter; but it is intended to erect six additional retorts, together with two engines and boilers and four mortar-mills, so that the material after it has left the retorts may be ground down and mixed with lime, thus becoming a marketable commodity. The members of the Council were accompanied by the Town Clerk (Mr. W. T. McGowen), the Medical Officer (Mr. H. Butterfield), and the Borough Surveyor (Mr. J. H. Cox).

Legal Intelligence.

STRATFORD POLICE COURT.—THURSDAY, JAN. 13.

(Before Col. HOWARD and Lieut.-Col. BIRT.)

THE LIABILITY OF INCOMING TENANTS FOR ARREARS OF GAS-RENT.

PROCTER v. THE WEST HAM GAS COMPANY.

This case has already been referred to in the JOURNAL (see ante, p. 17), and was a summons against the Company by a publican at Forest Gate for neglecting to supply him with gas. It will be remembered that complainant had just taken a house, the previous occupier of which had left, owing the Company £20 for gas supplied; whereupon they cut off the supply, and refused to reconnect the service until their debt had been paid.

Mr. ATKINSON, as before, appeared for the complainant; and Mr. WILLIS for the Company.

Mr. ATKINSON, upon the case being called on, said he had hoped the Bench would not have been troubled again in this matter, after a communication he had addressed to the Company, who had, however, refused to accede to the arrangement he had proposed. Continuing, he said, it would be recollected that these proceedings were taken under the 34th and 35th sections of the Gas-Works Clauses Act, 1871.

Mr. WILLIS: No, no; on the last occasion I distinctly asked under what sections the proceedings were taken, and it was then stated the 36th and 39th sections.

Mr. ATKINSON: I said they were taken under the 34th, 35th, 36th, and 39th sections.

Mr. WILLIS: Where does the summons show it? I took objection on the ground that the West Ham Gas Company were an incorporated Company, and do not come under the Gas-Works Clauses Act of 1871. The general Act of 1847 is incorporated with their Act of 1869; but the Act of 1847 and 1871 cannot be construed together.

Mr. ATKINSON: You can take the law as you please; Justice Lush's opinion is that the Act of 1871 must be read with the other as one Act.

The CHAIRMAN: The Bench are inclined to believe that the Acts of 1847 and 1871 cannot be construed together; and the case that was quoted against this opinion—that of *Scott v. Commercial Gas Company*—is only applicable to the Metropolitan Gas Companies.

Mr. ATKINSON: Surely, Sir, you are not going against that decision. I have taken Counsel's opinion, and we have come to the conclusive opinion that the two Acts must be read together. In 1856 the Company applied to Parliament and obtained an Act giving them additional powers, and this brings them within the two general Acts.

The CHAIRMAN: We have referred to the West Ham Gas Company's Act of 1856; the Companies' Clauses Act of 1845, 1863, 1869; the Company's own Act of 1869; the Gas-Works Clauses Acts of 1847 and 1871; and the Lands Clauses Act of 1845; and cannot agree with you.

Mr. ATKINSON: I have taken Counsel's opinion, and am very conclusive on the point.

Mr. WILLIS: And so have we taken Counsel's opinion.

The CHAIRMAN (to Mr. Atkinson): The Court is against you. We have heard the case pretty well, and not only heard it but considered the matter most fully, and we differ from your contention on the part of the complainant.

Mr. ATKINSON: You do not differ from me, Sir; you differ from Justice Lush's opinion. You differ with the statute and *dictum* as laid down by judges.

The CHAIRMAN: It appears to me that Mr. Atkinson wants to rely on the Company's own Act of 1856; but we have come to the conclusion that the Company did not thereby bring themselves under the Act of 1871.

The summons was then dismissed.

Mr. WILLIS: I may state that the complainant having kept public-houses before, ought to have known that in all cases of transfers the brokers are supposed to see that the gas bill is paid out of the valuation money.

Mr. ATKINSON asked on what grounds the summons was dismissed.

The CHAIRMAN: On technical grounds; upon the objections raised by Mr. Willis.

Mr. WILLIS: Then, Sir, with your permission, I will not ask for costs; but that my friend appearing for the complainant may not be taken by surprise, I may state that Mr. Procter has rendered himself liable, under the Act 19 & 20 Vict., cap. 59, sec. 46, to a penalty of £5 and 40s. per day as long as gas is burnt without the Company's permission.

LIVERPOOL CITY SESSIONS.—SATURDAY, JAN. 15.

(Before Mr. J. B. ASPINALL, Q.C., Recorder.)

AN APPLICATION TO APPOINT AN ACCOUNTANT OF THE LIVERPOOL GAS COMPANY'S ACCOUNTS REFUSED.

At the sitting of the Court this day,

Mr. LEWIS WILLIAMS made an application on behalf of certain gas consumers in Liverpool for the appointment of an Auditor to examine the accounts of the Liverpool United Gas Company.

The RECORDER said he thought some reason should be given for thinking that there would be any utility in making the appointment.

Mr. WILLIAMS submitted that it was intended to be an annual audit on behalf of the gas consumers.

The RECORDER said he could not think it was intended to be an annual audit. It might be that nothing would come of the investigation, which would be an expensive one, and he should decline to order an audit until he had an affidavit to the effect that there was reasonable ground for believing some result would follow the appointment of an Auditor. He would make the order in a moment on an affidavit being made to this effect by some respectable gentleman.

THE WATER SUPPLY OF BINGLEY.—At the last meeting of the Bingley Local Board, the Clerk produced copies of the Bingley Improvement Commissioners and of the Bradford Corporation Bills about to be laid before Parliament, seeking powers for water-works purposes at Bingley. The Board did not raise any objection to the former Bill; but appointed a deputation to wait upon the Denholme and neighbouring Local Boards, with a view to obtain united opposition against one of the clauses in the Bill of the Bradford Corporation, the clause, it was feared, having a tendency to weaken the powers of the Local Boards to act as inspectors in their own districts.—A meeting of ratepayers was subsequently held in order to decide finally whether or not opposition should be offered to the Bradford Corporation Water-Works Bill. Mr. Ecroyd presided, and after making known the nature of the Bill, and of the course the Commissioners intended to adopt, proposed a resolution authorizing the Commissioners to oppose the Bill in Parliament. Mr. R. Hartley seconded the motion. Mr. R. Fawcett proposed, and Mr. S. Waddington seconded an amendment negating the proposition made by the Chairman; but the motion was carried by a large majority. After some further discussion, the meeting gave the Commissioners authority to pay the costs of the opposition out of the money borrowed under the Bingley Improvement Act, or failing this source, out of the improvement rates.

Miscellaneous News.

EUROPEAN GAS COMPANY, LIMITED.

An Extraordinary Half-Yearly General Meeting of this Company was held at the London Offices, Austin Friars, on Wednesday, the 19th inst.—WILLIAM WHITE, Esq., in the chair.

Mr. H. M'L. BACKLER read the notice convening the meeting, and the following report of the Directors:—

The financial prosperity of France, which has recently been favourably commented on by the English Press, is a subject on which the Directors feel that they are justified in congratulating the Shareholders. The good sense of the great body of the people, coupled with experience of the past and their general thrift, seem to afford reliable guarantees that the material interests involved will ensure permanent internal peace, if not a general expression of contentment.

During the past half year the revival of trade has been distinctly felt in several of the towns lighted by the Company, and if the cotton industry has not yet fully participated in the improvement, it is probable that a similar advantage will soon reach that also.

At Sotteville, where many factories have been worked on short time only, the consumption of gas has not hitherto been such as to render it necessary to put the new works in action, the district having, so far, been sufficiently supplied from the Rouen station; but they will be quite ready to provide for the additional demand when it arises.

At Rouen a contract has been entered into between the Municipality and the Company, whereby long outstanding differences have been finally settled, and some claims and charges on the Company abandoned, in compensation for which the price of gas to private consumers was reduced by the equivalent of 54d. per 1000 feet from the 1st inst.

At Boulogne the construction of the new deep-sea harbour is proceeding on an extensive scale, and although it will not be completed for several years, the favourable effect of such an important public work is already felt in the increased prosperity which it is the means of bringing to the town and its suburbs. In addition to this it may be stated that the last bathing season at this place was unusually successful.

The Directors regret to state that the Chief Accountant at the Boulogne station has succeeded in eluding, by means of fraud and false entries, the elaborate checks placed on all holding similar positions. He had been 19 years in the service of the Company, and had borne an excellent character. The amount of his defalcations is now the subject of a strict investigation, but whatever the result may be, it will not affect the current profits of the Company, the guarantee provided being more than sufficient to cover the deficiency.

The severe winter of 1879-80 admitted of the old stocks of coke being sold off at fair prices, and was also the means of so generalizing the use of this article of fuel as to cause a continued demand for it, on an increased scale, throughout the year. The mildness of the weather during the early part of the present season has, however, somewhat checked this improved state of affairs, and stocks have been again accumulating, but, so far, to a moderate extent only.

In all other respects the business of the Company appears to be in a satisfactory condition, and recent returns show that the improvement over past years is considerable. Any more definite statement must be deferred until the annual general meeting in July, when the accounts for the twelve months ending on the 31st of March next will be duly presented to the Shareholders.

Debentures at 4½ per cent., amounting to £9700, which fell due on the 1st of January, were renewed for a term of years at the rate of 4 per cent. per annum, with the exception of £1200 paid off.

The usual interim dividend of 4 per cent. will be paid on the 1st of February next, free of income-tax.

The CHAIRMAN: As you are all aware, we do not at this time of the year give you a long report, because, in the first place, we have no accounts to lay before you, and, in the next place, our accounts are not made up till the 31st of March. Of course at that time we see our exact position, and know precisely how our affairs stand; but we have daily and periodical returns made, which are constantly before us, and which enable us to form an idea of our progress, and to report to you accordingly. This we have done to-day. I think what you have heard in the report is sufficient to enable you to judge how we are going on, and I believe the final accounts will entirely bear out the present statement of the Directors. The value of coke necessarily fluctuates according to the prevailing temperature; but one sharp winter, such as we had in 1879 and 1880, has an effect in extending the demand for new requirements, and this is generally felt long after the immediate occasion has passed away—in fact, the present price of coke is higher than it was last year, because the stocks then became exhausted, and we were able to raise the price and maintain it. The augmentation of the stocks must be met by a reduction of price, and then a different state of things will prevail for a time; but I should hope, from the present state of the weather, that we should not have any occasion to make a reduction, or very little reduction, in price. However, the main point on which we have to congratulate you is that the consumption of gas is increasing satisfactorily; and even at Rouen and Sotteville, where the factories have consumed less gas than usual, the reduction has been more than made up by the larger demand for shops, houses, and other establishments. We continue to do all in our power to promote a still more extended use of gas, by supplying fittings, stoves, and gas-engines on terms easily met by all, even though their resources may be but slender. It is with much regret, as the report states, that we have to inform you that our Chief Clerk and Accountant at Boulogne is found to be a defaulter. The accounts are being investigated, but whatever is the result it will not affect the current profits of the Company. The financial state of France is so satisfactory that I believe it will inspire an increased feeling of confidence that she will continue to prosper; and if this be so, we cannot doubt that the Company will derive their full share of benefit from the flourishing state of the country, especially as we are protected in all our business by exclusive privileges for long terms of years. I need not, I think, extend my remarks to any further details. The report is sufficiently explicit as to the particular points to which your attention is called, and if any further information is desired, I will do my best to give it to the satisfaction of any Shareholder who may desire it. I now move—"That the report now read be received and adopted."

Mr. H. SOLOMON seconded the motion.

Mr. T. A. STOKES thought it must be very gratifying to the Shareholders to hear that the security given by the defaulting Accountant was sufficient to cover the defalcation. This showed the great care with which all the appointments were made. He was glad to hear that the Company's position was so good; everything apparently going on well.

Mr. DODGSON asked whether the reduction in the use of gas at the factories, referred to in the report, was owing to the successful introduction into those factories of the electric light.

The CHAIRMAN: Certainly not. With regard to what Mr. Stokes said, we have not security for the defaulting Accountant at Boulogne. He had been an old servant of ours—he had been in our employ for more than 19 years, and we did not take personal security for him. The security we allude to is the amount we have set aside every year to meet accidents of this sort, and therefore we are amply covered without touching the Shareholders' dividends in any possible way.

Mr. DODGSON asked whether it would not be advisable to have a guarantee in future for those who occupied such positions in the Company's employ.

The CHAIRMAN: The difficulty is this: The salaries are not so large in France as they are here, and we hesitate about charging the clerks with a guarantee premium; but to prevent anything occurring to reduce our profits we lay by a certain sum of money yearly, so that we shall be quite clear that whatever happens will not interfere with the dividends we declare to the Shareholders. It is therefore merely a matter of discretion on our part. When a man has been in your service for 19 or

20 years, and is advanced to a better position, it is not always that we can get from him security, as you advise.

Mr. R. H. JONES inquired what effect the proposed reduction in the price of gas at Rouen would have on the profits of the Company.

Mr. BACKLER, in reply, stated that the advantages which the town had accorded to the Company would go very far to compensate for the reduction they had made in price.

In answer to a Shareholder, the CHAIRMAN said the matter of the default at Boulogne was under investigation. He thought it would amount to about £1500 or £1600.

Mr. DODGSON inquired the amount of the fund that was set aside to meet these contingencies.

Mr. BACKLER: £11,000.

Mr. BEARD thought it would certainly be advisable to take security from a guarantee society against such defaultations.

Mr. BACKLER reminded the Shareholders of what the Chairman had stated as to the salaries in France not being high for such employment, and remarked that if the Directors insisted in some cases, where personal security was not obtainable, they would have to pay the guarantee society. Instead of this they themselves provided against such contingencies as the present, by setting aside what they otherwise would have to pay to a society.

Mr. BADDELEY observed that it was an underwriting account.

The CHAIRMAN: We are underwriters for our people, and we are underwriters in other cases—with our freights and insurances, and everything of this sort.

The resolution was then put, and carried unanimously.

Mr. STOKES, in moving a vote of thanks to the Chairman and Directors, said he felt quite sure they did everything in their power to promote the interests of the Company, and the result was the great prosperity they enjoyed.

Mr. GAREY seconded the motion, which was carried unanimously.

The CHAIRMAN, in reply, said it was always a pleasure to the Directors to receive a vote of thanks from the Shareholders, especially when they stated that they were satisfied with the management of the concern. The Directors did the best they could to manage the business properly, and he thought, as Mr. Stokes intimated, the result proved that the Company were pretty well to do.

The proceedings then terminated.

THE GAS QUESTION IN LINCOLN.

In view of the poll of ratepayers now being taken in Lincoln, and which has been rendered necessary by the vote at the recent public meeting being adverse to the Bill deposited in Parliament this session by the Corporation, a statement has been extensively circulated throughout the city, giving information as to the objects sought to be effected by the Bill.

It states that the chief reason for promoting the Bill is to enable the Corporation to purchase the gas-works; and if this purchase had not been contemplated, it is probable the Bill would not have been introduced. Should the Bill proceed, the Corporation will most likely strike out or amend some of the clauses which do not refer to the purchase of the works. The only reason for including in the Bill the clauses which do not affect the gas-works was to take advantage of the opportunity of obtaining, at a small expense, enactments which experience in other towns has proved to be beneficial to the inhabitants of thickly-populated districts.

As to the purchase of the Gas Company's undertaking, it is stated that the effect of the agreement between the Corporation and the Company, provided it is sanctioned by Parliament, is as follows:—The Corporation agree to pay to the Company the annual sum of £5024, being the same sum as the Shareholders now receive by way of dividend. The Company transfer to the Corporation all the gas-works plant, and everything belonging to them, retaining only £2500 out of the reserve fund, so that the Corporation obtain the whole property of the Company, including the balance of the reserve fund (which balance in July next will probably amount to £11,500), without having to borrow or raise any money whatever. The Bill provides that the Corporation shall annually set apart a sum of money which will be sufficient at the end of a given term of years (the maximum length of which will be fixed by Parliament), either to redeem all the gas annuities, or to produce in the way of interest an amount equal to the annuities, supposing the annuities not to be purchased, so that in a given time the Corporation will be possessed of the gas undertaking free from any other charge or incumbrance.

The Company's capital is £84,480, and they are possessed of a large sum, now amounting to £10,900 in Consols, which forms the reserve fund. The following statement gives the details of the Company's capital and dividends:—

Capital Account.

320 old shares at £25, bearing a maximum dividend of £10 per cent.	£8,000
400 new shares at £50, £7 per cent.	20,000
320 improvement stock £14, £5 per cent.	36,480
Preference stock, £5 per cent.	20,000
	£84,480

Dividends.

£8,000 at £10 per cent.	£800
£20,000 " £7 " "	1,400
£36,480 " £5 " "	1,824
£20,000 " £5 " "	1,000
	£5,024

Total annual payment for dividends. £5,024

That the gas undertaking is now a most profitable concern appears from the following statement of the result of last year's working:—

The gross profits of the Company for the year 1879 available for dividend were.	£6601 12 0
After deducting the annual dividends on the shares, and which will continue to be payable by the Corporation, as above stated	5024 0 0
A surplus remained from the trading on one year of	£1577 12 0
On the completion of the purchase the Corporation will be entitled to	
Dividend on reserve fund, which will at least amount to £10,900, £3 per cent. Consols	327 0 0
And will save the Directors' and Auditors' fees of	210 0 0
So that a surplus for that year of at least	£2144 12 0
would have been received by the Corporation if the works had then been theirs, and the purchase had been made on the terms now proposed.	

It is believed that the accounts for 1880 will show greater profits, and of course a larger reserve fund, as the profits of the Company have steadily increased for years, and there is every reason to suppose that such increase will continue.

The Corporation were advised by Mr. G. W. Stevenson, who, in the course of his report, made the following remarks:—

The condition of the works, both in regard to the plant, machinery, and buildings,

is almost equal to new; and this applies without limitation to every part of the works, except to four old purifiers at the Newland works, which ought to come out, and be replaced by others, of equal or somewhat increased capacity, of modern design. This will cost about £800.

I am accurately informed of the facts in respect to every transfer that has taken place from gas companies to local authorities in recent years, and I am able to assure you that in no single instance have the terms agreed upon been so favourable to the purchaser as in this case. There is no bond debt to be taken over, the works are well designed, substantially erected, in first-rate condition, and larger than required for the business at the present time. The Company are able to pay maximum dividends, with a very low selling price for gas, and when the leakage shall have been reduced to its normal condition, there will be a surplus profit of at least £2000 a year, a large sum, amounting probably to upwards of £10,000, will be handed over from the reserve fund account, and yet you are only required to pay the proprietors' maximum dividends in perpetuity.

The statement—which is signed by the Mayor (Mr. B. Cannon), the Town Clerk (Mr. J. T. Tweed), and the Clerk of the Urban Sanitary Authority (Mr. H. K. Hebb) concludes the reference to this part of the Bill by saying: "Should the Bill become an Act of Parliament, the Corporation will have the right, if they think fit to exercise it, of lighting with electricity the streets and public places of resort."

THE PRICE OF GAS IN BRADFORD.

A proposal to reduce the price of gas in the borough of Bradford has lately been engaging the attention of the Gas Committee of the Corporation. In November last a Sub-Committee of the Gas Committee was appointed to look into the subject, and on Dec. 29 they presented a report which, however, was not finally considered by the Gas Committee until last Saturday week, when it was resolved that the report should be received but not adopted.

The Sub-Committee stated that, after carefully considering the matters referred to them, they are of opinion that the time has arrived when it is desirable that the price of gas supplied by the Corporation should be reduced. The present price of gas per 1000 feet is, in Birmingham, 2s. 6d. to 3s.; Halifax, 2s. 4d.; Nottingham, 2s. 8d.; Salford, 3s. 1d.; Huddersfield, 2s. 9d.; Preston, 3s. 2½d.; Leicester, 2s. 8d.; Liverpool, 3s. 3d.; Leeds, 1s. 10d.; Sheffield, 2s. 4d. At Birmingham, Halifax, Nottingham, Salford, Huddersfield, and Leicester, profits are made and applied wholly or in part to the relief of the rates.

The Sub-Committee are of opinion that a reduction in the price would give a considerable stimulus to the consumption of gas, which is so much required, considering that at the present time the maximum amount of gas consumed is only 11-14ths of the quantity which the existing plant is capable of producing, and in view of the considerable extension of the new Birkhall works, which are likely to remain useless for a long period unless a large increase in the demand should arise.

The use of gas as a fuel is, they mention, on the increase; and in the opinion of the Sub-Committee a reduction in the price would lead to a more general appreciation and adoption of gas for this and other purposes. Without offering any opinion as to the probabilities with reference to the practical application of electricity for lighting purposes, the Committee think it would be imprudent, considering the costly works and plant possessed by the Corporation, not to use every means for introducing and promoting the use of gas for other than illuminating purposes. The Committee also believe such a reduction not unimportant for meeting any competition which may arise from the use of other illuminating appliances; and one advantage of an increased consumption of gas as fuel would be that it would mostly be used for this purpose in the summer months, when the gas-works are comparatively idle for general purposes.

From the time the gas-works were taken over by the Corporation, the annual profits have been as follows, exclusive of sums appropriated to the sinking fund and the restoration fund:—

In the year 1871	£9,855 13 0
1872	12,927 12 1
1873	4,648 3 4
1874	10,848 12 4
1875	23,763 7 4
1876	21,583 17 11
1877	25,955 1 8
1878	22,881 1 3½
1879	26,131 2 9½
In the first half of the year 1880	14,014 4 4

Of these profits £151,500 have been applied in relief of the rates—a relief in which every ratepayer, whether a consumer of gas or otherwise, has participated rateably. The effect of this is that the distribution of benefit is unequal, and, as the Committee think, inequitable. They are of opinion that the supply of gas is a monopoly in the hands of the Corporation, entrusted to them for the supply of an essential article of universal requirement. Gas should therefore be supplied to the inhabitants at no higher price than is reasonably sufficient to cover the cost of production and distribution, a proper provision for depreciation, and a reasonable amount to cover risk of accident, &c.; unless, at all events, the burden of contributing to the extra price charged could (and from the nature of the case this is impossible) be made to fall upon every ratepayer proportionally.

As to the extent to which a reduction in price should be made, the Committee, after carefully considering the whole question, decided to recommend a reduction of 6d. per 1000 cubic feet, making the price 2s. 6d. per 1000 feet, such reduction to take place from and after the 1st inst. Assuming no increase whatever upon the present consumption, this reduction would reduce the profits by the sum of £18,687 per annum, which would still leave a fair margin of profit upon the year's operations. The reduction in profits, however, would not be so large in case the Committee's recommendations upon the question of discounts, hereafter mentioned, had been adopted.

The Committee reminded the members of the Council that this reduction, if adopted, would not entail any addition to the rates during the coming year, the profits for 1880 having already accrued, and there was every reason to believe that, with an increased consumption, and a consequently decreased proportionate cost of management, sinking fund, &c., together with a large prospective increase in the value of the residual products—viz., ammoniacal liquor, tar, and spent oxide—the apparent loss of profit involved by the proposed reduction would be largely counterbalanced at no distant date.

The rates of discount at present in operation are as follows:—

£1 to £15	2½ per cent.	£60 to £75	12½ per cent.
15 to 30	5 "	75 to 90	15 "
30 to 45	7½ "	90 to 105	17½ "
45 to 60	10 "	105 and upwards	20 "

The Committee were of opinion that discounts at these rates could not be justified upon any sound principle, and they saw no necessity for their continuance, provided the foregoing recommendation for reduction in price were adopted. The Committee say they had not been able to ascertain that discounts at these rates are allowed in any other town, nor did they find any other town in which anything like the same difference is made as at Bradford between the different classes of consumers. A reasonable discount for prompt payment, to be peremptorily forfeited

by default, is, they consider, not undesirable; and, under all the circumstances, the Committee recommended that in future the rates of discount should be as follows:—

£1 to £15	2½ per cent.	£15 to £60	10 per cent.
15 to 30	5 "	60 and upwards	12½ "
30 to 45	7½ "		

The Committee calculated that this alteration of discount would result in saving £3241, to set against the loss of profit previously mentioned.

The report, which was signed by Alderman Priestman, concluded in these words: "Without the adoption of the proposed reduction in the price of gas, the Committee think it would not be expedient at present to make any alterations in the rates of discount."

Before the report above referred to had been discussed, a second document, bearing the signature of the Mayor (Mr. Angus Holden), and entitled "Objections to Proposed Reduction in Charge for Gas," and dated the 12th inst., was printed and distributed to members of the Committee and the Town Council. This emanation from the Mayor we give in its entirety:—

There is a proposition now being made by a few members of the Gas Committee to reduce the price of gas from 4s. to 2s. 6d. per 1000 cubic feet. This is a serious question, and requires grave consideration on the part of members of the Committee, as the reduction, if made, would have an injurious effect upon the rates and property of the borough. Attention is called to the following reasons why it may be considered desirable to reject the proposal:—

1. The public outside do not demand any reduction, which would certainly not be the case if the price were considered to be excessive and unreasonable. Therefore it may well be asked why the question is raised at all.

2. The reduction could only benefit the large consumers and cottage owners. The latter, who generally include in the rent the charge for gas, will not make any reduction in rent because of the proposed reduction in the price of gas. Therefore, a few large consumers and cottage owners would derive all the apparent advantage, and the mass of the ratepayers would get none whatever. What the mass of the ratepayers would have to do would be to pay increased rates to make up any deficiency arising from the proposed reduction.

3. The sum realized as net profits from gas alone is not shown in the abstract of accounts, and therefore cannot be dealt with separately; but it will amount to much the same thing to take the receipts and profits upon the different items combined. The total receipts for 1879, the last year for which the accounts are published, for gas and residual products amounted to £141,000. The proposed reduction is equal to one-sixth of that amount, or £24,500. The net profits for the same period were £26,131. The result, therefore, of the reduction would practically be to annihilate the profits, to meet which an increased rate would be required. To saddle all the rateable property in the town with additional taxation cannot fail to prove prejudicial to its market value.

4. It will be useless to speculate on an increased consumption of gas, as the result of reduced prices, to meet this large prospective deficiency. Gas being a necessary article of consumption, the users of it are not likely to be influenced either one way or other, to depart from their ordinary practice, because of a change in price. They must, as a rule, under any circumstances use all they require. Further, the anticipations entertained, during the exhibition last year to illustrate the application of gas as an article of fuel, have not been realized. The public do not appear to avail themselves of the suggestion under other than exceptional circumstances. The prospect, therefore, of relief in this direction must be very remote indeed. Neither can any increase of income be assumed from other means. The extension of the works from time to time to meet the ordinary demand for gas will have a tendency rather to increase than diminish, for some time to come, the cost of management, sinking fund, &c. There can be no possible security that there will be a prospective increase in the value of residual products, or even a sustained demand for them. They may be superseded by a superior article, or be more economically obtained from some other product.

5. The gas-works are the ratepayers' property, and the ratepayers are entitled to the profits which result from a fair market price for their produce.

6. The Bradford Gas-Works were taken from the old Company solely that the ratepayers might have the benefit of the profits instead of the Company. The complaint against the Company was that, in effect, they monopolized the profits. To enable the Corporation to make adequate profits from the works, they were empowered by their local Act to charge 1s. per 1000 feet of gas, though the Company were only charging 3s. The Corporation do not avail themselves of this power, but are content with the price charged by the Company of 3s., less discount; terms which will compare most favourably with other large towns, and are lower than those demanded by many companies.

7. Ten per cent. is generally regarded as a fair return in the shape of profits on the capital in old established gas-works. It is well known that this was the limit of profit allowed to the Company, previous to the works becoming the property of the Corporation; and the Corporation are entitled to all the advantages enjoyed by the Company. It will be seen, however, on referring to the published accounts, that the existing return is much below that sum. The capital is £380,000, on which the profit of £26,000 is rather under 7 per cent.

METROPOLIS WATER SUPPLY.

THE EAST LONDON WATER COMPANY'S BILL.

At the Court of Common Council last Thursday—the Lord Mayor in the chair—the Remembrancer reported that the above-named Bill had been introduced into Parliament, and he suggested that it should be referred to the Special Water Committee. It was, however, duly moved and seconded that the Bill be referred to the Gas and Water Committee.

Mr. HART remarked that the Company had exceeded their powers in issuing stock by nearly £200,000, and were asking for further powers to raise very nearly half a million of money, and to issue debentures at 4 or 3½ per cent. for this purpose. There was no objection to this; but they were seeking for power to charge the ratepayers of the Metropolis with 7 per cent. upon the additional capital. Inasmuch as the whole of the facts connected with the water supply question were before the Special Committee, it would be better to refer the matter to them.

This motion having been seconded,

Mr. INNES said the Special Committee was simply a device to take power away from the proper Committee for dealing with a particular subject.

A long discussion ensued as to which Committee should have charge of the matter, and the amendment was eventually put and carried.

A division was called for, when the numbers were—For the amendment, 69; against, 67.

HYDRANTS IN THE CITY.—At the meeting of the Court of Common Council, referred to above, a report of the Gas and Water Committee, relative to the establishment of a system of hydrants for the extinction of fire in the City, was adopted. The report stated that the work of erecting hydrants was completed on Nov. 1, 1879, when the number, together with 28 erected by the Commissioners of Sewers on Holborn Viaduct, amounted to 818. By the returns received from the Commissioners of the City Police, the number of fires occurring in the City from Nov. 1, 1879, to March 31, 1880, was 139. Of these 51 were important, and out of this number 31 were put out by hydrants alone, 12 by fire-engines, and 5 by the combined action of fire-engines and hydrants. From April 1 to June 30, 1880, 30 fires occurred; 15 were of such importance as in 10 cases to require the use of hydrants, which extinguished the flames, while in the 5 other cases engines and hydrants were employed. From June 30 to Sept. 29, 1880, there were 38 fires, 14 of which were extinguished by hydrants alone, 4 by hydrants and engines, 2 by hydrants and stand-pipes, and the remaining 18 were unimportant. The amount expended in excavating and other work, previous to fixing the hydrants, was £13,303 12s. 2d., and the cost of hydrants £5112 9s. 8d., which, together with other expenses, made a total of £27,539 0s. 11d. The grants from the Corporation were £15,654, and the contribution of the Commissioners of Sewers £6738. The sum paid by the New River Company for the use of branch

mains was £2000. Miscellaneous receipts had amounted to £35 12s., leaving a balance of £3111 8s. 11d. to be provided, which had arisen in part from the 81 additional hydrants required beyond the estimated number. The report recommended that this amount should be paid out of the City's cash. The question of the repair of the hydrants, it was stated, was now under the consideration of the Committee, who were in communication with the Metropolitan Board of Works on the subject.

QUEENSTOWN GAS COMPANY.

We have received a copy of a report, just presented to the Queenstown Commissioners, of an audit of the accounts of the Queenstown Gas Company for the year ended June 30, 1880. The Auditor was Mr. Michael P. Buckley; and as the result of his examination, he urges the Commissioners "to take immediate steps to purchase the works" before the powers contained in the Company's Act of 1879 shall have expired—that is, within two years of the passing of the Act.

The report shows that the total nominal capital of the Company is £33,000, of which £8000 is to be raised by loans. The amounts issued are £15,000 of shares and £4000 of loans, in addition to which there has been received on capital account £73 16s. 11d for premiums on shares. The expenditure on works, &c., to June last was £18,375 10s. 2d. The cost of obtaining the Act of Parliament referred to above, figures in this item at £1691 9s. 11d.

A weekly comparison of the coal carbonized and gas made for the 12 months in question shows totals for the first half year of 758 tons of coal, at an average price of 15s. 2½d. per ton, producing 7,020,000 cubic feet of gas; and for the second half, of 691 tons 16 cwt. of coal, at an average price of 15s. 4d. per ton, producing 6,005,000 cubic feet of gas. The highest and lowest amounts of coal carbonized were 43 tons 8 cwt. in the week ending Dec. 17, 1879, and 14 tons 6 cwt. in the week ending July 9, 1879; producing 116,000 and 129,000 cubic feet of gas respectively. Of the 13,025,000 cubic feet of gas thus made, there were sold to private consumers 8,635,700 feet at 6s. per 1000 feet, 1,600,000 feet at 5s. 6d. per 1000 feet, and 1,120,100 feet under contract; leaving 1,968,600 feet, or 14¼ per cent., unaccounted for. The absolute loss by leakage cannot be ascertained, as the quantity used on the works and in the offices is not known. The production, per ton of coal carbonized, was 9397.84 feet; and the sale, 8040 feet. The capital employed amounted to £12 12s. 5½d. per ton of coal used, or £1 11s. 1½d. per 1000 feet of gas sold.

From the working statement we extract the following particulars:—

	Cost.	Per 1000 Feet of Gas Sold.	Per Ton of Coal Carbonized.
	£ s. d.	s. d.	s. d.
Coals	1107 18 2	22 81	15 3 10
Residuals	631 08 7	13 01	8 8 60
Net for coal	476 19 7	9 89	6 6 80
Working expenses	1270 8 3	26 12	17 6 28
Total	1746 8 0	35 92	24 1 08
Sales of gas	3529 5 1	72 06	48 8 21
Profit on manufacture	1782 17 1	36 74	24 7 15
Rental of meter and sundries	147 18 11	3 01	2 0 42
Total profit	1635 16 0	39 78	26 7 61
Dividend and interest	1497 13 3	28 98	19 5 02
Balance	538 2 9	10 80	7 2 62

The amount shown above—of £1407 19s. 3d.—represents 10 per cent. on the "A" shares, £992; 5 per cent. on the "B" shares, £150; 7 per cent. on the "C" shares, £59 8s. 5d.; and the remainder (£206 4s. 10d.) is interest on borrowed money. The balance in hand of £523 2s. 9d. has been carried forward to form a reserve and depreciation fund.

The report then goes on to point out that the present statutory dividend of the Company is £1407 19s. 3d., which at 16½ years' purchase* is worth £23,461 0s. 10d.; and that this amount raised by the Commissioners at 1½ per cent., would cost them £1055 14s. 11d. per annum. On these figures, as already stated, Mr. Buckley recommends a purchase of the works.

THE GAS SUPPLY OF RICHMOND (SURREY).

OPPOSITION TO THE GAS COMPANY'S BILL.

A Special Meeting of the Richmond Select Vestry was held on Thursday, the 6th inst.—Lieut.-Col. Sir FRANCIS BURDETT, Bart., J.P., in the chair—to consider the provisions of the Bill to be promoted in the present session of Parliament by the Richmond Gas Company.

The CLERK opened the proceedings by reading the report of a Committee appointed by the Vestry to confer with the Directors of the Gas Company as to certain suggested modifications in the Bill, with the view of securing to the consumers of gas more favourable terms than those they at present possess. A deputation from the Directors had an interview with the Committee on Dec. 29, when the Chairman (Mr. F. Chapman) stated that the Company could not agree to supply gas of increased illuminating power at the present price, nor to reduce the price; but they would be glad to consider the charge for supplying the public lamps, with a view to meeting the wishes of the Vestry. At an adjourned meeting of the Committee it was resolved that the minutes of the meeting on the 29th ult. be reported to a special meeting of the Vestry.

The CHAIRMAN said the question the Vestry had now to consider was whether they should oppose the Bill in Parliament. The Company had not met them in the manner he hoped they would have done—by increasing the illuminating power and reducing the price to be charged. The matter was one that required careful consideration, as the interest of the ratepayers was very much at stake; but although they might wish to increase the illuminating power of the gas, it was a question whether it would be worth while to incur the expense and trouble of going to Parliament to oppose the Bill.

Mr. BURDETT said the following resolution:—"That it is expedient for the Vestry to oppose the Bill promoted in the present session of Parliament by the Richmond Gas Company, entitled 'A Bill to enable the Richmond Gas Company to raise additional capital, to enlarge their works, and for other purposes,' and that the expense of such opposition shall be paid wholly out of the highway and general rate." In doing so he said the Vestry would remember that on a former occasion, when it was decided to summon the present meeting, he made a statement as to the grounds on which the Committee were appointed. He considered that a special meeting should be held, and the ratepayers be asked to confirm the views of the Committee with regard to opposing the Company's Bill. He should have thought the decision of the Vestry on the last occasion, that the present meeting should be held and the ratepayers convened, was a sufficient indication of the mind of the Vestry. He did not propose his motion with a view to incurring large expense in Parliament. He

* The Company, though a statutory one, are to be treated as being without parliamentary powers. Section 69 of their Act of 1879 expressly provides that the Arbitrator, in the event of a sale, shall assess the value of the undertaking without taking into consideration the fact that the Company are incorporated by statute.—ED. J. G. L.

would much prefer that some favourable arrangement should be made with the Company. It would seem, however, that the Directors were not prepared to make any concession on the two principal points mentioned by the Committee—they were not prepared to increase the illuminating power, nor to reduce the price of the gas. Nor was any suggestion made that they would at any future time reduce the price, except they were bound to do so by Act of Parliament. The Company could not, by their Act of 1867, pay a higher dividend than 10 per cent. on the original, and 8 per cent. on the new capital. It was not a question of paying 10 per cent. and 8 per cent. on £30,000 and £30,000; but they were going to Parliament to double the amount. They proposed to increase their capital from £60,000 to £120,000, and no modifications were inserted in the Bill under which the public or the Vestry would be benefited. When he said that the total amount paid in Richmond for gas was something like £27,000 a year, he thought it would be conceded that the subject was one of considerable importance. The Vestry had not yet received the accounts of the Company for 1880; but he had had an opportunity of looking at those for 1877, 1878, and 1879. In 1877 the receipts for gas, coke, and residual products amounted to £22,017; in 1878 they increased to £23,898; and in 1879 to £25,838—a very respectable figure; and he thought it might be assumed, from the increasing population of Richmond, and the house-building which was going on, that the increase of £2000 in 1878 and 1879 would be followed by an increase of £2000, or more, between 1879 and 1880. These were the total receipts for gas, residual products, and coke. The net revenue, which was perhaps a more important figure, was as follows:—1877, £8588; 1878, £9615; 1879, £10,814. Well, the Vestry paid, or perhaps he should say ought to pay, £1500 a year, or thereabouts, for the gas supply to the public lamps in Richmond, and, therefore, while the Vestry, in respect of their public obligations, paid but a small part of the gross receipts, as representing the ratepayers, who paid the remainder, they had the duty cast upon them, as a public body, of having regard to the price paid for private supplies, but he was informed that the representatives of the Company were not unwilling to consider a more favourable charge for supplying gas to the public lamps. This was a thing not to be despised; but when they saw the amount charged for the lamps was only £1500 a year out of £27,000, it was not a large matter, regarded from any point of view. He did not think, if the Company said they would supply the lamps at a very moderate rate, the Vestry would be satisfied to allow private consumers to be left to the mercy of the Company. The price paid for gas at Richmond was 3s. 9d. per 1000 feet, whereas in London one Company charged 2s. 10d., while other Companies charged 3s. At the present time all these Companies supplied gas nominally of 16, but in reality of 17 candles illuminating power, and he was glad to see that the Richmond Company, who were under an obligation to supply only 14-candle gas, had sometimes gone beyond their standard. The receipts were increasing largely every year, and it was perfectly clear the Company anticipated a much larger amount in the future. He could not help thinking that they should be able to supply an increased quantity of gas at a less price. He remembered that in 1867, when the ratepayers and the Vestry opposed the Company's Bill, a substantial reduction was obtained; and in view of the fact that the Company would not be in Parliament again for at least 20 years, and that they had an absolute monopoly of the gas supply, it appeared to him that this was an occasion when an inquiry should be made as to what was fair and proper, and there was no way in which the Vestry could obtain this except before a Committee of the House of Commons. They need not incur any very heavy expense in conducting an opposition in Parliament. If it was decided that it was necessary, they would have to take the advice and secure the assistance of some competent gas engineer. The details of the economy of gas making and all other matters must be very carefully considered before they went before the Committee on the Bill. But, although they might incur an expense of a few hundred pounds, when they considered the large amount paid for gas—£27,000—even supposing they spent £500, the money would be well laid out if they succeeded in obtaining a substantial reduction in price. There was one difficulty and only one—namely, whether they could obtain a sufficient number of the Vestrymen present to pass the resolution in accordance with the Act of Parliament; but if a sufficient majority was not present to pass the resolution, they must adjourn the meeting until they obtained it.

Mr. CARLILE thought Mr. Burt should state, before the motion was put, not the prices paid in London for gas, but those paid in other small towns. It was not fair for Mr. Burt to state the London figures.

Mr. C. RUGGE-PRICE seconded the motion, observing that the Committee met the Directors in conference, and they gave a categorical refusal to the points raised, so that the Committee were compelled to come to the Vestry for their authority to oppose the Bill.

Mr. SMITH asked Mr. Burt what was meant by the statement in the report of the Committee as to the charges of the Metropolitan Companies not exceeding 3s. 3d. per 1000 cubic feet. The standing prices of the London Companies varied, he said, from 3s. 6d. to 4s. 6d.

Mr. BURT said he must respectfully decline to answer the question. He thought the resolution of the Committee, that the gas consumers ought to be supplied at 3s. 3d. per 1000 feet, was a sufficient indication to the Company of what it was thought they ought to do. It was quite true that some London Companies did charge 3s. 3d.; but most of them now charged 3s., and one 2s. 10d. What the Committee meant was, that in the present condition of the coal market, 3s. 3d. per 1000 feet was the right price to charge. If the Company would be good enough to give them their views, he should be glad to hear them.

Mr. MAXWELL supported the motion. He said the first obligation of the Vestry was to see that every ratepayer was supplied with pure and cheap light. Years ago he considered it would be good policy for the Vestry to take into their hands the manufacture of gas on behalf of the public. If the Vestry opposed the Bill, they placed themselves in the common-sense position of extorting a useful bargain from the Company.

Mr. SIMS suggested that the Vestry should proceed with the petition. There were, he said, many things in the Bill of the Company that required a good deal of looking into. Therefore they must have power to oppose if they wished to make the best terms they could for the ratepayers.

Mr. TREVOR called attention to one or two figures in the Company's accounts. He said he found in the profit and loss account of 1877, after paying 10 per cent. and all expenses, they had a net profit of £2467; while in 1878 the net profit had increased to £7148 1s. 7d. Therefore there was a margin which allowed the Company to come forward and meet the ratepayers in this matter. He trusted the Vestry and the Company would come to terms.

Mr. CHAPMAN, the Chairman of the Gas Company, assured the Vestry that the Directors did not look upon themselves merely as Directors of the Company, but as Vestrymen and consumers, and in conducting their business their object was not simply to put large dividends into their pockets, but to benefit the parish generally. There was one error that had crept into the present discussion—namely, that there were large profits at the end of several years, and that nothing was done with them. He asked the Vestry to bear in mind that when there was a profit in the year 1877, a reduction of 3d. per 1000 cubic feet was made, bringing the price

down from 4s. 3d. to 4s. per 1000 feet. The Company continued prosperous, and there was again a balance, and they brought the price again down to 3s. 9d. So that they had not put these large sums into their pockets, and the Vestry would find in the accounts for 1880, that there was not an enormous balance over the sum set apart for the dividends, which were fixed by Act of Parliament. The Company had been compared with the London Companies. This was hardly fair; they were not a metropolitan company, and certainly should be compared with suburban companies or with companies in the neighbourhood. He would read the prices charged by the different neighbouring companies. The cost of coal delivered into the gas-works at Richmond was 17s. 6d. per ton; Tottenham, 16s. 9d.; Hampton Wick, 16s. 4d.; Staines, 15s. 11d.; Barnet, 15s. 9d.; Kingston, 18s. 4d.; Crystal Palace District Gas Company, 17s. 2d.; Harrow, 19s. 6d.; Croydon, 17s.; Mitcham, 19s. 6d.; Brentford, 16s. 5d.; and Wandsworth, 15s. 2d. Then again the illuminating power of the Company's gas was 14 candles, which was the same in all the other places he had mentioned. The maximum price fixed by Act of Parliament was 4s. 3d. per 1000 feet at Richmond; at Tottenham, 6s.; Hampton Wick, 5s.; Staines, 5s. 6d.; Barnet, 4s. 6d.; Kingston, 6s. 8d.; Crystal Palace District Gas Company, 6s.; Harrow, 6s.; Croydon, 4s. 7d.; Mitcham, 5s. 6d.; Brentford, 4s. 6d.; and Wandsworth, 4s., with a sliding scale. The average price actually paid last year was—Richmond, 3s. 9d.; Tottenham, 4s. 3d.; Hampton Wick, 4s. 6d.; Staines, 4s. 3d.; Barnet, 4s. 6d.; Kingston, 3s. 10d.; Crystal Palace District Gas Company, 3s. 8d.; Harrow, 5s. 11d.; Croydon, 3s. 9d.; Mitcham, 4s. 9d.; Brentford, 3s. 11d.; Wandsworth, 3s. 9d.; so that, after all, Richmond stood, with the exception of the Crystal Palace District Gas Company, as low as any. The Directors had it in their minds, and wished, to reduce the price as soon as they could do it in fairness to the Shareholders. He need hardly say that as trustees they would not be justified in supplying gas at cost price, and, whatever might be said to the contrary, he maintained that the consumers had it above the stipulated quality. The official reports showed that 18 times out of 20 they paid for 14-candle, and they had nearly 15-candle gas. Something was said about the large sum put by as a reserve fund. The reserve fund was £6000, and the surplus profits £2700. The price charged by the Richmond Company was less than that of the surrounding companies, with the exception of two. The moment the profits enabled the Company to reduce the price to 3s. 6d. per 1000 feet they would certainly do so.

Dr. SELLE trusted the Directors would give the matter a little further consideration. He had listened to Mr. Chapman's statement with a great deal of pleasure, and it seemed to him perfectly straightforward; but he assumed that the vote about to be given would be merely to petition Parliament provided the Company did not meet the Vestry.

Mr. GASCOYNE did not think the ratepayers would be satisfied unless they took the powers that were necessary. Mr. Sims had pointed out that there were many other things in the Company's Bill that should be modified. But the Vestry taking the powers asked for did not entail upon them the necessity of opposing the Bill, and the ratepayers would not be satisfied with them unless they took these powers.

Mr. BURT having replied,

The motion was put and carried, 18 votes being recorded in its favour, being two-thirds of the voting power of the Vestry.

The Vestry Clerk was accordingly authorized to prepare the petition, and present it to the Vestry at their next meeting.

A meeting of owners and ratepayers, convened for the purpose of endorsing the action of the Vestry in relation to the Gas Company's Bill, was held in the Vestry Hall on the following evening, when a resolution was passed approving of the course taken with respect to the opposition to the Bill; and at the meeting of the Select Vestry on the 11th inst., the Chairman formally announced the result of the meeting. It was then decided that application should be made to the Secretary of State for his approval to the resolution of the Vestry in favour of the opposition, and of the expenses thereof being defrayed out of the highway rate. On a proposition being submitted for authorizing the Gas Bill Committee to procure the assistance of a gas engineer, Admiral Stopford asked whether any communication had been made to the Company, with the view of arriving at an amicable settlement of the matter, and so saving the ratepayers' money. Mr. Burt replied that since the ratepayers' meeting there had scarcely been time for any negotiations with the Company, though he had had a friendly conversation with the Chairman. Alderman Stopford might, however, be assured that the Vestry would not spend one shilling of the parishioners' money unnecessarily. The proposition was agreed to.

"A Ratepayer," writing to the *Richmond Times* of last Saturday, comments on the gas question as follows:—"Now that this important Company is on its public trial, would it not be as well to inquire of whom it is composed? It almost exclusively consists of Richmond people who have faith in the undertaking, and who originally showed their public spirit by taking shares in an undertaking the success of which was by no means sure. It is governed by men whom we all know, and most of whom are concerned in the trade or property of our town, and all in its well-being. In the history of the undertaking, now spread over several years, we see the results have been not only the payment of dividends, but the supply of gas of the quality required by their Act of Parliament, as proved by the test of the Vestry. Still further we find that although at this moment, and quite within their powers, they might charge 4s. 3d. per 1000 feet for gas, they have voluntarily reduced the price to 3s. 9d.; and lately, at the Vestry, the Chairman expressed a hope that at no very distant period the price might probably be reduced to 3s. 6d. We have had before us the difficulty under which the Company labours, from the great distance from the river at which the works are placed, causing a charge of 3s. 4d. per ton for all the coal conveyed from Mortlake. This places Richmond in a very much worse position for the supply of cheap gas than any of the surrounding towns; and yet the price charged is equal to the very lowest, and is the same as Wandsworth—viz., 3s. 9d.—while Kingston is 3s. 10d. and Brentford 3s. 11d. per 1000 feet. By very unfair reasoning, both the Vestry and the public were induced to give every facility for an attack upon the Company in its proposed application to Parliament for further borrowing powers, and comparisons were drawn with the City of London now paying 3s. 4d. per 1000 feet, and with other places where it was stated even a less price was charged. The great facility of supply of coal, and the enormous quantity of gas produced, showed that comparison with these great Gas Companies was altogether unreasonable. At the public meeting lately held on the subject, we were told that by dint of bullying and holding over the Directors the prospect of opposition, we should be able to extract better terms from them than at present, and powers were voted to the Vestry to spend an indefinite amount amongst our legal friends for such a purpose. It was hinted that £500, or even less, might be enough; but the probability is that a very much larger sum would be wasted. This, however, is not the whole of the case, for the Gas Company, in consequence of opposition, will be put to a proportionately large expense, and thus all probability of reduction of price will, I fear, be out of the question. The ratepayers, of whom very few

attended the public meeting referred to, will have a large sum added to the burden they already deem heavy, and will have gained no adequate result, for should the opposition be successful, which I do not think probable, a sense of injustice would most likely induce the Company to withdraw their Bill, and thus reduce their powers of extended usefulness. Under these circumstances, I trust the public money will not be squandered in a most unwarrantable attack on a body so well deserving of our full support as the Richmond Gas Company. I write to you entirely without the Directors having any knowledge of the same, and merely as a ratepayer."

READING CORPORATION WATER SUPPLY.

A Special Meeting of the Reading Town Council was held on Thursday, the 13th inst., to consider the provisions of the Bill to be introduced this session of Parliament, "for the better local government and improvement of the borough of Reading . . . and for other purposes;" one of which purposes is in reference to the supply of water-works fittings to private houses.

The motion authorizing the promotion of the Bill having been passed, the Council went into committee to discuss clauses. In the course of the proceedings,

Mr. KING proposed that clause 74 of the Bill, which was to empower the Water Committee to supply materials, apparatus, and water-fittings to houses when requested, be expunged, saying it would establish the Corporation as a commercial and working body, and affect the interests of local tradesmen.

Mr. B. SIMONDS seconded the motion, as he thought the powers sought were unnecessary, and would certainly be unpopular, as the clause would put it in the power of the Authority to create for itself a monopoly to which it was not in any way entitled.

The MAYOR stated that a deputation had waited on him and presented a memorial, signed by 23 firms connected with the plumbing and water-fitting trades, expressing their opinion that such powers as were sought by the clause ought not to be possessed by the Corporation, and would be detrimental to the trades, and to the interests of the public, and urging that the clause be expunged. The fear of the deputation seemed to be that the Corporation would use the power in the ordinary way. He asked them if they thought it desirable the Corporation should have such power in the event of a strike among the workmen, or other such contingency, and on this point they were divided in opinion.

Alderman ANDREWS, Chairman of the Water Committee, thought the mover and seconder of the resolution, and also the deputation, were labouring under a strong delusion as to the intentions of the Committee. To a very large extent the powers sought for were already held by other Corporations under similar circumstances to Reading. With the knowledge that there was not the slightest intention on the part of the Corporation to enter into competition with the trade, he thought it would be wrong to tie their hands so that they would not be able, under any circumstances, to do such work.

The DEPUTY-MAYOR thought it desirable the Corporation should have the power in question, as it might be useful in certain circumstances.

The MAYOR moved, as an amendment, that the clause be modified so as to make it apply only in the event of a strike of plumbers or water-fitters, or other like contingency; but the amendment was not seconded.

On being put to the meeting, the resolution to strike out the clause altogether was carried by 10 votes to 8.

THE STRUCTURAL STRENGTH AND STABILITY OF GASHOLDERS.

We have been favoured by Mr. George Livesey with a copy of a report by Mr. B. Baker, M. Inst. C.E., on the stresses to which the three-lift holder, now in course of construction at the Old Kent Road works of the South Metropolitan Gas Company, is likely to be subjected. Mr. Baker's remarks will be read with interest, in view of the early publication in the JOURNAL of an illustrated description of the holder, directly the plans of the work as erected can be prepared.

Mr. Baker, when sending in his report, wrote in the following terms to Mr. Livesey:—"The result of my investigation does not suggest any modification of proportion or detail. I think that, with a 40-lb. wind acting on the whole area, the structure would be quite safe, though a diagonal tie might possibly break, and a vertical bend here and there, unless more than ordinary care be taken in putting the work together. A 40-lb. wind, however, can never take effect upon it. I do not believe it will ever be called upon to resist one-third of that, and consequently the structure enjoys a larger than usual factor of safety."

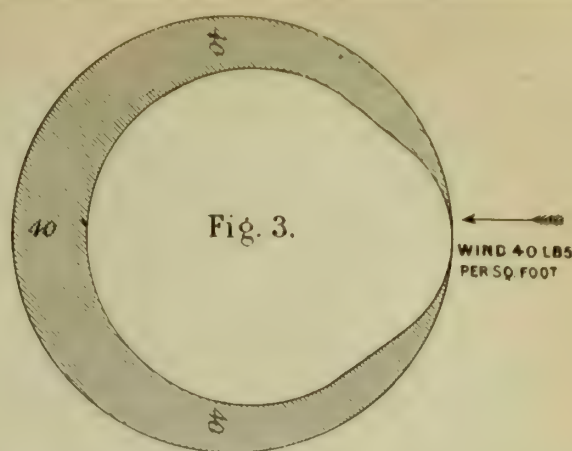
Report on Gasholder.

1. The gasholder under consideration is one of that class of structures in which it is impossible to foresee the exact intensity and nature of the stresses, on account of the details being so arranged that the stresses vary with the adjustment of the several parts and the contingencies of workmanship. It is equally impossible to foretell the stresses on an iron ship; but it is possible, in the case both of the ship and the gasholder, to arrive at a sound conclusion as to the capacity of the structure to resist the forces to which it may be subjected.

2. Complicating conditions are introduced by the construction of radial and tangential rollers, and by the arrangement of the diagonal bracing. The case is thus analogous to that of a five-legged table standing on rough ground, where the pressure on any individual leg must necessarily be a matter of chance and not of calculation.

3. The investigation as regards wind pressure may be considered firstly with reference to the strength of the gasholder, and, secondly, to the strength of the framework. If the holder would collapse with a certain pressure, it is useless, of course, to provide for a greater force on the framework.

4. The holders consist of a flexible skin of plates supported at the rim by annular rings having a certain amount of transverse strength, and by vertical stiffeners at intervals of between 8 and 9 feet. The pressure of gas may be taken as always in excess of that of the wind, and therefore there will be no tendency to a buckling inwards of the thin plates. Assuming the external and internal pressures to be the same locally at any point between a pair of vertical stiffeners, the plate would tend to pull flat from



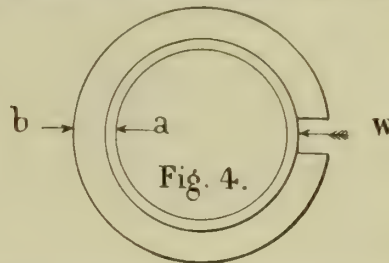
flattened plate; but this is not so in fact. The whole of the skin acts as a modified kind of arch, transmitting the distributed wind pressure to the annular rings and rollers, and the verticals act essentially as stiffeners to prevent the distortion of this arch. As there is an initial tension on the skin from the pressure of gas inside, there will be no actual direct compression on the thin plates. In fact, the condition of affairs will be best represented by conceiving the holder to be filled with gas, say at a pressure of 40 lbs. per square foot in the half of the holder remote from the wind, and at pressures ranging from 40 lbs. to nil on the side facing the wind, as in the sketch (fig. 3), where the etched portion represents the resultant bursting pressure at different points of the skin.

6. The preceding distribution of pressure necessitates the stiffening of the holder by annular rings, because a thin cylindrical vessel will only preserve its form when the radial pressure is uniform. It is a matter of indifference whether the annular stiffening be in the holder or in the framework. In the case under consideration it is in both.

7. As the resultant unequal bursting pressure in the holder (as shown in fig. 3) has to be transmitted from the several portions of the skin to the annular rings, and from thence through the rollers to the external framework, there will be diagonal strains in the skin, which would buckle the thin plate were the vertical stiffeners not introduced. The latter, however, are spaced sufficiently close together, and are made of ample transverse strength to prevent buckling.

8. If the radial and tangential rollers were all an absolutely perfect and rigid mechanical fit, the framework and holder might be dealt with as one structure practically bolted together, but it will be safer and more convenient to assume that the radial rollers alone are acting. This assumption will affect but little the final result as regards the force of wind required to destroy the structure.

9. An elastic free ring, fitting closely in a cylinder, will, if subjected to an external radial pressure on any longitudinal strip, transmit a pressure



of equal intensity to all parts of the enclosing cylinder. Thus if *a* (fig. 4) be the ring and *b* the cylinder, then a pressure of, say, 40 lbs. per square foot acting at *W* would, by the reaction of the elastic ring, induce a bursting pressure of the same intensity on all parts of the cylinder.

10. The gasholder represents the elastic ring, and the external framework the cylinder, the radial pressure being transmitted by the radial rollers. There will thus be a bursting pressure upon the framework; but, owing to the cylindrical form of the surface acted upon by the wind, the bursting pressure per square foot will be only about half the wind pressure. The framework possesses such an excess of strength in this direction that it is unnecessary to investigate this question closely.

11. The important point to be determined is whether the annular ring of framework is stiff enough to resist distortion under the unequal distribution of stress resulting from the conditions indicated in fig. 3, and to determine this it is first essential to know the effective pressure of wind on the gasholder.

12. No trustworthy experiments have been made with reference to the comparative resistances of flat and cylindrical surfaces to wind pressure. Duchemin's experiments with differently shaped solids moving in water indicate that a cylinder offers 50 per cent. of the resistance of a flat body. The Academy of Sciences give the reduced figure of 37 per cent., and Mr. Froude's experiments with models of circular ironclads confirm the latter result.

In the instance of the gasholder, I take the mean of the above, or 41 per cent., for the holder itself, and, allowing for eddies and other contingencies, I add to this 66 per cent. of the united surface of the twelve vertical girders of the frame, and a trifle more for the diagonals. The equivalent flat surface per foot of height thus becomes—

Holder, 211 ft. x 41 per cent.	=	86 feet.
Standards, 12 x 2 ft. 6 in. x 66 per cent.	=	20 "
Diagonals, say	=	4 "
		<hr/>
		110 feet.

13. The height being 160 feet, and the effective flat surface 110 feet, the total pressure of a 40-lb. wind on the structure will be—

$$\frac{40 \times 160 \times 110}{2240} = 314 \text{ tons.}$$

14. As the extreme diameter of the structure is 220 feet, or double that of the effective flat surface, the "bursting" pressure on the framework as distinguished from the holder will be that due to a pressure of about 20 lbs. per square foot, and the distorting force on the annular framework will thus be approximately represented by the following diagram (fig. 5),

Fig. 1.

Fig. 2.

the tension transmitted by the adjoining plates. Thus if fig. 1 show the normal condition with a camber of about 1 inch between the vertical stiffeners, then the worst that could happen would be the loss of this 1-inch camber, or the flattening of the plate, as shown in fig. 2.

5. At first sight it might appear that the vertical stiffeners must possess sufficient strength as bearers to sustain the pressure of wind acting on the

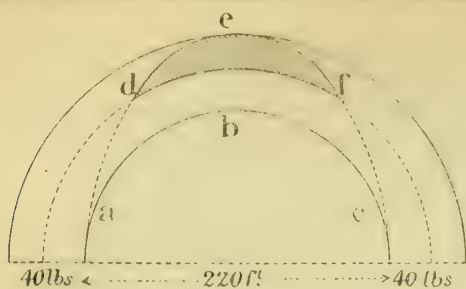


Fig. 5.

in which the space enclosed by the lines *abc* and *adefc* represents the total pressure of the wind, or 314 tons, and the etched space, *def*, the portion of that pressure which, owing to the unequal loading, has to be supported by the transverse strength of the annular ring of framework. The latter pressure is equal to about one-third of the former, or say 100 tons.

15. The annular ring at the bottom consists of the foundation to which the framework is securely bolted. At the top distortion is equally efficiently prevented by the domed top and strong steel ring of the holder. At intermediate points the annular rings constituted by the cup joints of the holder contribute a certain amount of stiffness, but as the vertical standards of the framework are relatively much stiffer, they take the greater portion of the duty.

16. Allowing for all the circumstances of the case, including the presence of the tangential rollers, I am of opinion that the maximum effective lateral pressure upon a standard will be equivalent to that due to an uniformly distributed pressure of 14 lbs. per square foot upon the surface supported, and that the strength of the standard as a girder will, owing to the description of cross-bracing introduced, be that due to a length of about 110 feet, instead of the actual length of 160 feet.

17. The distance apart of the standards being 28·6 feet, the bending moment on them will thus be—

$$14 \text{ lbs.} \times 28 \text{ ft.} \times 6 \text{ in.} \times 110 \text{ ft.} \times 110 \text{ ft.} = 270 \text{ foot tons;}$$

$$8 \times 2210$$

and the unit strain will be $270 \div 23$, the moment of resistance of the cross section, or 11½ tons per square inch tension from the action of a 40-lb. wind in distorting the true circular form of the holder.

18. There still remains to be considered the stress upon the framework due to the overturning action of the wind, the moment of which will be the total pressure multiplied by half the height of the holder, or 314 tons \times 80 feet = 25,120 foot tons.

19. The group of 24 standards may, for the purpose of the present calculation, be assumed to be replaced by two standards placed respectively at the centre of pressure of the group on either side of the axis of the holder. If the framework were perfectly elastic, the diagonals in direct lines, and the annular stiffness perfect, the centre of pressure, being determined by the radius of gyration of the group of standards, would be at 78 feet from the axis. Allowing for the actual conditions, it will be much nearer the centre of gravity, or 70 feet, and the latter figure will be adopted as leading to a safer estimate of the maximum strains on the diagonal bracing.

20. The moment of the wind being 25,120 foot tons, and the centre of pressure 70 feet from the axis, the total vertical shear on the bracing on either side of the axis of the holder will be $= 25,120 \div 4 \times 70 = 90$ tons. This shear will increase from the top to the base of the framework, and in the last of the five bays of bracing will be $= 2 \times 90 \div 5 = 36$ tons.

21. The length of the diagonal is 2·05 times the vertical distance between the opposite ends, and there are two diagonals in each bay; hence the tensile stress on each will be $= 36 \text{ tons} \times 2 \cdot 05 \div 2 = 37$ tons.

22. The effective sectional area of the 8-inch by ½-inch bar, being about 1·4 square inches, the maximum tensile strain from the overturning action of the wind will be $= 37 \div 4 \cdot 4 = 8 \cdot 4$ tons per square inch, assuming the bars to be so accurately adjusted as to each bear their due proportion of stress. Allowing for the latter conditions, and for the other functions performed by the diagonals (referred to in paragraph 16), the probable stress under a 40-lb. wind may be estimated at about 10 tons per square inch.

23. The vertical standards are subject to a compressive strain from the shearing stress; but, having regard to the sectional area, the amount is too insignificant to require consideration.

24. The sufficiency of attachment of the standards to the ground is similarly beyond question, as is the capability of the gasholder top, with its steel ring, to prevent distortion of the outer framework.

An interior bracket roller might possibly be called upon to transmit a stress of from 2 to 3 tons, and some of the external rollers perhaps as much as three or four times that amount, but the details appear to provide sufficient strength. The vertical guides also possess ample transverse strength for their duty.

Conclusion.

The determination of the probable strength of the gasholder and framework involves many complicated investigations if an exact mathematical result is to be attained. Exactness is, as already explained, practically unattainable in the present instance, and it is sufficient, therefore, to show that the stresses fall well within the proper limits. This has been done in the preceding report.

Other hypotheses than those set forth, such as the assumption of the tangential instead of the radial rollers supporting the holder, have been framed; but as the result did not alter the conclusion, it has not been considered necessary to set it forth at length in this report.

The general result of my investigations has satisfied me that the structure is well proportioned in its several parts, and that it would not be destroyed by a hurricane of 40 lbs. per square foot. Under that pressure the strains generally would be at or near the limit of elasticity of the material, but this is quite justifiable when it is remembered that a wind pressure of that intensity can never take effect upon the gasholder.

If additional strength had been given to the structure, it would, in my opinion, have been an unjustifiable waste of money; and this perhaps may be best enforced by remarking that should a storm arise in the Metropolis of sufficient strength to blow down the Charing Cross Railway Station—a higher and more exposed structure than the gasholder—the strains upon the latter would not exceed those prescribed by the Board of Trade for adoption in the case of railway bridges and other works of the class.

(Signed)

B. BAKER.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the *American Gaslight Journal*.]

(Concluded from p. 104.)

The last item on the programme of business at the recent meeting of this Association was a lecture by Mr. G. SHEPARD PAGE, of New York, on

RESIDUAL PRODUCTS.

The lecturer commenced by giving a description of an apparatus for making sulphate of ammonia, a drawing of which he exhibited; and he then referred to results obtained from the sale of ammoniacal liquor, stating that he did not believe there was a company in the United States who received 10 cents for it per ton of coal carbonized. Continuing his lecture, he said: Permit me to show you some of the products of ammoniacal liquor, and to state some of the uses to which they are put. You are all familiar with aqua ammonia. Here is a specimen of it. I also show a specimen of another product of ammoniacal liquor—sulphate of ammonia. The chief use of it is as a fertilizer. It contains from 25 to 27 per cent. of ammonia. If the same law prevailed in the United States that exists in England, the demand for it here would take all that would be produced. The manufacturers of American fertilizers do not put enough ammonia in them; but State inspectors by-and-by will remedy this.

Another important use of this product is in making alum; and alum from sulphate of ammonia is made more cheaply than in any other way. I show you a specimen of ammonia alum. It is made on an extensive scale in England; and the industry will soon be established in the United States. Here is muriate of ammonia, another important product. Here is the carbonate of ammonia, which is an ingredient used by all baking powder manufacturers. Those of you who are familiar with the growth of this business during the past five or six years, can form an idea as to whether or not the demand for this article is likely to be diminished. This specimen is muriate of ammonia—these beautiful crystals. Aromatic spirit of ammonia is familiar to most of you.

The specimens that I shall now show you are iron and ammonia, ammoniated copper, and bromide of ammonium. There are many others here, but it is unnecessary for me to go further. You see there is a market at home for your ammoniacal liquor, whenever you make it of marketable strength.

As I am expected to say something upon the products of coal tar, it may be proper for me to tell you how my attention was first called to the subject. While living in Boston, 24 years ago, I read this item in the *Annual of Science*, edited by the late Professor Pierce, of Harvard:—"The wonders of chemistry—ten processes from coal producing a substance worth its weight in gold." The ten processes were then given—coal, coal tar, crude light oil, crude benzole, refined benzole, nitrobenzole, crude aniline, aniline oil, rose aniline, magenta, the latter being worth 323 dols. a pound. The item closed thus: "The diamond is to come." This never faded from my mind. The next time my attention was called to the value of coal tar was two years later, in Salem, Mass. I saw a workman heating a black substance in an iron kettle in the street. I asked him what it was, and he said it came from coal tar. I asked him how it was made. He said he did not know. I found that it was coal-tar pitch, made by destructive distillation. The following year my interest in coal tar was aroused at the exhibition of the Mechanical Charitable Association of Boston. In an exhibit of chemicals were some coal-tar products. One of them was a substance many of you have seen—the oil of myrbane, sometimes called from its odour, though incorrectly, artificial oil of bitter almonds. I could not help thinking what a wonderful substance coal tar must be, yielding the beautiful and valuable colouring material, the exquisite perfume, and the useful pitch; and from that time I have been constantly identified in making of value what was then a waste product.

Now as to the processes and products. We have here a coal familiar to Western gas makers—Youghiogheny—and this other specimen from Erie. From every ton of these coals carbonized there is deposited in your hydraulic mains a substance called coal tar. The hydrocarbon, being heavy, falls to the bottom, and is constantly running away to your tanks. This is the substance you see here—black, always black; sticky, always sticky; a bad odour, always a bad odour. Gas men get rid of it in various ways. Some burn it. This is a terrible waste of coal tar, as I think as I shall be able to show by the facts and figures presented for your consideration. The business of distilling coal tar is conducted in this country, except by one or two companies, in a very crude way. The vapour given off is passed through a pipe in a condensing-tank, and the first liquid condensed is this. It is called the light oil of coal tar, because it is lighter than water. As the heat gets higher, the distillate becomes heavier than water, termed in this country the heavy or dead oil. The English term it more accurately creosote oil. One or two firms carry the distillation further. They run the heats still higher, and obtain this substance—anthracene oil. After the anthracene oil is taken out there is left what is called hard or fuel pitch. Ordinarily, however, the distillation is carried simply to the point of making and leaving a pitch, used in filling in between paving blocks. The ordinary process of distilling coal tar in the United States creates only these three products, light oil, heavy or creosote oil, and pitch, the respective values of which are as follows:—Light oil, 15 cents per gallon; heavy oil, from 5 to 7 cents per gallon; and the pitch from 5 to 7 cents per gallon. These are not large values, it is true, and hence the tar distiller in most of our cities cannot afford to pay over 20 cents per ton for coal tar. But if the heat is carried to 500° Fahr., greenish crystals form thickly upon the surface of the tar distillate—"green grease" we call it. This is passed through woollen filters, and then subjected to hydraulic pressure, the resultant being this substance—anthracene of 50 per cent. purity.

One of the most interesting discoveries in practical chemistry was that of anthracene, followed by one later, which gave great value to it—alizarine, or artificial madder. For years, and indeed for centuries, the sole source of alizarine was the madder root grown in Holland, France, Turkey, Russia, and Syria, and it required three years or more to gather from the ground the colouring matter, which was taken out by chemical process. But this substance, anthracene, is found to yield the identical compound. The same chemical elements can be taken from anthracene and put together cheaper by chemical process than they can be extracted from the madder root. Alizarine was discovered, in 1869, by the distinguished chemists Gräbe and Liebermann, of Berlin. I have here one of the earliest specimens of commercial anthracene, which was obtained by me in Glasgow, in 1870. At that time it was worth only 100 dols. a ton. In two years, so rapid had been the advances in the practical chemistry of converting anthracene into alizarine, that its value rose to 2500 dols. a ton. Since that time the agricultural madder-growing industry has disappeared, and the chemist produces from worthless coal tar a better and cheaper substance for dyeing the world's fabrics Turkey red.

To return to chemical aniline. It was discovered by Mr. W. H. Perkin, in 1855. Let me inform you how he made the wonderful discovery of the aniline dyes. The Peruvian or cinchona bark trees in Peru and in the East Indies, it was thought, were dying out. The physicians of London went to Professor Hofmann, a great chemist of that city, and requested him to endeavour to make quinine artificially. He knew that the elements of quinine were lodged in coal tar. He began the work of separating them.

He employed the services of one of his brightest pupils, Perkin. The latter carried the process on from the light oil to the benzole, from the benzole to the nitrobenzole, on to the aniline oil, and then, putting in a certain chemical, suddenly a gorgeous red colour was produced. You remember it was called "magenta," and the second dye "solférino," the battles having just been fought. This was in 1855. This was the brilliant discovery that led to so magnificent a result. He at once stopped searching for quinine, and immediately commenced the erection of works. In 1870 he began making alizarine. His works grew until in 1873 they covered 10 acres. You will appreciate the marvellous growth of this industry when I tell you that in 1873, 17 years after his accidental discovery of aniline, he sold the works, receiving a cheque for 750,000 dols. In the meantime he had accumulated a vast fortune. Our water gas friends say they do not want this vile residual, and do not make it in their process.

Mr. Perkin gives the following figures of the sales of aniline and alizarine dyes in 1878:—Germany, £2,000,000; England, £450,000; France, £350,000; other parts of Europe, £350,000—total, £3,150,000. Is it not humiliating that the United States are of necessity omitted from this roll of honour? You could not get any such figures from water gas residuals. It seems to me, gentlemen, if there is nothing else that stands out prominently before you as affording a hopeful outlook for the industry you represent, these figures would be sufficient to give you courage, if you had need of it.

I have told you that the light oil produces benzole, and that it is not only used in making aniline dyes, but it is also required in photographic chemicals, and for many other purposes. It finds a ready sale at from 65 to 150 cents a gallon. If not sold as benzole, it is converted into oil of myrbane, or nitrobenzole. One house in Chicago buys this material in quantities of from 10,000 to 20,000 lbs., at a cost of about 30 cents a pound. A New York manufacturer and other dealers also buy to an equal extent. Whisky makers use it to give the smoky flavour to "Genuine Irish Whisky" made in Kentucky; and lager beer brewers use it to "age" their beer, notwithstanding it is a deadly poison. This need not alarm you, as it is a well-known fact that the gas fraternity is strictly temperate. There is a market for every pound that is made here. The bulk of the trade is supplied by foreign importations, as only one American firm produces oil of myrbane.

To return to these aniline crystals from nitrobenzole which Perkin made in 1855. They were then worth 323 dols. per pound; but by increased facilities for manufacturing, by cheapening the chemicals, and by improved processes, they are now sold at from 3.50 dols. to 10 dols. per pound. The light oil also yields naphtha, toluol, and zylol. Then there is left a thick substance which, after passing through various processes, is converted into a pure white, solid crystal—carbolic acid, a substance familiar to all of you. It is used to a large extent in medicine and surgery, and in the mechanical arts, and the demand is rapidly increasing each year. There is produced in this country annually about 50,000 lbs. of crystallized carbolic acid, and about 150,000 lbs. of liquid; and yet from across the water comes every year an exceedingly greater quantity. From carbolic acid is made that very useful product—salicylic acid. Those of you who have suffered from rheumatism have undoubtedly had it administered to you. Of course, no member of this Association ever had the gout. Should any gas engineer find time to have it, he will probably experience relief by taking salicylic acid. It is also extensively used by beer brewers and wine makers to check fermentation. Here is another product from carbolic acid—picric acid. Among other purposes this is used for making a powerful explosive. Its chief use, however, is as an orange dye.

We now return to the heavy or creosote oil. It contains a substance called cresylic acid, somewhat similar to carbolic acid, except that it does not crystallize. This is sold to druggists, and by them to dentists, who use it in place of wood creosote. It is used for various purposes in the mechanical arts. This beautiful liquid, cresolene, is also obtained from the creosote oil. It was discovered by a French chemist, in 1865, that the hydrocarbon deposited in the bottom of your purifying-boxes gives off a vapour, when the boxes are open, that has a curative effect upon the zymotic or germ-produced diseases, as whooping-cough, asthma, scarlet fever, diphtheria, &c. You have doubtless frequently admitted to your purifying-rooms persons suffering with some of these diseases, particularly whooping-cough; and you probably know of many cures having been effected. The agent performing the cure is cresolene. In 1877 an American chemist whose child was suffering from whooping-cough, and was too sick to be taken to the gas-works, conceived the bright idea of taking the works to the child. He procured from the purifying-box at the gas-works the condensed hydrocarbon, and vaporized it for a few nights in the sick-room, and the child was cured. Cresolene is now being sold by druggists for this purpose. I have personal knowledge of over 300 cures of whooping-cough effected by the use of vaporized cresolene. The gas profession is not only a benefactor to mankind, in producing materials from which these beautiful colours are obtained, but also in affording to suffering humanity the relief that is obtained by the use of carbolic acid, salicylic acid, creosote, and cresolene.

The chief use of the crude creosote oil is as a preserver of wood. It is used not only to preserve wood from decay, but in the case of piles in docks and bridges, from the attack of the *teredo navalis*, or marine worm, in salt water, which often cuts off an unprotected oak, spruce, or yellow pine pile, 2 feet in diameter, in three or four months. This process has been in general use in England during the past 42 years. Nearly every railroad tie and bridge timber is creosoted. There are several works in operation for creosoting timber in Boston and New York; but this important industry can scarcely be said to have begun. Wherever creosote oil is produced in sufficiently large quantities, say, in Chicago, St. Louis, and Cincinnati, creosoting works will be erected for the preservation of wooden pavements, that now only last from one and a half to three years, and for the preservation of railroad ties, the life of which averages about three years, and involves an annual outlay of about 600 dols. per mile for renewal. Whenever you look at a paper or book you see coal tar on it. Creosote oil is burned in a peculiar furnace which permits the smoke to be condensed in a large closed apartment. It falls, like black snow, upon the floor, and is gathered and ground with linseed oil, producing printers' ink. So you see that even the press is dependent upon coal tar!

There is another product from coal tar, which the ordinary coal tar distiller never likes to see. Gas engineers also dislike to see it. That product is naphthalene. But naphthalene is to-day the most interesting of all the long list of remarkable products of coal tar. Brilliant, fast colours more glorious than the aniline dyes, are being produced from naphthalene. One of our most distinguished chemists says that, from present indications, the time will come when it will pay to run gas-works to make naphthalene, selling gas as a by-product! The rich gold colours the ladies are wearing are produced from naphthalene. You see some of them here. There has never been anything created by the art of man so beautiful as the colours that are abstracted by the chemist from naphthalene. These colours are fast; and in this fact lies their chief value. Aniline colours are often evanescent; but, although they fade, they fade all over alike. The ladies are learning to use the aniline dyes when a silk dress becomes faded. Many of the ladies are producing at home nearly as beautiful effects upon old silks, in re-dyeing them, as the dyers at Paterson can produce.

Let us proceed a step further. We have this substance that I now show you—pitch. It is used for many purposes; in making gravel roofs, in the wooden pavements in the streets of our cities, and for lining the inside of powder kegs. No moisture can pass through it. It is also being largely used in the construction of vaults, the bricks being dipped into it, so that the vault is kept free from dampness. I believe the time is coming when cesspools, reservoirs, and sewers will be constructed in this way, so that our houses will be made proof against filtration from sewers and cesspools, and our homes escape contamination. It costs but little more than the ordinary method of building with cement. The source of probably one-third of the ills which flesh is heir to, especially in the country and villages, would be obviated by this simple expedient. Dr. Chandler, President of the New York Board of Health, recently made this statement to me.

We now come to the hard pitch. When the company with which I have been identified commenced manufacturing anthracene, we accumulated the hard pitch—tons upon tons of it. There was no use for it, but we adopted a plan by which every ton was eventually utilized. And for what? Why, we mixed 10 per cent. of the material with 90 per cent. of anthracite coal dust, and manufactured a fuel to be used upon locomotives. Here is a method, and a profitable one, too, of not only utilizing the hard pitch, but also of utilizing the dust of anthracite and bituminous coal, and this is a very important consideration. Every fourth ton of anthracite coal is converted into dust, and 5 million tons are annually wasted in this way. The industry is yet in its infancy, although the fuel is being used upon several railroads in the East, and the works of the Anthracite Fuel Company, at Rondout, N.Y., have turned out 150,000 tons of this artificial fuel. You all know the vast quantity of bituminous coal that railroad companies and other industries use, and you can form some judgment of the enormous loss there must be from the now valueless dust. Coal-tar pitch alone furnishes a medium by which this waste coal can be made of value.

When the distillation of the tar is carried to the final point, two other substances are obtained, one called pyrene, the other chrysene. This last is perfectly white. Then is left this coke. Even the electric light yonder pays tribute to coal gas, its carbon-points being largely composed of this coke, which is 97 per cent. carbon. I do not know whether it is policy to produce a substance that furnishes carbon-points for electric lights.

We come back again to anthracene and its derivatives. I show you this brown liquid paste, the commercial product "10 per cent. alizarine." This phial contains the pure, brilliant red, needle-shaped crystals. How beautiful they are. But alizarine is not sold to dyers in this form, but in a paste, which is imported from England and Germany in barrels, 2,000,000 dols. worth each year, and 5,000,000 dols. of the aniline crystals. Think of it; 7,000,000 dols. paid by our manufacturers for these two coal tar products!

It seems to me, gentlemen, that it is a reflection upon the intelligence of our chemists that they did not do years ago what must first be done before these substances can be produced here, and that is to call the attention of your profession to the rapid growth and immense value of the industry, and to show you how your coal tar and other crude products can be profitably utilized. But the coal tar industry cannot be profitably carried on until the coal tar produced at the great centres, and within a radius of 100 or 150 miles of them, is gathered at a certain point within that radius, and utilized under the direction of skilful chemists. A great quantity of coal tar must be gathered together before these products, the bases of aniline and alizarine, can be profitably extracted. How much anthracene do you suppose there is in coal tar? But 1 per cent., and practically but $\frac{1}{2}$ per cent. is obtained. When I tell you that one house has, in eight years, received for this $\frac{1}{2}$ per cent. obtained from the coal tar produced by ten gas companies 500,000 dols., do I not offer a powerful argument in favour of urging forward the agglomeration of the coal tar, so that it will pay to take out anthracene in sufficiently large quantities to make the industry a profitable one? About 3 per cent. of benzole and 2 per cent. of carbolic acid can be produced from coal tar. By having coal tar gathered together in large quantities, these and the other substances I have shown you can be profitably extracted, but not otherwise. I have collected estimates, easily verified, based on practical experience, showing that from 5 to 7 per cent. of fine products from, say, 4 million gallons of coal tar, yield 170,000 dols., while the immensely larger proportion of from 93 to 95 per cent. yields but 200,000 dols. If this industry is thus established, in due time American chemists can supply the manufacturers of these magnificent silk, woollen, cotton, and leather goods throughout the country with aniline and alizarine dyes, for which such an immense sum is now paid to foreign manufacturers of these products. We can place our manufacturers on a level with those of Manchester and Lyons, who are now obtaining these dyes at one-half the price paid for them in the United States. On an importation of 7,000,000 dols., our manufacturers are paying a duty of over 2,000,000 dols.—35 per cent. *ad valorem*, or 50 cents per pound. I ask you, gentlemen, if you know of any industry more worthy of being established here, or one that offers a more brilliant future than this?

One of the most beautiful substances obtained from coal tar is uranine. The smallest particle will colour a large volume of water or alcohol. Before I go further, permit me to call your attention to these leather goods of different colours, all of which are produced from aniline dyes. Wherever you see leather with these bright colours, you may know they are from aniline. Indeed, it can almost be said of all coloured fabrics that the dyes are from coal tar.

I come now to the practical part of my remarks. I do not appear before you simply to exhibit what you can observe in the windows of any large dry-goods store. I come here to explain to you practical plans for obtaining more money from your coal tar and your ammoniacal liquor. Assume that within a circuit of 150 to 250 miles of the cities of Chicago, St. Louis, and Cincinnati there would be a carbonization of, say, from 200,000 to 250,000 tons of coal. Then you have the following figures:—

265,000 tons of coal, at 15.1 gallons per ton, yield 4,000,000 gallons of coal tar. The products are—		Dols.
2,400,000 gals. pitch, at 3 cents		72,000
1,000,000 " creosote oil, at 5 cents		50,000
20,000 " benzole, at 75 cents		15,000
20,000 " naphtha, at 50 cents		10,000
20,000 " black varnish, at 25 cents		5,000
5,000 " carbolic acid, 95 per cent., at 1.50 dols.		7,500
7,500 " " 85 " at 1 dol.		7,500
10,000 " " 75 " at 75 cents		7,500
3,333 " (30,000 lbs.) carbolic acid crystals, at 40 cents		12,000
20,000 " (200,000 lbs.) anthracene, 50 per cent., at 40 cents		80,000
6,667 " (60,000 lbs.) oil of myrbane, at 30 cents		18,000
2,777 " (25,000 lbs.) creosote, at 40 cents		10,000
150,000 " (1500 tons) tarred felt, at 50 dols.		75,000
3,665,277 gals. Total		367,500
Value of coarse products		200,000
Value of fine products		167,500
Total		367,500

The prices I have given here are fair market prices for the chemical products named.

Expense of Working 4,000,000 Gallons of Coal Tar.

	Dols.
Labour—40 men, at 2 dols. per day for 300 days	24,000
Factory expense	10,000
Fuel	10,000
Transportation	15,000
Expense account	3,000
Interest, taxes, insurance	10,000
Repairs	5,000
Superintendence	5,000
Chemicals	10,000
Dry felt, 750 tons, at 80 dols.	60,000
Total	152,000

The agent of one of the largest railroads in the country says that his company will transport the coal tar in tanks, as oil is transported, at the rate of 2 dols. per ton for 150 miles or under, taking the loaded cars to the point desired, and hauling the empty cars back, so that the cost for 150 miles for transportation will not be over 40 cents per barrel.

Cost of Plant to Work 4,000,000 Gallons of Coal Tar.

	Dols.
Ground, 60 acres	5,000
Tar stills, 50 barrels each, at 500 dols.	5,000
Fitting stills, at 250 dols.	2,500
Pipes and connections, condensers	2,500
Tar tankage, 20,000 barrels.	2,500*
Oil tankage, 5000 barrels	500*
Benzole and naphtha apparatus	2,500
Oil of myrbane apparatus	2,500
Carbolic acid and creosote apparatus.	5,000
Anthracene apparatus	5,000
Four saturating machines, at 625 dols.	2,500
Lumber, incidentals, labour	5,000
Four tank cars, tank barge.	9,500
Total	50,000

As shown by these figures, we have a margin of not less than 200,000 dols.

In regard to the utilization of the ammoniacal liquor, I submit the following figures:—

	Dols.
Plant	25,000
Labour, sulphuric acid, lime, fuel, transportation, repairs, interest, insurance, taxes, superintendent, per annum.	50,000
Product, 7,950,000 gallons of 10-oz. liquor yield 5,300,000 lbs. of sulphate, at 4 cents	212,000
Profit, 172,000 dols., or 65 cents per ton of coal.	

In conclusion, let me show you the actual results in money value to be obtained from these residual products by the gas companies of the United States. I think most of those present who have given the subject consideration will agree with me that the gross carbonization of coal is about one million tons annually. This would yield of sulphate of ammonia 20 million pounds, having a value of 800,000 dols. The present receipts, carefully estimated, are 63,400 dols. Here is a deficiency, in this one residual, of 736,600 dols. The coal tar product is about 15 million gallons, which, according to the results I have read to you, ought to yield the gas companies of the United States 1,120,000 dols. The present receipts do not exceed 200,000 dols., or an average of 20 cents per ton of coal carbonized, leaving a deficit of 920,000 dols., which, added to the deficiency in the receipts from ammoniacal liquor, makes a total of 1,656,000 dols. These figures must prove to be an incentive to you to bring about the utilization of these two residual products in a manner that will yield the largest results.

You certainly have no cause for discouragement, even though inventors and capitalists are seeking to introduce other processes of getting light. You hail the advent of the steam stoker which never strikes, and which costs so much less than manual labour, and performs its work so economically and satisfactorily. New fields for the introduction of gas are opening upon every hand. Gas-heating stoves, gas-cooking stoves, gas-engines, and gas-furnaces will speedily win their way to popular favour. Do not be handicapped by unsound notions of economy; but if, when you are convinced that it is economy to use the steam stoker, and that these results can be obtained from your residual products, you go forward with unhesitating steps. There is no department of trade in the country to-day that has a more bright and promising future than yours. This is the earnest conviction of one who has been identified with your industry for 21 years, who has paid to gas companies for coal tar, in this time, over 1,300,000 dols., and who looks forward to 21 years more of active, and, I trust, profitable labour in the same field.

A vote of thanks to Mr. Page, for his very interesting lecture, was then passed; and the business of the eighth annual meeting of the American Gaslight Association was brought to a close.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The manufacture of meters for the correct registration of gas is one of the many important industries which have been called into existence by the general adoption of gas for lighting purposes. So far as I am aware, there is no special reason why Edinburgh should have been fixed upon as the central spot for meter manufacturing. Messrs. W. and B. Cowan, for example, have produced as good meters in Glasgow as in Edinburgh, and if the Tay Works of Messrs. D. Bruce Peebles and Co. had been removed to a spot where their name would have been more in keeping with the locality, there would, I apprehend, have been no material difference in the excellence of the workmanship produced. But be this as it may, the fact remains that Edinburgh is the principal centre of meter manufacture; and Edinburgh, like other cities and towns in Scotland, comes under the clauses of the Sale of Gas Act. I had occasion, a week or two ago, to direct attention to one clause in this Act—namely, that relating to the stamping of meters—and to comment upon a construction which, I had good reason to believe, it had been thought desirable to place upon that clause. In the course of my inquiries relative to this subject, I came to know of another point arising in connection with the same clause, which, in the past, has excited some lively feelings on the part of those engaged in the meter trade. As I dare say the readers of the JOURNAL are all aware, the Act in question provides that specified rates shall be charged for stamping meters, and in the event of these sums not being sufficient to cover salaries of officials, and other incidental expenses, power is given to levy rates for the purpose. This provision is wise and proper, because, if the public desire that the meters by which gas is to be measured to them should be within a per cent. or two absolutely faultless, they must pay for securing such a guarantee. As a matter almost of course, this provision is of a general character, and is applicable to all towns

alike; but, in present circumstances, it has no application to Edinburgh. Here the stamping fees, owing to the large number of meters made, are far in excess of the expenses incurred, and they have been gradually accumulating, until now they stand at the handsome sum of £6982 5s. 6d. As in most cases such as the present, rumour had magnified this sum to £14,000, and even to £21,000, and those more directly interested in the matter naturally ask the question—What is to be done with this pile of money? Within the four corners of the Sale of Gas Act, there is not a word to indicate how surplus funds obtained in this manner are to be dealt with. Probably the Legislature never contemplated the probability of the stamping fees exceeding the expenditure; or it may be that our law makers gave local authorities credit for knowing better how to deal with funds than to allow them to accumulate. It must be confessed that if Edinburgh was not exceptionally situated, the stamping of meters would be a burden upon the community. In proof of this, I will make a short extract from the accounts of the city of Edinburgh, 1879-80:—"Salaries and allowances—Six Inspectors: One (late Inspector, from July 19, 1879, to March, 1880, and present Inspector from June 1 to July 19, 1880, at £210 per annum), £161 16s. 6d.; three (at £120 each), £360; one (to Dec. 6, 1879, at £90, and thereafter at £100 per annum), £96 3s. 9d.; one, £70; and temporary Inspector, £2 8s.; and allowance in respect of late Inspector's long service, £105—in all, £795 8s. 3d.; and the Clerk, £10." These items, with a number of others given in detail, bring up the expenditure to £947 14s. 7d. Now, deducting from this sum the generous allowance to the late Inspector, which, I suppose, is exceptional, there is an annual expenditure of £842 14s. 7d., whilst the revenue earned in the way of stamping fees for the same period is £1155 3s. 6d. To this there falls to be added £207 16s. 7d. as interest, &c.; and thus, still leaving out of account the above allowance, there is a clear income of £620 odd. Now, as I have said, the question has been asked—What is to be done with these funds? Are they to be allowed to accumulate to provide presents and retiring allowances for aged inspectors, or are they to be applied to some useful purpose? On the part of certain officials, I understand, there is a strong desire to erect a monumental pile, in the shape of a handsome building, in one or other of the thoroughfares, to the meter trade of the city, and under the roof of which all the stamping could be done. On the first flush of the question this looks like a reasonable proposal; but when it is probed it will be found to be fallacious. It is not the first time that such a project has been mooted. So far back as 1877, an attempt was made to have the inspectors removed from the offices provided by the meter manufacturers to a central building, and the ground that was then urged was the greater security it would give to the public. Now such an argument presupposes that the inspector is not conscientiously discharging his duty in the office provided for him at the meter-works; and that the interest of the meter maker in his goods ceases the moment they pass from his hand. Such suppositions, I need hardly say, are without the slightest foundation. The inspectors perform their duty solely with the view of maintaining the statutory accuracy, and the meter maker finds it to be his interest to send into the market only such meters as will sustain his credit for good workmanship and accurate registration. If I am correct in this, I may safely reach the conclusion that no possible benefit can accrue to the public by the establishment of a central office. But this only disposes of one view of the question. Should it be resolved to make the change, the meter makers would be put to great inconvenience and expense. There would be the necessary packing and unpacking of meters, the employment of a large number of hands which at present are unnecessary, and, I have no doubt, great delay and confusion. Three years ago, when the movement had assumed serious proportions, I have good reason to believe that the largest firm in Edinburgh would have removed their premises outside the city boundaries, and at one blow this would have cut off, I should say, from a half to two-thirds of the total income, and without doubt other firms would have followed suit. What was possible then is not impossible now, and therefore great caution ought to be exercised. The question yet remains—What is to be done with the £6982 5s. 6d.? To devote it to the reduction of local taxation would be absurd, and I would therefore propose that powers ought to be obtained to apply the funds to the better lighting of the city. No one acquainted with the city will deny that expenditure in this direction is highly necessary.

While upon this subject, I may touch upon a cognate topic. It had been arranged that the Jurors who were appointed by the Directors of the Glasgow Gas Exhibition to consider their awards, should meet in that city on Friday, the 21st inst.; but as Dr. Wallace was required as a witness in a pollution case which was being tried in the Court of Session on that day, the meeting was adjourned till next Tuesday. The different meter makers or their representatives are asked to be present, and the purpose of the gathering, I understand, is to open one meter sent by each firm to see that no exceptional means have been adopted to secure accuracy. The result is looked forward to with much interest. It has been whispered to me that the assemblage will not be of the most harmonious description, and that exception may be taken to certain meters being examined which were not placed for exhibition.

All over Scotland, owing to the exceptionally severe weather which we have been experiencing, there have been numerous complaints as to the supply of gas, and as to the damage done to property by the bursting of water-pipes. In Edinburgh the people are so accustomed to miserable street lighting that they do not take at all badly to the present condition of affairs. Yet it is nothing unusual to see lamps, if not totally extinguished, presenting such a paltry apology for lights as might excite the indignation of a less patient animal than the Edinburgh taxpayer. At a meeting of the Forfar Gas Commission on Monday, Mr. Mackintosh asked why the gas had been so bad since the new year. Mr. Craig, the Convener, said the Manager was doing all that he could, and using the best coal to make gas of the best quality. He attributed the bad light to the effects of the frost upon the pipes. The Manager said the gas was being kept up far above the standard, but many of the pipes were laid too near the surface. The Convener also said that many applications were being made to have wet meters taken away and dry ones put in. He had instructed the Manager to refuse such applications unless satisfied that there were good grounds for the change. The Provost said there would be fewer complaints as to the freezing of meters, were precautions taken for protecting them during frosts. I may here add, by way of parenthesis, that a notion is prevalent that dry meters are a protection against the effects of frost. To a certain extent there may be truth in this; but during a frost such as we are now experiencing, there is all the discomfort arising from bobbing lights as much from the dry as the wet meter. The vapours seem to condense in the supply-pipes, and becoming frozen, cause much annoyance. It was reported to the Commissioners, at the meeting above referred to, that the consumption of gas during December exceeded that of the corresponding month of 1879 by 412,500 cubic feet.

Greenlaw, the cold, cheerless little county town of Berwickshire, has been lighted up at night by automatic gas-lamps manufactured by the Sun Auto-Pneumatic Lighting and Heating Company, of London. The experiment is said to be a success, but no details are given.

A somewhat peculiar arrangement has just been given effect to. Mr. John McCrae, formerly Manager at Bury St. Edmund's, as the readers of

* Tar and oil tankage is created at this low cost by using condemned canal boats and barges.

the JOURNAL are aware, was recently appointed Manager of the works at Dundee. During the illness of the late Mr. McCrae, the works were under the charge of Mr. Alexander Mitchell, who has been for six or seven years Assistant Manager at the works, and whose efficient services were greatly appreciated in Dundee. Unadvanced in the town for which he has laboured so zealously, he has, it is satisfactory to know, been appointed to the post vacated by Mr. McCrae at Bury St. Edmund's.

The inhabitants of Newtown Stewart, in Wigtownshire, have resolved to call in the aid of a competent engineer to survey the district with a view to obtain for the burgh a pure and plentiful supply of water. There has been a good deal of agitation in the town, in consequence of the expense which must necessarily attend the introduction of water by gravitation.

With reference to the water supply of Elie, to which I have already referred, the Sheriff has made a remit to Mr. C. Boothby, C.E., to visit the district and report on the following points:—1. The population of the district, with reference to its tendency to increase or otherwise. 2. The quantity of the present water supply. 3. The quality of the same. 4. Could the present sources of supply provide sufficient good water for the district. 5. Whether there is any stream within the proposed district from which a supply of water of good quality, and of sufficient quantity, could be obtained.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

I am glad to be able to commence my "Notes" this week with some interesting particulars regarding the manufacture and delivery of gas at the Glasgow Corporation Gas-Works during the last few weeks; that is to say, during the period embracing the "turn of the year." The make during the month of December amounted to 305,678,000 cubic feet; and the consumption rose to the enormous total of 307,063,000 cubic feet, as compared with 296,314,000 and 299,414,000 cubic feet respectively during the corresponding month of 1879. The greatest quantity of gas delivered over a period of 24 hours in December was 12,037,000 cubic feet. This was on the 20th ult., which was a day of intense fog, and practically, though not astronomically, the shortest day of the present winter. The day on which the greatest quantity of gas was delivered in the month of December, 1879, was the 27th, several days after the winter solstice; and the amount delivered was 11,600,000 cubic feet. Then, again, the average daily delivery during December was 9,906,000 cubic feet, as against 9,658,000 cubic feet in the corresponding period of 1879; and the greatest make of gas over a period of 24 hours was 10,959,000 cubic feet on the 24th ult., as compared with 10,206,000 cubic feet on the same day in the preceding year. So far as the present month has gone the greatest delivery over a 24-hour period was reached on the 10th inst., the amount of gas sent to the consumers being 11,121,000 cubic feet. It is also worthy of remark that during the foggy weather of the past ten days or so the consumption of gas has been very much lower than the amount calculated upon, owing to the intense frost having in many cases partially closed up the service-pipes. In thousands of instances the delivery at the burners was so excessively meagre as to be only sufficient to "render darkness visible." As a matter of course candles and paraffin oil lamps have been in very large request. On several occasions the operation of carbonizing had to be suspended at the gas-works, as the holders were filled almost to excess, the consumers not being able to take the gas away as fast as it was being made, notwithstanding the fact that many retorts were not in use.

The systematic efforts made some time ago to have the streets of Kilmalcolm lighted on a satisfactory basis are now likely, it seems, to meet with the general consent of the community. The circulars which were issued to the ratepayers a few weeks ago, asking them to agree to a voluntary assessment of 1½d. per £1, are being signed in considerable numbers. From the quantity already sent in, it is hoped the Committee will see their way to provide for the permanent lighting of the thoroughfares and public places on that system. It is reported that there are numerous complaints from the consumers as to the high price of the gas, and there is some expectation that at an early date the Directors of the Gas Company will see their way to reduce the price.

Yesterday morning, the people residing in one of the tenements in Bridge Street, Partick, were well-nigh being placed in the same position that the suffering residents in Henderson Street, in this city, occupied on the morning of New Year's Day. They were alarmed by a smell of gas which had prevailed all night in their dwellings, and two girls, aged respectively fourteen and sixteen years, were found in the morning almost suffocated. The apartment in which they slept was found to be full of gas, and when they were removed it was deemed necessary to call in the services of a medical gentleman to administer restoratives. Meanwhile the affair was reported at the works of the Partick, Hillhead, and Maryhill Gas Company; and although the time was about five o'clock in the morning, Mr. John Henderson, foreman, was soon on the spot with a number of workmen. After examining the place carefully, Mr. Henderson discovered that a 3-inch main belonging to the Glasgow Corporation Gas Commissioners had burst or fractured in front of the tenement where the service-pipe was given off, and that the amount of gas which was escaping was alarmingly large. Mr. Henderson ordered all the fires to be put out, and the gas in the building to be turned off, and other precautionary measures to be adopted. All the people in the tenement, numbering between 30 and 40, were ordered out, and had to seek shelter in their neighbours' houses. Communication having been made with the Corporation Gas Office regarding the state of affairs that had been discovered, men were forthwith sent down to make the necessary repairs, which was found to be a matter of great difficulty, in consequence of the intense frost prevailing; before leaving, however, they made the place temporarily safe. But for the precautions taken by Mr. Henderson there is every probability that a very serious, and possibly fatal explosion might have occurred.

Baile Brymner, presiding at the Greenock Police Court, had before him this morning two specimens of "Young Greenock" who, on Wednesday night or early on Thursday morning, had indulged in the gentlemanly (?) amusement of breaking no fewer than 13 of the street lamps in the west-end of the town. Both the accused pleaded guilty. A local Solicitor appeared on their behalf, and in addressing the Court he said he thought the case was not one in which there should be any punishment further than admonition. The lads had been guilty of an indiscretion, and would pay the damage. The presiding Magistrate said he could not take this view of the case, and fined the accused £10 each, with the option of 40 days in prison. They left the bar immediately, and the case did not occupy over a minute. Wholesale lamp-smashing, even in the west-end, is not to be indulged in with impunity.

The Local Authority of Prestwick, an important suburb of Ayr, have for some time been much concerned about procuring a proper water supply for the district, but as they resolved not to introduce a supply by gravitation, one of the inhabitants recently lodged a petition in the Ayr Sheriff Court against the majority of the Local Authority, and Sheriff Orr Paterson remitted to the agent for the petitioner to ascertain whether a water supply could be obtained for the Ayr scheme; and he asked the agents on both sides to consider the advisability of taking a proof on the points at issue, or remit them to a practical man.

Business was done last Monday in Glasgow Corporation £1 Water Annuities at £106 10s., which was the previous quotation.

The Glasgow pig iron warrant market has been dull and heavy this week. With the exception of a spasmodic improvement on the report that a fair quantity of iron had been bought on American account, the price has gradually receded, closing at the lowest yesterday afternoon—namely, 52s. 5d. cash, and 52s. 7d. one month for buyers, and sellers very near. Since the 1st of January there has been a decrease of fully 10,000 tons in the shipments, as compared with those made in January of last year.

With the exception of the briskness due to the continued severe frost, there is practically no improvement to note in the local coal trade.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, Jan. 22, 1881.

Prices remain generally unchanged since last report, as follows:—

Tar, 40s. per ton.
Ammonia liquor (sp. gr. 1.035), 22s. per ton.
" sulphate (white), £19 10s. to £19 15s. per ton.
" " (good grey), £18 15s. per ton.
" muriate (white), about £36 per ton.
" " (grey), £30 per ton.
" " (brown), £26 per ton.
Muratic acid, £1 5s. to £1 10s. per ton.
Sulphuric acid (brown vitriol), £2 19s. per ton.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as the Manchester district is concerned, the colliers' strike, as I anticipated in my telegram last week, is now practically at an end. All the collieries owned by the principal Manchester firms are now working, and the ordinary output of the pits is being gradually resumed. In the Ashton district the strike is also at an end, but in the West Lancashire districts the men are still out, and attempts are being made to prevent the resumption of work by threats of intimidation. This has caused rather an uneasy feeling in the mining districts about Manchester, and it has been found necessary to station a strong force of armed constabulary in the neighbourhood of the collieries, to protect the men at work if necessity should arise, and arrangements have also been made for calling out the military should this be found requisite. The threatening attitude assumed by the men who remain out on strike has naturally had some effect in deterring numbers of the miners from returning to work, but the bulk of the men employed by the Manchester firms have now gone in, and during the last day or so a very fair quantity of coal has been sent away from the pits.

So far as the trade itself is concerned, the abundant supplies which have been sent into Lancashire from Yorkshire, Staffordshire, Derbyshire, and Nottinghamshire, have more than covered the requirements of consumers, and at many of the railway stations on the outside districts the sidings are now blocked with coal. A large quantity of this consists of gas-making coals, of which heavy consignments have been sent into the district, and gas companies, as a rule, have suffered only temporary inconvenience from the want of supplies. In some cases, in the absence of supplies of the common qualities of gas coals, they have had to fall back upon their stocks of cannel; but I do not hear of any actual suspension of operations having taken place. There has also been generally a good supply of manufacturing classes of fuel, although, of course, extra prices have had to be paid, which, in many cases, have represented about double the ordinary prices ruling prior to the strike. Consumers, however, are now less willing to pay these high figures, and there is a large quantity of coal held by speculative buyers, for which they are not able to realize the prices they were anticipating. In the Manchester district the principal firms have confined themselves to an advance of 10d. per ton all round; but dealers and merchants have taken advantage of the market to obtain any price they could command from consumers in pressing need of supplies, and it is almost impossible to give any fixed quotations, those which have been ruling in the open market being simply of a temporary character.

The Gas Committee of the Salford Corporation have incurred a certain amount of odium in consequence of their having about doubled the price of their gas coke during the pressure for fuel last week, and they are now returning to about their ordinary rates. The Manchester Corporation, who hold considerable stocks, have not made any alteration in price, and they have continued to offer free, to those who could cart it away, an inferior quality of coke, which, I understand, is the product of a low-class cannel bought in the Nottinghamshire district.

The iron trade has been very quiet during the past week, but prices generally remain steady, and rates for both pig and manufactured iron are without material alteration from last week.

(BY TELEGRAPH.)

MANCHESTER, Monday Afternoon.

The principal collieries in the Manchester district are still working, and are now sending out fully half their usual output. In one or two small districts in Manchester the men are going in, but in West Lancashire the strike continues. Gas companies are mainly dependent upon outside districts for coals, but other consumers are being better supplied at rather lower prices.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The activity reported in my last communication still prevails in the coal trade at Cardiff. Prices are as firm as ever, and the difficulty in securing coal in no way relaxes. Further engagements at present prices are reported, and a higher figure is anticipated before the demand grows less active. The house coal and coke trades are briskly employed, and prices are firm. The clearances for the past week were 108,089 tons of coal, against 98,345 tons in the previous week. Of iron there was sent away 2085 tons; patent fuel, 3211 tons; and coke, 808 tons. Coming to the Newport coal trade, I am pleased to report that the excitement has not diminished in the slightest, and the clearances for the week show the heavy work which the collieries are sustaining, in order to enable shippers to keep pace with the engagements held. Demurrage has arisen in numerous cases, and the losses entailed in this respect have been, in some cases, serious. Prices, of course, remain very high, and it has been a matter of the utmost difficulty to get coal at anything like short notice. As long as the heavy demand lasts at Cardiff it cannot be expected that business here will be much less pressing; but it is felt that the labour question is an important item in estimating the probable course of events during the year, and the agitation which is now going on is serious enough to be taken into account. The demand for house coal remains very good, and the present severe weather will doubtless have its effect upon this branch of industry. Prices continue to take an upward turn, and coke is also firmer.

The iron-works are steadily and well employed, and prices of finished iron are firm. There was a good stock of pitwood to hand during the past

week. No change of importance took place in freights. The exports during the week were 29,139 tons of coal, 100 tons of coke, and 1306 of iron—an increase in coal of 7500 tons upon the previous week.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Owing to the recent unusually severe weather, the demand for coals of all classes has been of an improved character; household qualities especially having been in great call, and a further advance in rates has resulted. Most of the pits are now fairly well employed, though great difficulty is experienced in the way of transit, all the canals in this district having been frozen over for the last week or nine days, and the railway service has been so bad that deliveries, in the majority of cases, have been out of the question. Several furnaces, as well as a number of foundries, have been absolutely standing for want of fuel. Unless a general and speedy thaw takes place, the production of both raw and finished iron will to a considerable extent be curtailed. Large numbers of boats have been frozen out, and it is a long time since traffic was so thoroughly hampered.

As the result of a limited supply of fuel, the iron trade is less brisk than it otherwise would have been. At the recent markets the attendances were rather small, and business negotiations were hardly so extensive as they were anticipated to be. Nevertheless, prices were firm, and the parcels booked were somewhat limited, makers declining to accept existing quotations to any great extent. Marked bars were scarcely in so great a call as unmarked qualities. In the latter the wants for the district were tolerably good, and prices were strong. Hoops and sheets were in good request, though puddled bars perhaps were in receipt of the most attention. For the latter more money was asked for all new contracts. Pig makers, as a rule, have a goodly number of orders on their books; still there is not at present any great desire existing for an increase in the number of furnaces.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The condition of the iron trade is somewhat improved, and several branches are now better off for orders than they were a short time ago. The furnaces devoted to the smelting of pig iron are kept in full work, and are receiving weekly large supplies of ore from North Lincolnshire, the working of the ironstone pits in Yorkshire being but little prosecuted. Some of the works devoted to the manufacture of sheets, plates, and merchant iron are fairly off for orders. At the Horbury Junction Iron-Works, near Wakefield, the mills are in full operation, and are producing plates, merchant sheets, rods, and bars in large quantities, an extensive order for plates for shipment being on the point of completion. A very fair business is being transacted in Bessemer steel rails, tires, and axles; while waggon builders and repairers are fairly off for orders.

Since my last notice the coal trade has been active, the increase having been brought about for the most part by the weather and the strike in Lancashire. The latter, however, may be said to have now terminated. A very large tonnage of manufacturing coal and slack has been forwarded by rail over the Lancashire and Yorkshire, and the Manchester, Sheffield, and Lincolnshire Railways, from both South and West Yorkshire. Extensive as the quantity sent has been, it would have been much larger from South Yorkshire if the Company could have conveyed the coal. Prices of manufacturing fuel have largely increased, owing to the dearth of coal in Lancashire, but a few days more will see the pits in that county again at work.

The house coal trade at most of the pits in both districts is just now active, and as a rule the collieries in the West Riding coal-field have, since my last notice, made pretty nearly full time, whilst those in South Yorkshire have improved. The traffic by rail to London and the Eastern Counties has been much impeded by the frost; yet a large tonnage has been sent over both the Midland and the Great Northern line. The local demand has also improved, and prices have advanced.

Steam coal, as is generally the case at this season of the year, is growing quieter, owing to the closing of the export season. The traffic for Hull, Grimsby, and Goole, by water, has been almost stopped, the canals being frozen, and large quantities of ice making their appearance in the River Humber, rendering navigation very dangerous, if not impossible.

Other kinds of fuel, including gas and locomotive coal, have been freely called for, but supplies have, in some instances, been difficult to forward, owing to the weather and the block on the railways. The Sheffield district has suffered from the canals being frozen, which has prevented the works having the usual supplies of slack and engine fuel.

The coke trade still forms one of the most important branches carried on in connection with mining pursuits in both districts. The output is well sustained, and a large quantity is sent daily from South Yorkshire to North Lincolnshire, although the new list of rates issued by the Manchester, Sheffield, and Lincolnshire Railway Company has somewhat increased the rate to Frodingham, where fortunately business continues very fair, there being 15 out of the 18 furnaces built at work.

Unfortunately, the South Yorkshire district promises to be again the scene of another contention arising out of the advice of the Miners' Association to the men to give notice for an advance, where the notices have been withdrawn. The Union officials report that fresh notices have been served at Wath Main, Roundwood, and Thybergh Hall Collieries, in the Rotherham district; but these, it is believed, are confined to the miners who are members of the Union, the other men not taking part in the movement. At the Woolley Colliery, between Barnsley and Wakefield, the Unionists who sent in their notices have left work, but the rest of the men will continue to follow their employment.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The weather on sea and land in the North, as in the South of England, was of the most trying description last week. Gales of wind at sea, and intense frost and drifting snow on land, very materially interfered with the gas coal trade. The cold was so intense on Monday of last week (26° of frost) that though fires were burnt, it was found impossible for the men at the pit heads, especially in exposed places, to be kept at work filling the trucks. The waggon ways, too, were drifted up with snow where there were cuttings to get through, and when the trucks were brought down to the docks and shipping-places, it was found that the coals they contained were completely frozen, and a considerable amount of time was lost in running the loads into the holds of steamers. It was an anxious week for all concerned in the trade, for unless large gangs of men had been employed clearing the snow away from the railways and colliery waggon ways, the business would have been entirely stopped. And again, until Friday, the screw steamers bound with gas coal to London and elsewhere were kept in the Tyne and Wear through the destructive gales at sea. Generally speaking the course of shipping business was dislocated by the state of the weather. Under the circumstances, the shipments of gas coals were, of course, below an average; but

they were larger and better than was ever known at other times when the coal trade of the district was in a similar condition. The gas coal trade is steady; the advance in prices over the rates of last year, upon contracts made, as I have already reported, are comparatively small; upon the run of the business concluded they are nearer 3d. than 6d. per ton. Second-class coals are in pretty strong demand for domestic use, and as many descriptions sell as house, gas, or manufacturing, the market is necessarily in a somewhat better position to command business. It is probable that the owners of the pits will be making a moderate profit instead of losing money, as they did for three years previously.

Steam coals, especially the very best sorts, have slightly improved in value. The coke trade is steady, and it can hardly be said that there is a very material advance in prices upon last quotations. On both sides, on that of the manufacturer as of the ironmasters and shipping merchants, there is an indisposition shown to enter on contracting, upon anything like a large scale, on the uncertainties which surround the iron trade at the present moment. This business stands over until further on.

Under the exceptional circumstances of weather, freights for handy and ready steamers ran up last week from 3s. 10½d. on Monday to 4s. 9d. and 5s. per ton on Saturday to load for London; but as soon as the fleet of steamers which have been lying at the low end of London river arrive, no doubt the quotations will fall as rapidly as they advanced.

The rivers of North Europe are full of ice; the Lower Baltic and the Sound, with Copenhagen, Hamburg, Antwerp, Gothenburg, and Rotterdam, are closed. The shipping business of last week was therefore of a very negative description. Little was transacted in the exportation of gas coals to the Mediterranean, the Peninsula, or the North of France.

Mr. George Ramsay has bought the Swallow-on-Tyne Fire-Brick Works, belonging to his late father and partners, Messrs. G. H. Ramsay and Co. Messrs. Joseph Cowen and Co., the extensive fire-brick and fire-retort manufacturers and canal-coal owners, at Blaydon Burn, have become the purchasers of the well-known Derwenthaugh Fire-Brick and Fire-Clay Works, lately the property of Messrs. G. H. Ramsay and Co., which they will open forthwith. Messrs. J. Cowen and Co., by their new purchase, will be able to ship their Blaydon, as well as Derwenthaugh fire-bricks, and other fire-clay goods, from thence in all kinds of weather and at the times when shipping-places at Blaydon, as now, are blocked with ice.

There were large sales of English lead in the Tyne and in London last week. The prices realized were from £14 15s. to £15 per ton. There is not any great change to note in the iron trade of the North. The chemical market gives few signs of recovery; indeed, with the exception of soda, the price of chemicals was weaker upon the whole last week. Speculators are not in the market. The business transacted continues to be very much limited to the supply of immediate wants. With the great European water ways closed, and the ports blocked with ice, shipping business in chemicals is about nil.

SALE OF SHARES IN THE BROADSTAIRS GAS COMPANY.—At a recent sale of shares in the above-named Company, £300 of "A" stock, bearing interest at the rate of 10 per cent., was sold in fifteen £20 lots, at the following prices:—1 lot at £39 15s.; 1 at £39 10s.; 3 at £39 5s.; and 10 at £39. At the same time £30 of "A" stock, and £10 of "B" (7 per cent.) stock sold for £75.

PROPOSED TRANSFER OF THE BASINGSTOKE GAS-WORKS TO THE TOWN COUNCIL.—At the last monthly meeting of the Basingstoke Town Council, sitting as the Urban Sanitary Authority, the Town Clerk stated that he had had a letter from the Solicitors to the Water Company (Messrs. Chandler and Son) informing him that they had received instructions to prepare and forward to the Board, for their approval, a draft contract for the sale and purchase of the Company's works, &c. They, however, were instructed to request that the Board would forward an undertaking, on the part of the Sanitary Authority, to pay all costs incurred by the Company in relation to the preparation of the draft contract, in the event of the Local Government Board declining to sanction the transfer of the undertaking, or any other event happening, whereby the negotiations for the transfer should be abandoned. The Board gave their assent to the conditions of the letter.

SALE OF SHARES IN THE WANDSWORTH AND PUTNEY GAS COMPANY.—At the Auction Mart, Tokenhouse Yard, E.C., on Wednesday last, Messrs. Fox and Bousfield sold by auction 81 £10 original 10 per cent. shares, 15 £10 original 7½ per cent. shares, and 54 £10 ordinary 7 per cent. shares in the above Company. Upon all the shares maximum dividends were paid last year, and the dividends accruing, which will be payable in about a month, were included in the sale. It was announced previous to the biddings being taken that purchasers would be entitled to participate in an issue of new shares, bearing 7 per cent. dividend, which the Directors have decided to make before long *pro rata* among the Shareholders. There was a brisk competition for the shares offered for sale, and the following prices were realized:—Original 10 per cent. shares: 10 at £19 15s., £19 10s.; 51 at £19 10s., £19 10s.; 20 at £19 5s., £19 5s.; 10 at £19 5s., £19 5s. Original 7½ per cent. shares: 15 at £14 10s., £14 10s.; 217 10s. Ordinary 7 per cent. shares: 54 at £13 10s., £13 10s.; £729. The total amount obtained by the sale was £2523 10s.

THE DUDLEY GAS COMPANY AND THE CORPORATION.—A special meeting of the Dudley Town Council was held last Wednesday week, when the Mayor (Alderman Wainwright) stated that the Town Clerk had, in accordance with the instructions received at the previous meeting, written to the Gas Company, asking for information with reference to the Bill they intended this session to introduce in Parliament. The Company had replied declining to give the information asked for, and saying that they preferred to give it to Parliament, from whom they were asking something, rather than to the Town Council, from whom they were asking nothing. A report of the Streets and Gas Committee was afterwards read, in which they recommended the Council to pass a resolution authorizing the Town Clerk to take all necessary steps to oppose the Bill promoted by the Company, and that the Sub-Committee appointed to deal with the matter be given full power to seal any petition adopted by the Committee for the purpose of such opposition. The report was unanimously adopted.

INCREASED CONSUMPTION OF GAS IN LEEDS.—From the half-yearly report of Mr. Henry Woodall, it appears that the consumption of gas in Leeds is increasing at the rate of 126 million cubic feet per annum, or over 9 per cent. The total consumption for the half year ending Dec. 31 was 720,115,300 feet, as against 658,030,000 feet in the corresponding half of 1879. This shows an increase of 62,085,300 feet, or 9½ per cent. The amount of gas produced per ton of coal carbonized amounted to 9324 feet, and the quantity of coal and cannel used in the half year just concluded was 77,000 tons. The increasing consumption was discussed at the monthly meeting of the Gas Committee, held last Thursday, when it was resolved that Mr. Woodall be instructed to prepare a report showing what is the present manufacturing power of the three gas-works in the town, and also the full extent of the ground at these works, at the disposal of the Corporation, upon which could be erected additional retorts. Large extensions are at present in progress at the New Wortley gas-works,

which, with the existing facilities, will probably meet all demands for a couple of years; but it may be necessary during that time to arrange for further enlargements, or for new works.

THE RECENT FATAL GAS EXPLOSION IN GLASGOW.—A meeting of the subscribers to the fund raised for the relief of the sufferers by the recent gas explosion in Glasgow was to be held yesterday, in the Council Hall, for the purpose of appointing a Committee to co-operate with the Lord Provost in administering the fund, which is stated to be quite inadequate to meet the necessities of those who have suffered by the calamity.—A small debt case, arising out of the explosion, was decided on Thursday last, before Sheriff Balfour. Thomas McCoull, 18, Kelvin Drive, sued Adam Robson, 177, Henderson Street, for £4 19s., the rent of his house there for the half year ending Whit-sunday next. Defender's house, it appeared, was in the tenement adjoining that in which the explosion took place, and the defender left it in consequence, as he alleged, of its being in a dangerous state and unfit to be occupied. Among the witnesses examined was Mr. White, Assistant Master of Works. He stated that he did not consider the house to be in a dangerous condition. Had it been in such a state, it would have been his duty to warn the various tenants to leave their dwellings, and take steps to have the tenement repaired. His Lordship, having regard to this evidence, gave decree for the full amount, with £2 expenses.

THE WATER SUPPLY OF PLYMOUTH, STONEHOUSE, AND DEVONPORT.—Last Thursday's *Exeter Gazette* said: "There is quite a panic in the three towns of Plymouth, Stonehouse, and Devonport, in consequence of the water famine. The entire population depends for water on the Leat running from Dartmoor. Since Tuesday the Leat has been completely frozen and buried beneath the drifts of snow. The supply in the three towns has altogether ceased, and the Authorities have sent gangs to clear the Leat. Up to the present no success has been attained, drift succeeding drift, and the snow freezing as it falls. The inhabitants are using wells and snow water, and it is suggested that the military shall be employed." Later advices state that on Saturday 400 marines, engineers, and men of the 13th Regiment were employed in clearing the Leat, which is 12 miles in length. There were also engaged in the work about 250 labourers. During Saturday night 100 men worked, soldiers returning to Plymouth in the evening. On Sunday the Volunteers, hired men, and a squad from the 13th Regiment left Plymouth for the moors, and were engaged all day. The Leat was cleared out in the afternoon, and at 6 p.m. the stream, which was coming on slowly, had reached within 5 miles of the town. The want of water in Plymouth has been very severely felt.

THE WATER SUPPLY OF ABRAM (LANCASHIRE).—The Local Board of Abram, a small township about four miles from Wigan, having applied to the Local Government Board for sanction to borrow £5000 for works of water supply, Captain Hildyard, one of the Inspectors, held an inquiry into the subject of the application on Friday, the 14th inst. Mr. M. W. Peace, the Law Clerk to the Board, explained that the inhabitants of the district formerly obtained their supply of water from wells, but as these had failed they were compelled to procure a supply from the Wigan Junction Colliery Company, who had entered into an agreement to let them have 150,000 gallons of water per day at the price of 6d. per 1000 gallons. The estimated population of the district was 2750, with 491 houses, the rateable value of the township being £16,728 9s. 1d., a general district rate of 8d. in the pound producing £557 13s. 8d. It was proposed to purchase an acre of land for the erection of a storage tank, and in case the contract with the Colliery Company should come to an end, the Local Board further proposed to take powers to acquire a second acre of land a short distance from the other site, where a good supply of water was believed to be obtainable from the new red sandstone. The Board had power to levy a rate of 4d. in the pound, but considered one of 3d. would be sufficient to meet expenses. Mr. N. Hannah, the Medical Officer of Health for the district, testified to the need of a good water supply; and Mr. G. Heaton produced plans of the proposed works, and in explanation of the same, said the proposed tank would contain 40,000 gallons, or half a day's supply for a population of 3000. The tank was to be filled twice a day, which would give 80,000 gallons. This would be sufficient for a population of 8000 at 10 gallons per head. People would not use more than 6 gallons per head per day. Some further details having been gone into, the inquiry terminated.

BURSTING OF A GAS-MAIN AT LEEDS.—One of the results of the severe frost at Leeds has, says the *Leeds Mercury* of last Friday, been the bursting of a gas-main in Derby Street, Dewsbury Road, by which one or two families narrowly escaped suffocation; and but for the fact that the fires and lights had been extinguished in the houses affected, an explosion, with serious consequences, might have occurred. About two o'clock yesterday morning Mr. Charles Jeffcock, who resides at 35, Derby Street, awoke and detected a strong smell of gas. He imagined that one of his sons had not turned off the gas in the kitchen; but on making an examination, he found that the tap had been properly turned off. Fortunately, he did not strike a light, but proceeded to arouse the members of his family, and to open the windows to let the gas escape. He then went downstairs to the cellar, where the smell was so strong that he was nearly overpowered. In the meantime Mr. W. Smith, who resides next door, had been awoke by hearing Mr. Jeffcock's family moving about, and he also became aware that there was an extensive escape of gas. Unfortunately, the windows in his house could not be opened, as Mrs. Smith was lying ill with bronchitis. Mrs. Jeffcock had gone out in search of a policeman, but could not find one, and Mrs. Smith, having by this time dressed, proceeded to the gas-works in Meadow Lane to give information. The man whose duty it was to receive such messages was absent, and Mr. Smith then went to the Meadow Road Police Station, and told the officer on duty of the occurrence. He was informed that the police had nothing to do with such matters; but a constable was sent with him to the gas-works, and shortly afterwards a staff of men were at work in Derby Street. It was discovered that the main had burst, and steps were taken to have it immediately repaired; but it was noon before Mrs. Jeffcock was allowed to light her kitchen fire. The gas had found its way into one or two other houses, but not to any great extent. A little girl who was in attendance upon Mrs. Smith was greatly overcome by the gas, and felt very sick and ill during the day, but last night she was better.

SANITATION IN INDIA.—In an article recently published in *The Times* on a "Report on Sanitary Measures in India in 1878-9," which has just been presented to Parliament, it is stated that although the year covered by the report was one of much sickness and great poverty, steady and general progress was made in works of sanitation. Not only in the great towns, but throughout remote districts, an active staff of sanitary inspectors is constantly at work endeavouring to bring science to bear upon the lives of the people. The best intentions of the men of science are, however, sometimes fairly conquered by the supineness, the poverty, and the social habits of the natives. A population of 28 millions in a district of Madras is only able to raise £30,000 for sanitary expenditure—not so much as an English town might spend on perfecting its drainage. Some

15 years ago almost every street and lane in Calcutta was lined by one or two open drains, from 2 to 6 feet broad, and more or less loaded with noxious matter. Now the greater part of the city is properly drained, 140 miles of underground sewerage having been constructed. In Madras and Bombay it is only the question of expense that stands in the way of similar reforms; and that the projects are well looked upon is shown by the fact that Bombay has lately had no difficulty in raising a loan of £270,000 for new drainage works. What is of still more consequence is that this determined attack on the tyranny of dirt is not confined to the Presidency towns, but is being carried on throughout the whole of India. In many towns in each Presidency drainage is proceeding with the double effect of preventing epidemics, and, by carrying off the subsoil water, of drying the ground and of lessening the danger of malaria. Meanwhile the villages, which are justly called "the foci of Indian epidemics," are not neglected, though they are very difficult to influence. Something is being done by causing the vaccination officers, as they go their rounds, to act as sanitary inspectors as well, and efforts are being made to bring the head-men to a sense of the importance of the elementary principles of health. The Government have even issued a primer of health, to be distributed throughout Bengal. The people are slow to understand these efforts, but in one direction they are, generally speaking, more appreciative. They like good water, and they are anxious to get it. The villages and townships are active about their tanks, and several of the great towns are carrying out ambitious schemes for bringing a water supply from a distance.

THE WATER SUPPLY OF SUTTON-IN-ASHFIELD.—On Tuesday, the 11th inst., Mr. Arnold Taylor, one of the Inspectors of the Local Government Board, held an inquiry at Sutton-in-Ashfield, respecting the application of the Local Board to be invested with all the powers and duties which are given to Rural Sanitary Authorities by the Public Health (Water) Act of 1878. A memorial was handed in, signed by a large number of rate-payers in the district, protesting against the investiture of the Board with powers which would enable them to erect water-works. Mr. Daubeny, who presented the memorial, said that there was a bountiful supply of water in the district, and, although it was stated by medical men that the sources of supply were impure, yet it was a fact that people reached as mature an age in Sutton as in any other town, and the Registrar-General reported that the death-rate was 0.5 per 1000 below the average of England. He thought that the owners of property in the place were not in a position to bear unnecessary burdens, but they would not shirk the responsibility of providing water-works when they were required. Mr. Beecroft said he believed that three-fourths of the owners in the district had a water supply for their property, and to inflict the imposition of water-works upon property owners was a positive injustice; whereupon, the Inspector remarked: "For a man to get up in this year of grace and say that the establishment of water-works is an imposition and a positive injustice, does astonish me." Dr. Dyer, the Medical Officer of Health for the district, stated the results of some analyses of water taken from wells in the town in 1875; and, as no further evidence as to the quality of the water was forthcoming, the Inspector said it appeared to him that the Local Board were not prepared with sufficient information to satisfy the ratepayers. The samples of water were taken as far back as 1875, and it was highly necessary that fresh analyses should be made. The results of modern experiments showed that the quality of water from shallow wells was of a very apprehensive nature. He thought the Local Board ought first to supply an analysis of twelve samples of water taken fairly from the pumps and wells of the district, and also a return of the number of houses requiring a proper and adequate supply of water, and how they were at present supplied. The inquiry was then adjourned so as to enable the Board to furnish further particulars as to the supply of water to the town.

THE NORTH BIERLEY LOCAL BOARD AND THE BRADFORD IMPROVEMENT BILL.—At the last meeting of the North Bierley Local Board, the Clerk (Mr. S. Wright) presented a copy of the correspondence which has passed between him and the Town Clerk of Bradford, in reference to clause 42 of the Bradford Improvement and Water-Works Bill of the present session. The clause referred to gives power to the Corporation to call the attention of all the Local Authorities taking water from the Corporation to instances where owners of small tenements fail to supply such tenements with water at the rate fixed by the Corporation; and, in case of default, by the Local Authority in not enforcing compliance, the Corporation may call upon the Local Government Board to take such steps as they may think desirable. Mr. H. B. Woodcock observed that the clause was most arbitrary in its interference with the Local Authorities outside the borough. The Clerk said he had prepared a section, which he proposed should be added to clause 42, as follows:—

Where, by reason of the scattered population in the district of any Local Authority under the Public Health Act, 1875, other than the Corporation, outside the borough, and wholly or partially within the Corporation limits, or from any other cause whatever, the scale of charges for water supply authorized to be charged by the Corporation to consumers within the borough, shall not, in the opinion of such Local Authority, be remunerative, as supplied by the Local Authority of such district, where the distribution of the water is undertaken by the Local Authority of such district, it shall be lawful for such Local Authority to apply to the Local Government Board for the purpose of having a general scale of charges for water to consumers settled for any such district, and the Local Government Board shall and may thereupon, by order, determine the charge for water to consumers to be taken by such Local Authority, within such district, in the same manner as the said Board may now do where there is no water-rate authorized by any local Act in force in such district.

The Clerk said he had reason to believe, from communications he had received, that the Corporation would accept the clause just read, the effect of which would be that, while relying upon the Public Health Act for the necessary powers to compel property owners to supply their houses with water, the Local Board would have power to fix a scale of charges for the North Bierley portion of their district, which was within the limits of supply of the Bradford Corporation, as well as for Wyke, which was outside their limit. Upon the motion of Mr. Midgley, seconded by Mr. J. M. Woodcock, the Board resolved to accept the section of the clause as prepared by the Clerk.

THE WATER SUPPLY OF BEVERLEY.—A special meeting of the Beverley Town Council was held on the 1st inst. for the purpose of considering the application made to Parliament for a Bill to construct water-works for the borough. The Mayor (Alderman E. Crosskill) presided, and in opening the proceedings said the first business was to consider and decide upon the propriety of opposing in Parliament a Bill entitled "A Bill for better supplying with water Beverley and its neighbourhood, in the East Riding of the county of York," and if deemed desirable to pass a resolution in favour of paying all costs and expenses which might be incurred in relation to such opposition out of the borough fund, or other public funds or rates under the control of the Council, and generally to take such steps in opposition to the Bill as might be deemed necessary. He said the matter was one of great importance to the inhabitants, and it was desirable that as little should be said as possible. He would move—"That the Town Clerk, as the Solicitor to the Corporation, be instructed to take all such proceedings as may be necessary for opposing the Bill in Parliament, with power to affix the common seal thereto, and to petition for the

purpose under the direction of the Parliamentary Committee, and that all costs and expenses which may be incurred in relation to such opposition be paid out of the borough fund." Mr. Turner seconded the proposition. Mr. Julian, after pointing out the uselessness of the opposition, moved, as an amendment—"That a vote of the ratepayers be taken to ascertain whether the majority were in favour of the Town Council making an application to Parliament for the purpose of erecting water-works, that such vote be taken by ballot, and that the Town Clerk be instructed to make the necessary arrangements for the same as early as possible." Mr. Wray seconded the amendment, which was lost after a discussion, the opponents of it stating that a public meeting would in any case have to be held, at which the opinions of the ratepayers could be ascertained.—A public meeting of the inhabitants of Beverley, convened by the Mayor, was held on the 12th inst., for the purpose of considering the desirability of opposing in Parliament the Bill, which is referred to above, promoted for supplying Beverley with water. The Mayor presided, and having called upon the Town Clerk to read the requisition, pointed out that the only question the meeting could consider was whether the Water Bill should be opposed. The Corporation had, he said, the necessary power and convenience for constructing water-works if they deemed them necessary, and this could be done for £10,000, which was less than half the cost proposed by the Water Company's scheme. It was necessary that a resolution should be passed to enable the Corporation to appear before the House of Commons Committee, and he therefore proposed the following resolution:—"That in the opinion of this meeting the Bill in Parliament, entitled 'A Bill for better supplying with water Beverley and its neighbourhood, in the East Riding of the county of York,' is unnecessary and objectionable, and this meeting approves of the resolution of the Town Council, passed on the 1st of January inst., to oppose the same in Parliament, and hereby consents to all such action and proceedings being taken as may be necessary for such opposition, at the cost of the borough fund." Mr. Green seconded the resolution, which was carried by a large majority. The proceedings concluded with a vote of thanks to the Mayor for presiding.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 84.—DOUGLASS, J. N., Dulwich, London, "Improvements in burners." Jan. 7, 1881.
- 87.—NEWTON, H. E., Chancery Lane, London, "Improvements in gas regulators." A communication. Jan. 7, 1881.
- 125.—HADDAN, H. J., Westminster, "Improvements in gas-engines." A communication. Jan. 11, 1881.

- 180.—FOULIS, W., Glasgow, "Improvements in gas-engines." Jan. 14, 1881.
- 245.—CLARKE, C. L., and LEIGH, J., Manchester, "Improvements in the construction of apparatus for lighting gas, which improvements are also applicable to other electrical appliances." Jan. 20, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 2714.—ANDERSON, A., Brixton, London, "Improvements in apparatus for forcing and discharging water, air, and other fluids and gases." July 2, 1880.
- 2916.—EDMONDS, E., Fleet Street, London, "A new process and improved means for carburetting air and rendering it either explosive or illuminating at will." A communication." July 8, 1880.
- 2971.—TROTMAN, S., Wainstead, Essex, "Improvements in apparatus for saturating atmospheric air or gases used for heating or illuminating purposes with liquid hydro carbon." July 12, 1880.
- 2915.—JOHNSON, J. H., and HAYDOCK, W., Wigan, Lancs, "Improvements in and relating to apparatus to be used in sorting ores, coal, and other substances." July 15, 1880.
- 3023.—FOXALL, J., Newport, Monmouth, "Improvements in dry gas-meters." July 23, 1880.
- 4395.—BRODRIBB, C. A., Hastings, Sussex, "Improvements in gas-stoves." Oct. 27, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £5 BEFORE THE EXPIRATION OF THE THIRD YEAR.
- 4919.—WILSON, J. G., "Improvements in and apparatus for carburetting gas to increase its illuminating properties." Dec. 28, 1877.
- 39.—BENSON, M., "Improvements in pipe joints for containing liquids, gases, and air, but more especially applicable to gas and water mains." Jan. 3, 1878.
- 101.—PENNEY, J., "Improvements in ferrule taps and in the method of connecting the same to steam, gas, and water pipes, and in apparatus employed in effecting the connection." Jan. 8, 1878.
- 103.—SUGG, W. T., "Improved apparatus for purifying illuminating gas." Jan. 8, 1878.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £10 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.
- 25.—GOTTHEIL, R., "Improvements in motors to be worked by gas." Jan. 2, 1874.
- 167.—HEARSON, C. E., "Improvements in argand burners for burning coal, gas, or other illuminating gas and animal, vegetable, and mineral oils." Jan. 13, 1874.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Jan. 19, 1881.

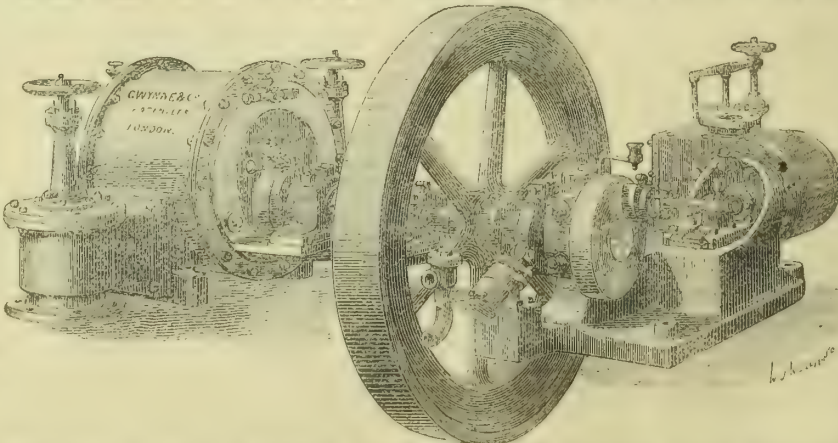
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill				Station	closed	for	repairs				
	Camden Town	17.6	16.8	17.2	22.9	14.3	17.4	0.0	0.0	0.0	None.	In excess
	Dalston	17.5	16.5	17.0	15.2	11.2	13.6	0.3	0.0	0.1	"	"
	Bow	16.8	16.3	16.6	12.4	9.2	10.2	0.6	0.0	0.3	"	"
	Chelsea	17.4	16.7	17.1	15.4	15.4	15.4	0.2	0.2	0.2	"	"
	Kingsland Road	17.3	16.4	16.8	15.3	13.4	14.3	0.3	0.1	0.2	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas). . .	21.4	20.3	20.9	21.8	17.6	19.6	0.2	0.0	0.1	"	"
	Peckham	18.0	16.9	17.6	12.6	6.5	9.5	0.6	0.0	0.3	"	"
Commercial Gas Company	Old Ford	18.1	17.0	17.6	18.0	10.7	16.0	0.2	0.0	0.1	"	"
	St. George-in-the-East . . .	17.9	16.3	17.1	10.1	8.7	9.2	0.2	0.0	0.0	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

We shall esteem it a special favour if Correspondents will, as far as possible, send their communications so as to be received not later than Saturday morning—the earlier the better. At present we each week receive, on Monday, many letters which it is impossible to attend to in the current number of the JOURNAL.

H. G.—See above notice. Your letter shall appear next week.

G. J. C.; M. R.—Shall publish in next issue the reports you kindly send.

T. G. H.—Thanks for complying with request.

In the heading to the paragraph in last week's issue in reference to the proposed transfer of the Basinstoke Water-Works to the Town Council, the word "gas-works" inadvertently appeared instead of "water-works." The text of the paragraph, however, indicated plainly that the water-works, and not the gas-works, were likely to be bought up by the Local Authority.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 1, 1881.

TAXED AND FREE GAS.

If any one wishes for a clear profession of faith for and against the principle of diverting gas profits, made by corporate bodies, to aid the rates, we can refer him to the abstract of a report which appeared in the last number of the JOURNAL, and which was made by a Sub-Committee of the Bradford Corporation Gas Committee, who were appointed to inquire into a proposal to reduce the price of gas. The arguments used on this occasion were very striking, and the case of cheap *versus* taxed gas was remarkably well put by the Sub-Committee. Unfortunately, the majority of the full Committee sided with the Mayor in holding to the existing rule of levying double rates upon the gas consumers, so that in this case the verdict was not clearly in accordance with either evidence or argument. It must be confessed that the Mayor's party had all the power of custom and prejudice on their side, and the reformers were heavily weighted with the great objection, always heard against such views as theirs, that (if

carried out) their proposals would entail a marked addition to the rates, to make up for the gas profits which they would take away. Many people will willingly grant the strict equity of the plea for untaxed gas, but when it comes to the question of substantiating their opinion by frankly giving adherence to the alternative of higher rates, they shrink from what may be an unpopular step, and so the old state of things goes on.

It will perhaps be profitable if we devote a portion of our available space to-day to an investigation of the Bradford case, taken as a typical example of a number of towns where there is a strong minority contending for cheap gas, against the stubborn force of vested interests arrayed on the other side. The Bradford Sub-Committee allege that if gas is cheapened, its consumption is increased; but this is denied by the Mayor, who states that the public always burn as much gas as they require, and are not liable to be influenced by considerations of price in the amount they consume. We can only say that gas is no exception to the rule of other marketable commodities, and that it is precisely its conformation thereto, in the elasticity of gas-rental under reductions in price, which makes such reductions possible in nine cases out of ten. The Mayor's contention cuts both ways. If the consumption of gas is not increased when the selling price is lowered, for the same reason it will not be lessened when the cost is raised. Hence a speedy and easy way of extinguishing the capital charges on works, and afterwards of relieving the property of the town from all rates whatever, would be to raise the price of gas at once to the highest possible point. The Mayor and those who think with him would probably hesitate to try the experiment; but, as far as the argument goes, it would be a perfectly logical and politic action. Again, it is said that the use of gas for cooking and heating purposes has not increased in Bradford, despite the prominence given to its advantages in those respects at the late exhibition; and, therefore, it is supposed to be useless to court such a class of consumption by lowering the price. This is as much as to say that there will not be found any more use for gas at, say, 2s., than for the same gas at 3s. per thousand cubic feet; and that, because gas cooking has not become universal in about a month or so, it will never come into general favour if the fuel is continually being cheapened. The Mayor of Bradford is also afraid that any rise in the gas consumption will increase the cost of management and of the capital charges! It is indeed a pity that a gentleman with these views should be called upon to speak in reference to commercial matters, in which he is evidently out of his depth. Will a millowner shrink from the outlay of building a new mill, in addition to his old one, if the extension of his business requires it? But it were idle to argue this point with any one who cannot distinguish between absolute and relative capital expenses.

In respect of the whole question of the desirability or not of increasing the consumption of gas, the Sub-Committee remark that with costly works not fully employed at any time, and especially disproportionate in summer, it is most essential that every effort should be made to popularize the use of gas, so as to give the undertaking a firm basis, and to lessen the proportionate incidence of capital expenses. What a different, and, if we may so speak, how much more statesmanlike is this view of the necessities of a great manufacturing establishment than that of which we have just spoken! In the one case we have a policy of trusting for safety and continued prosperity to the fact that the work done is to be made a necessary of life to many people and in many ways; while the other says in effect, "Draw in our responsibilities, contract our bulk, let people feel they can do without us; so that when we go to the bottom we shall not make much noise about it." The Sub-Committee touched the core of the matter, as it must appear to every one who likes to see the saddle always put upon the right horse, in their statement that £151,500 has, within the last ten years, been taken from the gas profits in aid of the rates. Now it is evident that, but for the gas consumers, this branch of the Corporation business would be a failure; how, then, have the Corporation treated their faithful supporters? Simply by making them for ten years pay rates for people who declined to burn gas. There is no other way of putting it; this most manifest injustice cannot be explained away or justified. The gas consumers are the minority, yet they are mulcted of hard cash to help the majority. If it could be maintained that the gas consumers, being ratepayers, are refunded in one way as much at they are overtaxed in another, the case, although still bad, would be less iniquitous. But the reality is widely different. Of two traders carrying on business in the same street, and equally struggling for existence, the nature of one

man's business requires his establishment to be kept going all night, at a heavy charge not only for gas but in other ways, in comparison with his neighbour who burns little or no gas. When the relief to the rates from the gas profits comes into operation, the latter individual benefits at the expense of the former, and in the course of ten years, perhaps, to a considerable extent. Or a millowner may, and frequently does, under such circumstances, make his own gas, and still rejoice in low rates at other people's cost.

The argument that the works belong to the ratepayers, and that they have, consequently, the right to whatever profit can be made from selling gas at a fair market price, is plausible but unsound. A body of ratepayers is not a trading corporation that they should make profits by the necessities of others. There is no such thing as a fair market price for an article which is the subject of a monopoly. The fair price of gas in any locality is just the price at which it can be made and sold in that locality, and Parliament recognizes no other principle. It may be said that there are places where corporate bodies, after acquiring the gas-works from Companies, have granted substantial relief to the rates from their surplus profits, and have yet sold gas cheaper than the Companies would have done; to which we reply that the conditions are wholly different. A Gas Company is a trading body who have invested money in the gas industry just as they might have invested it in a brewery, and they expect a certain profit to recoup them for the initial risk. A Corporation, on the contrary, takes a gas-works for the same reason as it acquires a water supply or lays down a tramway—simply for the good of the consumers or users of either of these things, and because they are essential to the social life of the locality. Parliament never endows a Corporation with such property for the sake of helping the rates. If this principle were not to be observed, there could be no argument against a Town Council purchasing and working any old-established gin distillery, which, being a profitable trade, might materially assist the borough funds.

There is no necessity to carry the inquiry further. We have shown that, vested interests apart, there can be no reason for a system which compels one man to pay money on behalf of another. The phantom of vested interests has daunted many a bold innovator; but, as we are repeatedly informed, whenever an ardent reformer attacks an abuse which he has no personal desire to maintain, such obstacles must always eventually yield to the force of public opinion. We can only trust that not only in Bradford, but, also wherever gas undertakings are entrusted to corporate management for the public good, this law of progress will be found to prevail; and that the reproach of selling taxed gas will in time be removed from Corporations who would scorn to increase their revenues by indirect rating in any other guise.

THE FAILURE OF THE LINCOLN BILL.

THE refusal of the owners and ratepayers of the city of Lincoln to support the proposed Corporation Bill for the acquisition of the gas-works does not come altogether as a surprise. We referred last week to the circumstances of the case, and then expressed the conviction that the bargain offered to the Municipality was an unusually good one. The possibility of receiving an immediate profit of over £2000 per annum without incurring any preliminary outlay, and the certainty that the annual surplus would tend to increase rather than diminish, must have formed, to the minds of the advocates of the transfer in the Town Council, arguments so persuasive that they thought their constituents could not fail to appreciate them at their full worth. As it happened, the opponents of the Bill, with the Mayor at their head, were more apt, or more solicitous, to sway the populace to their views, and they succeeded in gaining a remarkable majority to their side, no less than 4006 votes being recorded against the Bill, while only 1036 votes were given in its favour. The Gas Company can afford to smile at the exaggerated fears of the majority respecting the stability of the gas undertaking, and they will go on as they have been doing, paying full dividends, and gradually increasing their scale of operations and their capital.

It remains for consideration—not so much in reference to the refusal of a majority of ratepayers in any particular place to recognize a proposition intended for their own good, but on general principles—how far the existing provisions of the law of local self-government answer their purpose in such cases as this of Lincoln. The Town Council, in the exercise of their full discretion, committed themselves to the inception, arrangement, and provisional conclusion of an agreement with the Gas Company for the purchase of the undertaking of the latter. These negotiations being terminated, and apparently to everybody's satisfaction, it

became necessary for the Council, if they wished to avoid another year's delay, to take the usual preliminary proceedings for obtaining the necessary Act of Parliament to ratify the agreement. Notice of the proposed Bill was, therefore, given at the proper time, and the Bill itself was printed and deposited in accordance with the Standing Orders. After all this has been done, the ratepayers, in the exercise of their right, if with doubtful wisdom, have refused to sanction the action of the Council, and the whole thing consequently falls to the ground. It is difficult to imagine a break-down more irritating to those concerned. It is a most humiliating rebuff to the majority of the Council, and will probably prove a source of trouble between that body and the local public. The Council will, moreover, have to face the fact that besides losing their pains in preparing the Bill, all the expenditure incurred in connection with it, on the presumption that the consent of the ratepayers would be obtained, has now no legal warrant; and, as in the case of Exeter, where something very similar occurred only a few years since, the members of the Council are individually liable for these charges. This is not as it should be. Whether the Councillors have to pay the expenses of the strangled Bill out of their own pockets or not, it is neither right nor reasonable that the most important step in the preliminary stages of an application for a Corporation Act—the condition without which the whole proceeding has no justification—should be treated, as it too often is, as a merely incidental matter. We do not know, in the present instance, who is to blame for the fact that, whereas the agreement with the Gas Company was concluded on the 6th of July last, the first meeting of the Council at which the promotion of the Bill was agreed upon was not held until the 15th of November—just in time to get the notices inserted; and the final Council meeting, the town's meeting, and poll have been held during the present month. It is difficult to see why the necessary meetings were put off to the very last, after some hundreds of pounds of expense had been incurred, which somebody will now have to pay. The Borough Funds Act explicitly states that no expense in the promotion of a Bill in Parliament is to be charged on the rates without the ratepayers' sanction. This being so, it would appear that to secure their consent should be one of the earliest cares of Corporations going to Parliament, instead of being, as in Lincoln, the very last thing thought of. It all appears to be a part of the common system of always getting up Bills in a hurry, and at the last possible moment, whereby much unnecessary cost is incurred, often, after all, as we now see, in vain. If this is due to any imperfection in the law, then the law ought to be amended; on the other hand, if it is due to the carelessness or over-confidence of individuals, then those individuals ought to be made liable for the results of their rashness. If the general effect of surcharging a few town councillors will be to teach the others to reckon more carefully with their constituents, and, above all, not to delay their parliamentary business to the last minute, then the sacrifice of the few will be to the advantage of the many.

ELECTRICIANS IN FELLOWSHIP.

WHEN electricians do agree, their unanimity is wonderful. A remark of this kind was originally made many years ago, and with reference to a very different class of people; but it will serve in the present instance as though it were specially designed for it. Mr. R. E. Crompton has delivered an address during the past week at the Royal United Service Institution, on "Recent Improvements in Lighting by Electricity," and although much of the lecturer's time was taken up by references to the use of electric lighting for military and naval purposes, he was enabled to give his hearers some interesting information respecting the different systems of producing light by electro-magnetic currents now before the public. It is well known that Mr. Crompton is himself the inventor of an electric lamp of great merit, which has been widely adopted for the illumination of railway goods yards, and similar places where the arc-light is not objected to. The most striking characteristic of Mr. Crompton's lecture was, however, the magnanimity he displayed in praising the systems of Mr. Swan and Mr. St. George Lane Fox, to the disparagement of Mr. Edison. He is reported to have stated that Mr. Edison's efforts to invent an electric lamp had been forced on by certain speculative geniuses in Wall Street, and he expressed some regret that the efforts of English electricians were beginning to lose interest for the general public, because of Mr. Edison's failure. He predicted that Mr. Swan's light, or something very like it, would be the domestic lamp of the future; but, of course, he was careful not to fix the day when the last gas-burner will be turned off for good. Surprising as it may seem, Mr. Crompton actually

showed his audience the difficulty that in his own and other arc-lamps attends the adjustment of the carbons! This is pushing candour almost to the extreme of artlessness, and although it is not stated that the lecturer described his own lamp as the worst of the lot, his audience must have been greatly impressed with his simple modesty in laying bare the weak point of his own invention. When it is added that Mr. Crompton's lecture was given in a room illuminated by Mr. Swan's lamps, we only want to hear that Mr. St. George Lane Fox acted as the lecturer's assistant, and lent those diagrams—which did not appear at Lincoln on a recent occasion—for the purpose of illustrating the address, to believe that the millennium will dawn at about the same time as gas goes out before the electric light.

A NOVEL SYSTEM OF CARBONIZATION.

It is but natural that the hopes of those persons who, with some sense of the difficulty of the enterprise, seek to make London free from black fogs, should be directed towards gaseous or solid smokeless fuel as offering the readiest means of attaining the desired object. Mr. Scott-Moncrieff endeavoured, in his address to the Society of Arts on Wednesday last, to show how the problem might be solved. As the lecture in question is given in full in another column, and we have, moreover, elsewhere noticed the Author's arguments at length, we need only refer in this place to the fundamental principles of the proposed system. Mr. Scott-Moncrieff suggests that all bituminous coal intended for use as fuel should be passed through the gas-works, where about one-third of its gas would be extracted. The solid residue would, in the lecturer's opinion, be saleable at a figure sufficient to cover the prime cost of the coal, the gas would be about half as rich again as that commonly supplied in London and other southern towns, and to the higher price which this gas would bring, and to the increase in the quantity of liquid residuals resulting from the partial distillation of thrice the usual quantity of coal, the gas manufacturers would have to look for their profit in the extra work which would thus be thrown upon them. Mr. Scott-Moncrieff thinks that no increase in the existing plant of the Gas Companies in London or elsewhere would be necessitated by his proposed method of carbonization, because it has been possible, in cases of undue pressure on ordinarily constructed gas-works, to pass a greatly increased weight of coal through the retorts, and thus to keep the gasholders afloat. Any temporary expedient of this kind is, however, a very different thing from a regular system of one and a half hour charges, and we do not think our professional readers generally will consider that the extra work involved by such a method of carbonization would not draw after it expenses—for labour wear and tear, and for additional capital—exceeding anything contemplated by Mr. Scott-Moncrieff, even if the practical results of the scheme should be equal to his expectations, which, on the whole, we venture to doubt.

THE LAW OF GAS SUPPLY.

MR. WILLIAM LIVESEY, whose ripe experience is always at the service of bewildered inquirers into the law of gas and water supply, has furnished us with complete statements of his views on two important subjects which have lately occupied some portion of our editorial and correspondence columns respectively. Mr. Livesey's longer communication refers to the position of non-statutory Gas Companies with respect to the disturbance of the public highways for main-laying purposes, and it is a subject of satisfaction to ourselves to find that our own lately-expressed views as to the right interpretation of a debateable passage in the Public Health Act, 1875, are corroborated by such a painstaking and vigilant observer of parliamentary practice as Mr. Livesey is known to be. His letter may be commended to any one who is desirous of knowing the bearing of recent legislation on the question at issue, and it is not his fault if a careful perusal of his remarks leaves an impression on the reader's mind that in this, as in so many other things, the intention of Parliament has not been expressed with the distinctness that might be desired. Mr. Livesey's second letter settles in the clearest possible way the difficulty experienced by a correspondent with respect to the size of service-pipes. It may be remarked, however, that the consumer's gas-fitter can do his worst beyond the meter, and while the size of the cap and lining on the latter is disregarded as a guide to the bore of pipe required, the consumer is likely for all time to be a vigorous complainant of the quality of the gas supplied to him. Still, as Mr. Livesey points out, Gas Companies should in all cases make full use of the regulating power which they now undoubtedly possess over service-pipes.

Water and Sanitary Affairs.

THE Earl of Camperdown has a notice on the paper of the Upper House, "To ask whether, considering the present condition of public business, it is not advisable to introduce in the House of Lords the Bill providing for the creation of a "Metropolitan Water Trust." The question was to have been asked on Friday, but now stands for to-day. The introduction of the Bill in the Lords, instead of commencing with it in the Commons, would be accompanied by a disadvantage which the Home Secretary would keenly appreciate—namely, that the first explanation and defence of the measure would devolve on somebody less conversant with the subject than himself. We observe that Lord Camperdown's question is founded on the idea that the Bill is to provide for the creation of a "Trust." This may be the case, but we rather look for an intermediate step, as recommended by the Select Committee who reported on the subject last year. It will be remembered that the Earl of Fife subsequently replied to Earl Fortescue in the House of Lords, stating that it was the intention of the Government to "give effect to the recommendations of that "Committee" by creating "an independent Water Authority with adequate powers to deal with the whole "matter." The notice of the Bill which appeared in November last proposed a "Water Authority," armed with "such powers as may be necessary or expedient for securing "to the consumers, at reasonable rates, a greater efficiency "in the supply of pure and wholesome water for domestic "and other purposes." This does not necessarily include the idea of purchase. It would probably please Sir W. Harcourt very well, if he saw a prospect of buying up, on popular terms, the works of one of the London Water Companies, in the hope of showing what wonderful things could be done by public management. The Home Secretary has a versatile genius, and the Water Companies must be prepared for almost any conceivable device in reference to their interests. How far the public are going to be benefited is very problematical.

Lieut.-Col. Bolton will have to enlarge the capacity of his monthly broadsheet in some way, if he purposes to include all the analyses which are now performed upon the London Water Supply. A printed document has just been issued, apparently intended to be the first of a series, addressed to the President of the Local Government Board, being a report of the composition and quality of daily samples of the water supplied to London from Dec. 20, 1880, to Jan. 19, 1881, by Mr. Crookes, Dr. Odling, and Dr. Tidy. The public are thus presented with a report which is free from the defect we have on former occasions pointed out as attaching to the monthly statements of Dr. Frankland, the latter being simply a record of analyses taken once per month for each Company. Mr. Crookes and his colleagues say: "As yet no daily analyses "of the London waters have been recorded," and they observe that "all the reports hitherto published relate to a single "sample of each Company's water, taken on one day only in "the course of a month." It is very properly argued that it is "manifestly impossible to judge the character of a "whole month's supply by a single sample." The report relates to the seven Companies drawing their supply from the Rivers Thames and Lea. The analyses refer to three or four samples of the water of each Company, taken at intervals of about a week, and so arranged that all the days of the period are covered, except Sundays and Christmas-day. Examinations for colour and turbidity are recorded with respect to every day, and amount to 169, while the quantity of free oxygen is shown in respect to 158 samples. Summing up the results, the three Analysts say: "We are of opinion that, "considered both chemically and physiologically, the water "delivered by the Companies during the month over which "these examinations extended was of excellent quality, "wholesome, and in every respect well fitted for the supply of "the Metropolis." We would venture to suggest that it is desirable, if possible, to make the monthly period coincide with the several months of the year. The present report ends about the middle of January, which creates another element of dislocation in the analytical reports relative to the water supply. But we must commend the report, on the whole, as a very complete and important document, and we shall look with much interest for its succeeding issues.

Mr. W. H. Baker, Overseer of St. John's, Westminster, writes to one of the London daily newspapers, expressing his surprise on being informed by the Surveyor of the Chelsea Water-Works that the fixing of stand-pipes, to give a supply of water in time of frost, is a voluntary act on the part of the

Company, and is not obligatory by law. Mr. Baker thinks it "quite time the ratepayers took active measures to make it a duty, and not a voluntary act, of these monopolists to supply the absolute necessities of the community." He is not even pacified by the statement of the Surveyor that, although the supply thus given "involves great expense and labour," every effort is made to render it effectual. Apparently it does not occur to the Overseer of St. John's that the expense and trouble thus thrown upon the Water Companies is occasioned by the parsimonious manner in which builders provide for the water supply of houses, and the miserable workmanship of which the plumbers are guilty. If it were possible to pass a law which should make builders and plumbers perform their duty in this respect, a great waste of time, money, and temper would be prevented. At present the Water Companies, and therefore the consumers, are taxed for the benefit of the building fraternity and a certain class of workmen. Mr. Baker would perpetuate this system, and would have a stand-pipe on every plug whenever there was a frost, making the Water Companies pay pounds to remedy an evil which might have been altogether avoided by the expenditure of as many shillings out of the pockets of the parties more immediately concerned.

After a week of much distress and anxiety, Plymouth has been relieved from the serious inconvenience occasioned by the freezing-up of the artificial watercourse which is the channel for the water supply of the town. Had the frost continued to the present time, it is difficult to estimate what the consequences might have been, especially in the event of fire. The circumstances were discussed at some length at a meeting of the Town Council on Wednesday last, by which day the peril had been overcome. The operation of clearing the Leat was hindered not only by the ice and the continued frost, but by the heavy falls of snow which took place. The telegraphic communication was imperfect, and there was immense difficulty in supplying food to the hundreds of men who were at work along the line of the stream. But for the powerful assistance rendered by the military, the difficulties would not have been overcome as they were, and Plymouth was evidently indebted to the presence of a garrison for an earlier extrication from its dilemma than would otherwise have been possible. Private wells were utilized to the utmost during the prevalence of the water famine, and evidently some steps must be taken to guard against the risk which besets the town so long as the authorities rely for their water supply on a long, exposed, open channel. A more uncertain method of supplying a town with water in winter time can hardly be conceived. A letter in one of the Plymouth papers shows that as far back as 1852, Mr. A. Hamilton Bampton, M. Inst. C.E., advised certain alterations and extensions in the town water-works, which, if carried out, would have prevented the recent crisis. The Devonport Water Company, wiser in their generation, have taken precautions which proved of great service during the late frost.

The Rivers Conservancy Bill, introduced in the House of Lords by the Government, differs in no great respect from the two Conservancy Bills which followed the appearance of the report of the Select Committee of the House of Lords in 1877. It is permissive in its character, it being provided that action shall only be taken at the instance of the inhabitants of a river basin, or contiguous river basins. Following a petition to the Local Government Board, an inquiry would take place, and ultimately a Provisional Order might be granted, which would await the sanction of Parliament. On the Order being confirmed, a Conservancy Board would be elected, and this authority would have power to levy rates for the purpose of executing works to prevent floods, and for the carrying out of other objects specified in the Bill, including the enforcement of the provisions of the Rivers Pollution Act. The exclusion of the Thames from the provisions of the Bill has caused expressions of regret, and a demand is rising for more complete legislation in respect to the waters of the Thames basin. In the Commons, Mr. Magniac has a Bill very similar to that brought forward by the Government in the Lords.

The adjourned discussion before the Chemical Section of the Glasgow Philosophical Society, on the chemistry of sewage precipitation, to which reference was made in the JOURNAL a few weeks since, was resumed last week, and brought to a close. Two of the speakers were in favour of dealing with the Glasgow sewage in detail, by having six or eight precipitation-tanks in different parts of the city, rather than one large concentrated establishment on the outskirts. Professor Mills, of Anderson's College, declared himself strongly opposed to the adoption of a precipitation process in Glasgow. Late in the day though it was, he most earnestly pleaded that the

Corporation would give the irrigation process a chance. Mr. Stamford expressed his surprise that so advanced a man as Professor Mills should be found at this time of day talking about irrigation. If the Professor had tried sewage farming, as he (Mr. Stamford) had done, he would have spoken differently on the subject. Dr. Henderson advocated precipitation, and another speaker held the same view. On the whole, precipitation seemed to be the favourite remedy—a result which might, perhaps, be expected in a "Chemical Section," one of the speakers observing that hitherto the engineers had enjoyed "nearly all the say in the matter." The unhealthy condition of some of the towns on the estuary of the Clyde is the subject of considerable discussion, and the state of these towns is used as an argument against carrying the sewage of Glasgow in that direction.

NEW VIEWS ON THE ECONOMY OF CARBONIZATION.

MR. W. D. SCOTT-MONCRIEFF, in the lecture delivered by him before the Society of Arts on Wednesday last—a report of which will be found in another column—has made a very interesting contribution to the present discussion of the means of rendering English towns smokeless. The communication in question is of particular interest to those engaged in the gas industry, as it refers almost exclusively to the great problem of which is the most perfect method of carbonizing coal for the purpose of gas making. This subject has been recently discussed at length in our columns by many experienced Gas Engineers, who have, without exception, confined themselves to a very narrow issue arising out of the commonly received practice of manufacturing gas from bituminous coal. The whole of that discussion may be truly said to have circled round the tail-end of the ordinary six-hour charge, and it left untouched the root of established usage. This was probably because all our correspondents were gas men, and had been trained to regard the production of gas as the chief end and aim of their work. It is therefore highly instructive to observe how the whole subject of carbonization presents itself to the mind of a skilful Engineer who is free from any such bias, and, as in the present instance, approaches it from a different direction. Mr. Scott-Moncrieff regards the question as though the coal and coke were of equal importance with the gas, and with the preliminary assumption of a greatly widened interdependence between gas manufacturers and the general public. According to him, gas manufacturers at present only fulfil a fraction of the public duty which should rightly be theirs, and which they must, in the near future, be called upon to undertake for the benefit of the community. It is the purpose of Mr. Scott-Moncrieff's lecture to show in what this extended responsibility consists, and how it may be justly apportioned.

We may here pause to remark that advisers like Mr. Scott-Moncrieff who are content to dispassionately advocate a course of action which to them appears right, and calculated to improve the existing conditions under which they, in common with others, live, will rarely lack a patient hearing; and when they are otherwise well qualified to speak of a subject, and are careful to provide themselves with good materials for argument respecting it, their opinions will never fail of respectful consideration. It is only those persons whose own self-sufficiency prompts them to dogmatize on matters of which they are altogether ignorant, who get deservedly snubbed by those whom they pretend to instruct. Gas Companies are most used to the latter class of critics, and the friends of the gas industry are therefore the more likely to welcome a competent and impartial counsellor, and take his suggestions to heart in order to show that it is only to the ignorant and malicious that they are scornfully indifferent, while ready at all times to discuss points of policy with any capable judge of such matters.

To return to our subject, Mr. Scott-Moncrieff devotes the first part of his lecture to proving that bituminous coal, in its raw state, cannot be consumed smokelessly in a single operation, especially on the scale of ordinary domestic firing. This is a very important point, and its bearing is fully appreciated by the lecturer; for it necessarily follows that if this statement is capable of proof, the way is clear for proposals which would otherwise have much less chance of universal adoption. We, of course, assume throughout that the smoke of imperfectly burnt bituminous coal is confessedly such a nuisance that measures of some kind for its prevention are imperatively called for. Unless this fundamental truth is agreed upon, Mr. Scott-Moncrieff, Dr. Siemens, and others, are merely wasting their energies in making revolutionary proposals with a view to remedy the existing state of things. But let it be granted that the prevention of smoke, from domestic and other fires, is so ardently desired that sweeping measures for effecting the purpose are called for, it is then possible to regard Mr. Scott-Moncrieff's proposals with the gravity which their character and possible effects demand. No perfection in the combustion of raw bituminous coal by the usual means being attainable, and the same kind of coal being admittedly the cheapest and most useful fuel throughout the greater part of the kingdom, the question naturally arises whether it must always be burnt imperfectly, or if it can be treated in some way so as to remove its reproach of dirtiness. Mr. Scott-Moncrieff asserts that the latter procedure is not only possible, but that as dirt is known to be only "matter in the wrong place," it will be found practically profitable to put the dirt or smoke of caking coal to good use in its proper position.

A perusal of the lecture will give a better knowledge of Mr. Scott-Moncrieff's arguments than we have space for here. Briefly stated, he proposes that no bituminous coal should be sold in its raw state,

but in the condition of a manufactured article. It should have passed through the gas-works before it is distributed for household use, and the treatment it would then receive would rob it of its tendency to smoke, while its ready inflammability would remain, and its heating power would be increased. The part retained by the gas manufacturer would be in the form—not of smoke, but of brilliant gas of 50 per cent. higher illuminating power than ordinary London gas; and a great quantity of liquid residuals, now worse than wasted, would be preserved for beneficent use in agriculture, manufactures, and the arts. All this is to be done without any sacrifice of existing interests, or disturbance of the present use and distribution of money, while every one is to be benefited in some material way by the change. Mr. Scott-Moncrieff, in short, proposes, as a solution of the smoke difficulty, a means of effecting a great economy, and a method of obtaining better gas and better fuel, that the existing gas-works should take all the coal required for the service of a community such as that of London, and instead of extracting from it about 10,000 cubic feet of gas per ton as in their ordinary way of business, they would take only about one-third of the quantity, or say 3333 cubic feet, which would necessitate their carbonizing three times the usual amount. The coke, or partly carbonized coal, would, the lecturer stated, be most suitable for fuel, powerful, smokeless, inflammable, and cheap. All this, it was contended, could be effected by gas manufacturers with their existing plant, and they would find the new practice attended with considerable profit. Mr. Scott-Moncrieff brings statistics from Field's "Analysis of the Metropolitan Gas Companies' Accounts," and from other sources, to prove the feasibility of his scheme, and these, as we may at once concede, he uses with much skill.

Let us, however, consider first the nature of the principle upon which the whole theory rests—we refer to the proposed yield of gas from the coal. In connection with this, the letter of Mr. Robert Morton to Mr. R. Rawlinson, C.B., the Chairman of last Wednesday's meeting, lays bare the gist of the matter. With the light of our common experience, it may be asked how we are to ensure the first conditions of the successful solution of the problem. Bituminous coal yields its best gas in the first three hours of distillation, during which perhaps 6000 or 7000 cubic feet to the ton are made. If the charge is then drawn, it will be found unevenly carbonized, tarry, and so friable as to almost worthless for fuel. This is, however, carrying the process beyond the limits contemplated by the lecturer, who thinks that only half this quantity of gas should be taken out. But in this way it may be shown that much of the best gas would be lost. Rather poor gas is produced during the first hour, although the quantity may be about 2000 cubic feet per ton; then we could only take the product of another half hour to make up the quality to the required twenty-four candles, after which the charge must be drawn—and in what state? The retort would then have to be charged afresh, and the discharged material removed for sale. For success in this system, dependence would have to be placed on a regular quality of gas, not less than twenty-four candle power, and on preserving the quality of the coke. If this could be done, the higher prices that could be realized for these two staples, and the increased quantity of tar and liquor obtained from treating the greater weight of coal, would, it is said, recoup the gas manufacturer for his trouble.

We do not believe that in London it would be possible to obtain 4s. 6d. per 1000 cubic feet for gas of twenty-four candle power, after selling seventeen candle gas, as now, for 3s. per 1000 cubic feet. The public would want the better gas for the same price as the poorer; and, as they might burn less of it, the result would not be satisfactory to the producer. Again, would it be possible to obtain 23s. per ton for the half-carbonized coke, granting the latter to possess all the good qualities claimed for it? On the contrary, so far from the gas producer getting his coal for nothing, we fear he would have to give away his coke, for such tender, friable stuff would be practically worthless from its inability to withstand the rough usage of transit. If uniform in quality, it might perhaps be compressed; but we do not see how it is to be made so. Different portions of the charge would have different characters, and the loss in drawing a charge of this nature would be great. In short, unless we had an altogether different system of retort setting and working, by which a partial but regular carbonization could be secured, it is difficult to see how it could be managed. Added to this, the nuisance, labour, wear and tear, and destruction of one and a half hour charges would be enormous. Gas Engineers have been seeking for some continuous system of carbonization ever since the days of the revolving web retort, and it is to be feared that until this is found, ninety-minute charges will not come into general use.

It would be useful to know to what Mr. Scott-Moncrieff would look to recoup himself for the admitted loss of two-thirds of the gas, in places like Manchester, where, from local causes, the illuminating power of the gas is permanently maintained at about the average of the yield of ninety minutes' carbonization, and where the coke would gain little increased value from the sacrifice. We do not attach much value to the objection in reference to the additional quantity of coke that would have to be consumed as fuel under the proposed régime, because with gas generator firing the heat may be kept up to almost any required degree of intensity; still, it is a point that may be fairly made. It would almost appear, for various reasons, that the conditions upon which Mr. Scott-Moncrieff's proposal depends are only to be found in London, or in similar towns, where the proportion of total coal consumption to the coal required for gas making bears the ratio of 3 to 1, or thereabouts. It is clear that although a lesser ratio would only result in the gas manufacturer having to manipulate less coal, and therefore take more gas from it, and leave it poorer as a semi-coal, the circumstance of a greatly increased demand for

fuel would have a serious effect in the gas-works, as the coal would hardly remain in the retorts long enough to get hot through, and the gas would be worthless. Hence it does not appear that a principle based on a fortuitous example is of universal application, nor that the consumption of gas and fuel is always in the same ratio.

We have little more to say with reference to the large figures dealt with by Mr. Scott-Moncrieff in showing the applicability of his system to the case of London, except to notice the remark that the consumers would purchase the coal, and hand it over to the Gas Companies for treatment. This is not quite clear; it should be stated thus, to use the figures given: The Gas Companies would naturally have to buy the coal they would require, the same as now, and would have to sell the products for what they would bring. The Companies would therefore have to pay £4,800,000 per annum for coal, and for the coke produced they would receive nearly an equivalent, or say £4,715,000. To this would have to be added the gas-rental of £5,250,000; thus showing, as compared with the actual rental, quoted by Mr. Scott-Moncrieff at £3,500,000, a profit to the manufacturer, on the new system, of £1,835,000 for gas and coke, which, by the addition of £350,000 from the bye-products, is swelled to a grand prospective gain of £2,185,000. These figures are truly startling, but before an Act of Parliament is passed to alter the existing state of things, it will be necessary to know, first, if the stated prices for gas and coke can be secured; secondly, how much additional capital the Companies would have to employ; and, thirdly, the average extra expenses for labour, wear and tear, &c.

Mr. Scott-Moncrieff deserves great credit for the courageous way in which he has stated his views, and the care with which he has used the few statistics and facts open to him in support of his theory. It cannot be said, however, that a small experience of an expedient resorted to in time of distress at the Woolwich Arsenal Gas-Works is enough to give the proposed system that firm basis of practical success, even on a small scale, which would warrant its application, if merely argumentatively, to the case of the Metropolitan Gas Supply. Mr. Scott-Moncrieff may think our request for further data unreasonable after the statement of his own convictions in the matter. We can only say that if Mr. Scott-Moncrieff or any of his friends will conduct a small provincial gas-works—and many such, large enough to show the working of the system, may be had on lease—for a whole year or more, in accordance with the ideas expressed in his lecture, and with good results from a commercial point of view, we shall be glad to reconsider our opinions.

THE REPAYMENT OF LOCAL LOANS BY ANNUAL INSTALMENTS.—Mr. Isaac Binns, F.R.Hist.S., the Borough Accountant of Batley, has published a work which will be found most useful by all persons—and their number is a large and increasing one—who are concerned with the settlement of sinking funds for the redemption of loans. The Author prefaces his book with a few short extracts from the Local Loans Act, 1875, which define the duty of local authorities in respect of the establishment of sinking funds, and the bulk of the work is filled with tables giving the average annual instalments of principal and interest required to pay off £1 and £100, with interest, in any number of years not exceeding 100; or the annuity which £1 or £100 will purchase for any number of years not exceeding 100. The tables are calculated at rates of interest rising by increments of one-quarter per cent. from 3 to 5 per cent. Examples are also given of the manner of using the tables. Mr. Binns's work is intended to save time and facilitate calculations of this class, and it is well adapted to serve its purpose.

Notes.

AN EXPLOSIVE GAS TELL-TALE.

Ansell's gas leakage indicator has been improved upon by Richard Weber, a Leipsic mechanic, in a new and ingenious appliance bearing a long name, signifying that it is intended to be used as a protector against gas explosions. The principle of the apparatus is identical with that of Ansell, and consists in taking advantage of the diffusion of gases through porous diaphragms. The difference between the two instruments lies in the manner in which their indications are intended to be observed. Ansell's gauge is a portable article, and its indications require to be read off by an observer precisely in the manner of an aneroid barometer; Weber's apparatus is, on the contrary, intended to be a fixture in places where an accumulation of inflammable gas may be expected, and its warning is conveyed to any distance by an electric signal. A suitable block, very like an ordinary gas-bracket back, carries on its face a short metallic cylinder, the outer end of which is closed with a porous diaphragm of plaster of Paris. This cylindrical drum is made airtight, except in respect of the diaphragm, but to its under side is fixed a U-tube opening into the interior, and filled with mercury. The outer end of the tube is provided with an insulated cap, to which is affixed a platinum point dropped inside the tube, but not touching the quicksilver, when the latter is at its normal level. The metallic tube containing the quicksilver, and the insulated cap and needle, are both connected in circuit with a battery and an alarm bell. When the air contained in the drum is expanded to a degree which can only be an effect of fire, or when it is swelled by the endosmosis of gas from the exterior, the mercury in the leg of the tube which communicates with the expanded air is depressed thereby, and the outer column of quicksilver consequently rises. At a certain point, to be previously regulated, the electrical circuit is completed by contact between the platinum needle and the rising mercury, whereupon the alarm is sounded. The platinum point is, of course, susceptible of

being raised or lowered in order to give warning at any percentage of inflammable mixture of gas and air, or it may be modified to show the presence of carbonic acid. The action of diffusion indicators of this kind is remarkably quick, and the power of the movement in endosmosis is quite sufficient to operate a column of mercury through the distance required to give a signal. Weber's apparatus is said to be suitable for halls, living-rooms, coal mines, the holds of colliers, and such places where a safety tell-tale for explosive gaseous mixtures could be fixed.

THE DENSITY OF SNOW.

According to Sig. G. Bignami Sormani, of Milan, the density of snow, and consequently the weight of it, which roofs, gasholders, &c., may have to carry, varies in a range of as much as eleven times the minimum. A cubic yard of snow from one snowstorm will sometimes weigh 814 lbs., while an equal bulk from another fall will only weigh 71 lbs. This indicates that any flat surface upon which snow may be drifted to the depth of only 3 feet may be called upon to sustain a weight of snow equal to a pressure of about $814 \div 9 = 90.5$ lbs. per square foot; or it may only be loaded under like conditions to the extent of $71 \div 9 = 7.9$ lbs. per square foot. The weight of a cubic foot of the densest snow recorded by Sig. Bignami Sormani being 30.14 lbs., while a cubic foot of water weighs 62.5 lbs., it therefore appears that, under certain conditions, the density of snow may be almost half that of water. Snow of this character will, however, in all probability be little different from ice, and would be rarely met with in this country, at least in any serious quantity, except on the ground or very near it. If it were otherwise, it is certain that much more destruction than is at all usual would be the consequence of a thick fall of snow on exposed lofty surfaces. The lowest named weight from new-fallen snow, only 2.63 lbs. per cubic foot, is abnormally light, being only about 1-24th of the density of water. It is usually assumed that the density of snow is ordinarily about one-eighth that of water, and this allowance, therefore, falls well within the range of Sig. Bignami Sormani's figures.

IMPROVEMENTS IN GAS-ENGINES.

Mr. William Foulis, C.E., of the Glasgow Corporation Gas-Works, has—as was briefly noticed in this column a few weeks since—recently patented some improvements in gas-engines having reference to the better and more economical working of this class of machine. Mr. Foulis's object is, firstly, to construct the cylinders and pistons of gas-engines in such a way as to separate the part of the cylinders wherein the explosion takes place from that in which the piston works. Mr. Foulis proposes to make his cylinder in two parts of about equal length, to be fixed, in the case of a vertical engine, one over the other, and separated by a thick packing of millboard or asbestos. The hottest half of the cylinder may be lined with asbestos or other non-conducting material, and the side of the piston which is presented towards this part of the cylinder is similarly covered. This side of the piston also carries a tubular piece of nearly the same diameter as the inside of the cylinder, and nearly as long as either part of it. This tubular piece is separated from the working piston by the non-conducting coating above mentioned, and is itself protected in the same way. The combustion end of the cylinder is coated outside with non-conducting material, and the working end is cooled by a water jacket in the usual way. It is hoped by this method of construction to keep the combustion chamber hot without heating to a commensurate extent the working cylinder. Means are also provided to prevent the perfect combustion of the gaseous mixture from which the power is drawn being interfered with by the foul gas remaining in the combustion end of the cylinder. To effect this the mixture is to be contained in a separate combustion chamber, enclosed or appended to the cylinder; and into this chamber enters, but without actual contact, a small piston which projects from the centre of the driving piston. The combustion of the gaseous mixture is made to take place in this combustion chamber, while the loose piston closes its end, and keeps back the foul gases. The proper mixture of air and gas is effected in a separate flexible chamber, which is so arranged as to keep up a supply of the mixture, from which the engine, when in motion, draws off the quantity required. The igniter used is the form patented by Mr. Foulis in 1878, arranged to ignite the mixture after the piston has made a portion of its forward stroke.

BLACKBURN CORPORATION GAS SUPPLY.—It will be remembered that at the meeting of the Blackburn Town Council on the 6th ult., a recommendation by the Gas Committee that "on all gas accounts due in April next, and in every succeeding quarter, a discount of 5 per cent. be allowed, if such accounts be paid on or before the 7th day of the second month of each quarter," was referred back to the Committee for consideration, it being thought by some members of the Council that a reduction in the price of gas would be more generally beneficial than the proposed discount. At the ordinary monthly meeting of the Committee held on Monday last week, it was decided, as preliminary to the reconsideration of the question as to the form that the proposed reduction in price should take, to obtain information from the municipal boroughs in the Midland and Northern counties which have corporation gas-works, with respect to the quantity of gas supplied to the public, the price which is charged for gas to various classes of consumers, and the amount of the discount, if any, allowed by the corporate authorities for prompt payment of gas accounts. This information, when procured, is to be tabulated; and copies are to be in readiness for the members at the next monthly meeting of the Council. It is necessary that the conclusion of the Committee as to the extent of the reduction should not be taken until the balance-sheet of the gas department for the past year has been made out. This is expected to be ready in two or three weeks, and it is believed that it will show a profit of several thousand pounds on the twelve months' operations.

NO GAS.

It was a Gas Consumer who,
Upon a wintry day,
Did seek for gas to cook his food,
The hunger-pangs to stay
Of self and wife and children dear,
Who loved a Sunday dinner,
And quite as much disliked to fast
As any cloister'd sinner.

'Twas bad enough when overnight
But specs of flame were seen,
And gas was supplemented by
Some lamps of paraffin;
But when the morning came, and "Pa"
In vain all efforts tried
To clear the pipes of naphthaline,*
Then "Ma" broke down and cried.

He felt it hard that he for days
No water had for grog,
But much too hard at last to find
He could not cook his prog.
The water stoppage he had borne,
And without sighs or murmurs
But 'twas too hard when not a jet
Would light of cooking burners.

The weeping children group'd around
That most unhappy man,
And wailing broken voices said,
"Dear Pa, do what you can;
We all are hungry, and we feel
The bitterness of cold.
You've taught us all to trust in gas,
Now that so cheap 'tis sold.

"We've not a scrap of wood or coal,
Or coke to make a fire,
And if you don't do something soon,
You'll see us all expire.
There's not a bit of meat that's cold
To help us through the day,
But only beef that's raw, which you
To cook must find the way."

The "Ma" then interposed and said,
In tones the most severe,
"You see the pass you've brought us to;
'Twill be the last, my dear.
How often have I told you, eh?
That gas was but a snare?
How often have I warn'd you that
Of gas you should beware?"

"It always fails when most we want,
And always will, I'm sure,
And such a state of things I will,
In future, not endure;
But there, don't stand just like a block,
But go at once and try
If wood and coals, from neighbours, you
Can borrow or can buy."

'Twas useless to resist, and so
The wretched man went out
With pails in hand, to search for fuel
At houses round about.
But all the people knew him as
A gas enthusiast,
And so refused him any aid—
From house to house he pass'd.

The night came on, and still he went
From place to place for fuel,
While people follow'd mockingly,
And jeer'd him—it was cruel.
At last demented he became,
And then he saw a way
To stop the frost from stopping pipes,
However cold the day.

Said he, "Why, 'tis electric force
Which threatens now to take
The place of gas for lighting us,
And this same force I'll make
A means to warm the gas-mains up,
And keep up a supply;
Sir William Thomson says we can
Conduct—if but we try—

"Electric force by copper pipes,
And water (hot) may sell;
Let's, then, combine electric mains
With those of gas as well;
And then the frost may strive in vain
To spoil our Sunday dinners,
While gas and electricity
Will both of them be winners."

* * * * *

While thinking out this scheme of his,
And where he should begin,
He'd walk'd to Colney Hatch's† doors,
And there they took him in.

F. W. HARTLEY.

Jan. 24, 1881.

* The poet would have also said,
Of frozen vapours too,
And tried another verse to frame,
But found it would not do.
†Twas breaking up the interest grave,
Which more intensely grows,
In course of the narration of
Some fellow-creature's woes.

† An asylum for the insane.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

SIZES OF SERVICE-PIPES AND METERS.

SIR,—The difficulty to which your correspondent "D" refers in this matter is one entirely of his own creating; no such difficulty exists in fact.

The Sale of Gas Act has no application in this matter.

The Gas-Works Clauses Act, 1847, does not make the supply of gas compulsory; consequently, if the service—so far as it may be on the consumer's own premises—the meter, or the fittings are defective or insufficient, the Company can decline to make or allow any connection to be made with their mains until the defect is removed to their satisfaction. No penalty would apply if they refused, with or without reason.

The Metropolis Gas Act, 1860, relates only—as its title implies—to Gas Companies supplying the Metropolis, and to none others.

The Gas-Works Clauses Act, 1871, which is an amendment of the Act of 1847, makes (clause 11) the supply of gas compulsory, and provides that the company "shall furnish and lay any pipe that may be necessary for that purpose, subject to the conditions following"—which are, that when the consumer's premises are not more than 30 feet from the company's mains, the company shall pay the cost; but when they are beyond the 30 feet the consumer shall pay the difference. The dimensions, as a matter of course, are thus left entirely at the discretion of the company. Under this clause, the company can insist upon laying the whole of the service themselves; and if the meter is insufficient, they can (under clause 17) refuse a supply until it is altered.

If at any time a consumer increases the number of his burners so as to make the meter insufficient—and the meter is the property of the company—the company can change it at any time they think fit, with or without the consent of the consumer.

Gas and Water Companies' Association,
6, Victoria Street, Westminster Abbey, Jan. 29, 1881.

W. LIVESEY.

NON-STATUTORY GAS COMPANIES AND PUBLIC ROADS.

SIR,—I have been much pleased with reading your article in the JOURNAL of the 18th inst., headed "Non-Statutory Companies and Public Roads," which I think is a clear and correct exposition of the law as it now stands. I, like you, have been often applied to about it, and have often, in consequence, reconsidered the question, but my opinion has always been the same, and in agreement with the views set forth in your article.

Whenever I meet with any doubtful meaning in an Act of Parliament in which I happen to be specially interested, I always endeavour to reason it out (if the term is allowable) as against myself, and if I find that the following up of any special interpretation I put upon it leads me into some indefensible position inconsistent with concurrent legislation on the same subject, I give that up, and try some other until I find one in which the inconsistency disappears. Of course, this is not always practicable, but it is so to a greater extent than is generally supposed; and having taken this course in the case in point again and again, I am confirmed in the belief that the interpretation you have given is the right one, although I admit that the words of the Act, by themselves, make it seem doubtful. When the words of an Act of Parliament are so clear and distinct as to admit of only one interpretation, the Courts will, as a matter of course, adopt that interpretation, irrespective of other considerations; but when the words are doubtful—and it may be admitted that they are so in this case—and the Courts have to consider what was intended, they give due consideration to the attendant circumstances, and frame their decisions accordingly. It is, therefore, worth while to consider what the attendant circumstances are in this case.

Parliament, after many long and exhaustive inquiries, some years back conclusively established the fact that having two sets of gas or water mains in the same street is injurious to the public interests, a waste of capital, a nuisance to the public in the unnecessary opening of the public thoroughfares, and an injury to the first company, without being any benefit whatever to the public. That as the price of gas depends upon the success of a company's operations, and no two companies ever did succeed under such circumstances, no permanent benefit can possibly accrue to the public from such a system; and although the consumers may derive some trifling pecuniary advantage while the opposition lasts, the two companies sooner or later are sure to amalgamate, and the district be permanently burdened with the double capital, and the price of gas be kept up at an unduly high rate in consequence. For these and many other similar reasons Parliament has deemed it expedient for many years past not to authorize any such schemes.

Following this up, Parliament, with a view to protecting the public from an improper use of this quasi-monopoly, and to facilitate the companies coming under proper regulations, passed, in 1870, the Gas and Water Works Facilities Act, whereby the Board of Trade were authorized to grant to gas or water companies Provisional Orders, having the same effect as special Acts; but, consistently with their former decisions not to authorize a duplication of mains, the Act provided that no such Orders should be granted for places where there was any corporation, company, or person authorized to supply gas by special Act or Provisional Order.

For the further protection of the public, another Act, the Gas-Works Clauses Amendment Act, was passed in 1871, to place all the statutory companies under uniform regulations, and among many others are the following:—(1) The companies are compelled to lay down services, when required so to do, for any public lamps within 50 yards of their mains. (2) To supply the said lamps on the average meter system, when so required. (3) To refer any disputes between themselves and the local authorities, respecting the public lamps, to arbitration. (4) To keep the gas supplied by them free from all impurities. (5) To provide testing-places and apparatus for testing the gas so supplied, and the local authorities a requirement to appoint examiners for this purpose. (6) And the companies are made subject to heavy penalties in the event of failure on any of these points. In addition to these,

all companies, when they apply for Acts or Provisional Orders, are limited in their district of supply, and prohibited, under any circumstances, from charging more than a certain prescribed rate, and are compelled to supply gas at all hours of the day or night.

In 1872 the Municipal Corporations (Borough Funds) Act was passed. It was an Act to authorize local authorities, with the consent of the ratepayers, to apply borough funds to opposing gas companies in their applications to Parliament; but this Act, like the Act of 1870, provided against the duplication of mains as follows:—

"Provided that nothing in this Act contained shall authorize any governing body to promote any Bill in Parliament for the establishment of any gas or water works to compete with any existing gas or water company established under any Act of Parliament or Provisional Order."

In 1876 the Burghs Gas Supply (Scotland) Act was passed to authorize the governing bodies in Scotland to undertake the supply of gas; but, consistently with the Acts before quoted, it provided as follows (sec. 2):—

"The provisions of this Act shall not empower the town council or commissioners of police of any burgh in which this Act shall be adopted, as commissioners under this Act, to supply gas within any part of the area of supply over which the town council or commissioners of police of any other burgh, or any gas company incorporated by Act of Parliament, or any company, partnership, or person authorized by any Provisional Order, confirmed by Act of Parliament, shall have statutory powers to supply gas at the date of the adoption of this Act in such burgh."

In 1875 the Public Health Act was passed. The main object of this Act was to consolidate and amend all the different Acts relating to the public health, and for this purpose all those Acts were repealed bodily, and such of their provisions as were in harmony with the legislation of that date were re-enacted wholly or in part, or altered to meet the altered circumstances; and the following clause (161) relating to the supply of gas was the result:—

"Any urban authority may contract with any person for the supply of gas or other means of lighting the streets, markets, and public buildings in their district, and may provide such lamps, lamp-posts, and other materials and apparatus as they may think necessary for lighting the same. Where there is not any company or person (other than the urban authority) authorized by or in pursuance of any Act of Parliament, or any Order confirmed by Parliament, to supply gas for public or private purposes, supplying gas within any part of the district of such authority, such authority may themselves undertake to supply gas for such purposes or any of them throughout the whole or any part of their district; and if there is any such company or person so supplying gas, but the limits of supply of such company or person include part only of the district, then the urban authority may themselves undertake to supply gas throughout any part of the district not included within such limits of supply. Where an urban authority may, under this Act, themselves undertake to supply gas for the whole or any part of their district, a Provisional Order authorizing a gas undertaking may be obtained by such authority under and subject to the provisions of the Gas and Water Works Facilities Act, 1870, and any Act amending the same; and in the construction of the said Act the term 'the undertakers' shall be deemed to include any such urban authority: Provided that for the purposes of this Act the Local Government Board shall, throughout the said Act, be deemed to be substituted for the Board of Trade."

As the origin of the question now under consideration is the interpretation of this clause, it is important to notice that the clause authorizes the Local Government Board to grant Provisional Orders to local authorities, *subject to the provisions of the Gas and Water Works Facilities Act, 1870*, and that that Act especially provides, as before stated, that no such Orders shall be granted in places where there is any corporation, company, or person supplying gas under the authority of a special Act or Provisional Order. It is, therefore, abundantly evident that Parliament has, in every possible way, prohibited the duplication of mains in all cases where the companies supplying the district are subject to the usual statutory regulations.

The local authorities, if I understand the question rightly, claim, under the first part of this clause, the power of entering into contracts for lighting the public lamps, with any company or person they think fit, and authorizing that company to lay mains in any other company's district, whether authorized or not. This part of the clause is taken from the Public Health (Supplemental) Act, which was passed in 1849—a time when there were very many places in different parts of the country not supplied with gas; and the intention of it at that time was to afford facilities for the establishment of small companies in these outlying places, and it has answered this purpose exceedingly well, for gas companies have since then sprung up in all parts. But it was never intended that it should be made use of, or that it gave the local authorities power to authorize new companies to lay mains in the districts of, and to compete with existing companies. The second part of the clause authorizes local authorities, in places where there is not any authorized company or person supplying gas, to undertake the supply themselves, on obtaining a Provisional Order from the Local Government Board; but the Local Government Board are, as shown before, prohibited from granting any such Order for places where there is an authorized company.

If, then, the contention of the local authorities is correct, this clause in itself prohibits them, on the one hand, from laying mains themselves for lighting the public lamps in a district supplied by a statutory company; and authorizes them, on the other, to permit any other company or person to do so.

If such a power exists at all, it must, from necessity, be unlimited, and consequently the local authorities would have the power of making a contract with one company for three years, and then with another for the same time, and then with another, and of authorizing each company to lay down mains for the purpose. There is no exaggeration in this, preposterous as it seems, for it must absolutely be this or nothing; and if it is, then every statutory company in the kingdom is liable at any time to have its prosperity destroyed at the caprice of the local authority of the district. As the local authorities are responsible for lighting the public lamps, surely the authorizing of some other company or person to lay mains for this purpose in their district is the same as doing it themselves, and the doing it under another name is merely a subterfuge. It is impossible to suppose that the clause is intended to give, or does give such inconsistent powers; on the con-

trary, the just interpretation is that the local authorities, having no power themselves to lay mains in an authorized company's district, have no power to permit any one else to do so.

For the sake of argument, it may be well to show what the effect would be if the local authorities had this power. The only protection granted to statutory companies on their undertaking statutory obligations is the exclusion of other mains from their district. When other mains are once introduced, this protection is at an end. The position of the original company in such a case, with all its obligations and penalties, would be worse than that of the new company, which would be under no obligation as to furnishing a supply when not likely to be profitable, no limitation as to the price, no fixed quality of gas, no penalties for failure. The local authorities might contract for the lighting of the public lamps only; but, the mains being laid, the consumers would have the power to take their supplies from one company or the other at their own option, and, except in certain events, the original company would not have power to prevent them doing so. As all statutory companies are confined to certain districts, none but non-statutory companies could enter into a contract for such a purpose; consequently, if such a contract were made, all the regulations provided by Parliament as to the illuminating power, price, purity, pressure, accounts, and other things, for the protection of the consumers, would, so far as the new company was concerned, be inoperative. If any local authority attempts to put such a power in force, the gas company in the district should send a deputation up to the President of the Local Government Board, and call his attention to the proceedings.

Gas and Water Companies' Association,
6, Victoria Street, Westminster Abbey, Jan. 24, 1881.

W. LIVESEY.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1881.

Of the 46 petitions deposited in the Private Bill Office of the House of Commons for Bills in relation to gas or water in the present session, only one—that for the Beverley Water Bill—will go before the Examiners as an opposed petition, the Corporation of Beverley and Freemen of the borough having presented a memorial complaining of non-compliance with Standing Orders.

HOUSE OF LORDS.

THURSDAY, JAN. 27.

The Examiners reported that the Standing Orders had been complied with in the case of each of the following Bills:—Aberdeen Corporation; Alnwick Gas; Barrow-in-Furness Corporation; Bingley Water and Improvement; Bradford Water and Improvement; Bray Township; Brighton and Hove Gas; Cambridge University and Town Gas; Cheltenham Corporation Water; Colne and Marsden Local Board; Dundalk Water; Eastbourne Water; East London Water; Egremont Local Board; Fylde Water; Goole and District Gas and Water; Hexham Gas; Holland and Sutton Bridge Water; London Sea Water Supply; Matlock Water; Oban Burgh; Paisley Burgh; Reading Corporation; Richmond Gas; Sheffield Water; South Metropolitan Gas; Westbury-upon-Trym Gas (No. 1); Westbury-upon-Trym Gas (No. 2); Westgate and Bitchington Gas; Woking Water and Gas.

The Examiners also reported that no Standing Orders are applicable to the Lower Thames Valley Main Sewerage Board Bill.

METROPOLIS WATER SUPPLY.

The Earl of CAMPERDOWN gave notice that on Tuesday, Feb. 1, he will ask whether, considering the present condition of public business, it is not advisable to introduce in the House of Lords the Bill providing for the creation of a Metropolitan Water Trust.

FRIDAY, JAN. 28.

The Examiners reported that the Standing Orders applicable to the following Bills had been complied with:—Hyde Gas; Kirkcaldy and Dysart Water.

HOUSE OF COMMONS.

TUESDAY, JAN. 25.

The Chairman of Ways and Means reported—That, in accordance with Standing Order 79, he had conferred with the Chairman of Committees of the House of Lords, for the purpose of determining in which House of Parliament the respective Private Bills should be first considered, and they had determined that the Bills contained in the following list should originate in the House of Lords, viz.—Bray Township; Colne and Marsden Local Board; East London Water; Lower Thames Valley Main Sewerage Board; Oban Burgh.

THURSDAY, JAN. 27.

The petitions were presented for the following Bills, which were ordered to be brought in:—Aberdeen Corporation, by Mr. Webster and Sir A. Gordon; Alnwick Gas, by Earl Percy and Mr. A. Grey; Barrow-in-Furness Corporation, by Lord F. Cavendish and Major-Gen. Feilden; Bingley Water and Improvement, by Sir A. Fairbairn and Sir J. Ramsden; Bradford Water and Improvement, by Mr. W. E. Forster and Mr. Illingworth; Brighton and Hove Gas, by Mr. Gregory and Mr. Scott; Cambridge University and Town Gas, by Mr. Walpole and Mr. W. Fowler; Cheltenham Corporation Water, by Baron De Ferrieres and Mr. R. Martin; Eastbourne Water, by Lord E. Cavendish and Admiral Egerton; Egremont Local Board, by Mr. P. Wyndham and Mr. C. Bentinck; Fylde Water, by Colonel Stanley, Sir J. Holker, and Major-Gen. Feilden; Goole and District Gas and Water, by Mr. Jackson and Mr. Woolf; Matlock Water, by Lord E. Cavendish and Mr. Cheetham; Paisley Burgh, by Mr. W. Holms and Mr. Crum; Reading Corporation, by Mr. Shaw-Lefevre and Mr. G. Palmer; Richmond Gas, by Colonel Makins and Mr. Mappin; Sheffield Water, by Mr. S. Morley and Sir G. Goldney; South Metropolitan Gas, by Mr. Boord and Baron De Worms; Westbury-upon-Trym Gas (No. 1), by Colonel Kingscote and Mr. S. Morley; Westbury-upon-Trym Gas (No. 2), by Colonel Kingscote and Lord Moreton.

The Examiners reported that the Standing Orders had not been complied with in the case of the petition for the Cleator Moor Local Board Bill.

FRIDAY, JAN. 28.

The petitions were presented for the following Bills, which were ordered to be brought in:—Dundalk Water, by Mr. H. Thomson and Mr. J. Dixon; Hexham Gas, by Sir M. Ridley and Sir T. Lawrence; Hyde Gas, by Mr. Cunliffe Brooks and Mr. Legh; Kirkcaldy and Dysart Water, by Mr. R. P. Bruce and Sir G. Campbell; London Sea Water Supply, by Sir C. Russell and Mr. Dodds; Westgate and Bitchington Gas, by Sir T. McClure and Mr. S. Holland; Woking Water and Gas, by Mr. Cubitt and Mr. Dodds.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

MONDAY, JAN. 24.

(Before Vice-Chancellor Hall.)

ATTORNEY-GENERAL V. GUARDIANS OF THE POOR OF THE UNION OF DORKING.

THE SEWAGE OF DORKING.

This was an action at the relation of Mr. J. C. Deverell, the owner of a mansion in the parish of Dorking, the grounds of which are bounded partly by the Pipp Brook, a natural stream flowing into the River Mole, and partly by the River Mole itself. The relator's house is situated about a mile from the town of Dorking, and the sewage of the place is discharged by various drains into the Pipp Brook, and so into certain millponds intersected by the brook above the plaintiff's house. The sewage of the district has, it appears, rapidly increased of late years, for the population of Dorking has risen from 5996 in the year 1851 to about 10,000 at the present time; and the object of the action was to restrain the defendants from causing or permitting the sewage of the town (other than sewage as to which there was a prescriptive right before the commencement of the action) to be conveyed into the Pipp Brook or the ponds above mentioned, unless sufficiently purified and deodorized, and freed from foul matter, so as not to create a nuisance. According to the description given by the plaintiff and his witnesses, the condition of the Pipp Brook, which was formerly a trout stream and favourite bathing-place, was such that no fish could live in it, and few persons would venture to walk beside it. Sewage matter could be seen in the ponds floating in masses some yards square; in summer the mud consisted of "accumulated masses of festering sewage;" there had been outbreaks of typhoid and scarlet fever; and, according to the depositions of the millers at the Pipp Brook, the state of the millponds and stream was "unspeakably beastly, and few people would care to enter into or minutely describe it." The defence was that the state of things was not nearly so bad as the plaintiff represented, and that there was, in fact, no substantial nuisance at all; the defendants also contended that they were not the body in whom the sewers of Dorking were vested; and a great mass of legislation was referred to, in the course of the arguments on their behalf, to show that the sewers in question, being made by the Highway Board, were still vested in that Board. The defendants, moreover, contended that even if these sewers were vested in them and a nuisance existed, they were not responsible for it, for they had not done any act to create or increase the nuisance. They had not themselves made the drains in question, but were only using in the accustomed manner the drains they found in existence when they were constituted a public body; and, according to the authorities, the remedy, if any, of the plaintiff against a rural sanitary authority under the Public Health Act, 1875 (the character in which the defendants were being sued), was not by an action in the Chancery Division, but by the prerogative writ of *mandamus*, which should be sued out in the Queen's Bench Division.

Mr. KAY, Q.C., Mr. W. F. ROBINSON, Q.C., and Mr. LATHAM appeared for the plaintiff; Mr. W. PEARSON, Q.C., and Mr. VAUGHAN HAWKINS for the defendants.

After some arguments, which lasted two days, judgment was reserved.

The VICE-CHANCELLOR this morning gave his decision, saying that he did not intend to deal with the argument on the part of the defendants that the sewers in question were not vested in them, for, assuming this contention to be incorrect, his judgment would still be in their favour. The plaintiff's case was founded on the fact that the defendants had used the sewers in question without freeing the sewage from noxious matter; and in order to show user by the defendants themselves, reliance was placed upon a bye-law passed by them in October, 1876, requiring persons erecting new buildings within their district to properly connect the drains thereof with the sewers. This did not, however, authorize any unlawful user of a sewer, nor establish on the part of the defendants such a user as would render them liable to an injunction. In the case of *Glossop v. The Heston and Isleworth Local Board* ("Law Reports," 12, Chan. Div., p. 102) it was decided that if a local board did not act themselves to cause a nuisance, but merely neglected to perform their duty of providing a satisfactory and healthy system of drainage, it was no ground of action by an individual for damages or an injunction; but that the remedy of the individual was by prerogative writ of *mandamus*. In the case quoted it was to be observed the sewers were actually vested in the then defendants, and, upon the whole, his Lordship considered that the present case was bound by the decision in the former case. The information and action must, therefore, be dismissed, with costs.

THE LIABILITY OF GAS COMPANIES FOR THE NEGLIGENCE OF THEIR SERVANTS.—In the Common Pleas Division of the High Court of Justice for Ireland, on Monday, the 24th ult., a case was heard before Chief Justice Morris and a special jury, in which a Mrs. Miller, a widow lady residing at 45, North Strand, Dublin, sought to recover damages from the Alliance and Dublin Consumers' Gas Company, for injuries sustained by her through the negligence of the Company's servants in leaving unprotected an opening made in the street for the purpose of laying down gas-pipes, in consequence of which she received injuries to her spine and other parts of the body. The jury, in the end, returned a verdict for the plaintiff for £105.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

A report—signed William Crookes, F.R.S., William Odling, M.B., F.R.S., F.R.C.P., &c., and C. Meymott Tidy, M.B., F.C.S., &c.—on the "Composition and Quality of Daily Samples of the Water supplied to London from Dec. 20, 1880, to Jan. 19, 1881," has just been presented to the President of the Local Government Board, and printed. It contains the results of examinations and analyses of daily samples (except on Sundays and Christmas-day, while on the 18th and 19th ult. the severe weather interfered with the collection of samples) of the water delivered in the Metropolis by the seven Companies deriving their supply from the Rivers Thames and Lea. The samples were, it is explained, collected by a man entirely under the control of the three gentlemen named above, at places and at times appointed by them, and unknown to the officers of the several Companies.

The report commences by stating that "as yet no daily analyses of the London waters have been recorded, all the reports hitherto published relate to a single sample of each Company's water taken on one day only in the course of a month. It is manifestly impossible to judge the character of a whole month's supply by a single sample; this may prove to be very good, whilst the water supplied during the rest of the month may be very bad, or vice versa."

In the first table appended to the report there are recorded the results of analyses, in detail, of a daily sample in every case; the purity of the water, in respect of organic matter, having been determined by the

oxygen and combustion processes. In the second table is shown the colour, together with the clearness or turbidity of each sample. In the third table is stated the quantity of free oxygen in 158 of the samples collected. Of the 169 samples collected in all, 199 were found "clear," 21 are noted as having been "very slightly turbid," 8 as "slightly turbid," and 1 as "turbid." The particulars of these appearances are given in the following words:—"The samples supplied by the New River Company were, without exception, clear, bright, and efficiently filtered. Of the 24 samples from the mains of the East London Company, 2 were noted as 'very slightly turbid,' the remainder were bright, clear, and well filtered. Of the 24 samples from the mains of the Chelsea Water Company, 2 were noted as 'very slightly turbid,' the remainder were bright, clear, and well filtered. Of the 25 samples from the mains of the West Middlesex Company, 1 was noted as 'very slightly turbid,' the remainder were clear, bright, and well filtered. Of the 24 samples from the mains of the Lambeth Water Company, 3 were noted as 'very slightly turbid,' and 4 as 'slightly turbid,' the remainder were clear, bright, and well filtered. Of the 24 samples from the mains of the Grand Junction Company, 6 were noted as 'very slightly turbid,' 4 as 'slightly turbid,' and 1 as 'turbid,' the remainder were clear, bright, and well filtered. Of the 94 samples from the mains of the Southwark and Vauxhall Company, 7 were noted as 'very slightly turbid,' the remainder were clear, bright, and efficiently filtered." The reporters, in explanation of the terms here used, say, "If a trace of suspended matter be noted, we record the water as 'turbid.' If, on close scrutiny, we are able to detect any suspended matter whatever, we call the water 'very slightly turbid.' A water is recorded as 'slightly turbid' when we consider it would come between those two extremes."

Messrs. Crookes, Odling, and Tidy, as the result of their investigation, state: "We are of opinion that, considered both chemically and physiologically, the water delivered by the Companies during the month over which those examinations extended was of excellent quality, wholesome, and in every respect well fitted for the supply of the Metropolis."

LIMERICK GAS COMPANY.

An Extraordinary Meeting of this Company was held at the Cannon Street Hotel, on Tuesday last, to consider a scheme "for the appropriation and final distribution of the remaining assets, and for the ultimate dissolution of the Company." Mr. ROBERT HUDSON presided.

The SECRETARY (Mr. D. W. Ogg) read the notice convening the meeting, and the following report of the Directors was presented:—

The Directors have proceeded with winding up the affairs of the Company. All debts and liabilities of the Company, as far as they can be ascertained, have been discharged. The outstanding sums due to them have been collected or written off, except a small balance of about £50, which it is expected may, wholly or in part, yet be recovered. They consider the result satisfactory, having succeeded in recovering a larger proportion of the debts due to the Company than had at one time been expected.

The Directors hope that the provisions which they caused to be inserted in the Limerick Gas Act, 1878, will enable them to wind up the affairs of the Company with greater expedition, and at less cost, than would have been involved in winding up in the Court of Chancery. By section 11 of the Act of 1878, the Company are empowered to vote a sum not exceeding £2000 in making compensation to the officers or servants of the Company. By section 9 of the same Act the Directors are empowered to provide for the costs and expenses of and incidental to the winding up of the affairs of the Company, before distributing the ultimate balance amongst the Shareholders, and they propose to set aside a sum of £30 for this purpose.

If the assets are appropriated in accordance with the Directors' scheme, each Shareholder will be entitled to the sum of 1s. per share by way of dividend, and 8s. per share by way of return of capital. There will thus have been returned to the Shareholders £3 8s. in respect of each share, and the Directors trust that the Proprietors will consider the result of the parliamentary proceedings of 1877 and 1878 as satisfactory.

The Directors recommend the Proprietors to carry out the provisions of the Limerick Gas Act, 1878 (section 11), and to declare that a sum not exceeding £2000, as therein enacted, be put apart for compensation to those officers who, by reason of the dissolution of the Company, were not required by the Corporation of Limerick.

The assets and liabilities of the Company on the 1st of January were as follows:—

Assets.		
Cash in hand at Bankers	£283 11 2	
Do. on deposit	7000 0 0	
Interest due on do.	39 6 3	
		£7322 17 5
Liabilities.		
Due to Proprietors for unclaimed capital and dividend	£131 7 6	
Income-tax and costs of winding up the Company	124 1 6	
		255 9 0
	£7067 8 5	
Compensation to officers under the Act of 1878	2000 0 0	
		£5067 8 5
Balance to be appropriated at the meeting of Proprietors.		

The CHAIRMAN stated that the only object of the meeting was to submit the scheme embodied in the report. He congratulated the Shareholders on the manner in which the liquidation had been carried out, and said that the result was very different from what it would have been if it had been carried out under the Court of Chancery. He then read a list of the officers among whom it was proposed that the sum of £2000 should be distributed as compensation, on the dissolution of the Company and their services not being required by the Limerick Corporation; and concluded by moving a resolution adopting the report, and agreeing to the proposed distribution of £2000.

The motion was seconded and carried; as was a further resolution declaring the dividend of 1s. per share, as stated in the report.

A vote of thanks to the Chairman terminated the proceedings.

At a special meeting of the Sheffield Water Company, held on Monday, the 24th ult., Mr. Barnard Platts Broomhead was unanimously elected Law Clerk of the Company in place of the late Mr. Blakelock Smith.

Mr. R. K. Moorhouse, at present Manager of the Andover Gas-Works, was, on the 21st ult., appointed Manager of the Guildford Gas-Works; and will commence his new duties on Monday next. Mr. W. Longworth will still retain his position of Secretary and General Manager of the Guildford Gaslight and Coke Company.

THE PURCHASE OF THE BRIDGNORTH GAS-WORKS BY THE TOWN COUNCIL.—The Town Council of Bridgnorth having, in November last, negotiated with the Bridgnorth Gas Company for the purchase of their works for £14,000, subject to the approval of the Local Government Board, a circular has been sent by post to the ratepayers, advising them not to consent to the arrangement. The reason stated is that the Council will have to pay £300 or £400 more to the Government or any other lender than the Company have to pay in dividend, which will cause gas to be 1s. per 1000 cubic feet dearer than at present; also that as the electric light is coming so much into use £1000 will be wasted. The circular calls upon the ratepayers to sign a requisition for a town's meeting to be called, and a Committee and Solicitor appointed to thoroughly investigate the matter.

THE PURCHASE OF THE NEWCASTLE-UNDER-LYME GAS-WORKS BY THE CORPORATION.

ARBITRATION PROCEEDINGS.

SURVEYORS' INSTITUTE, WESTMINSTER.—TUESDAY, JAN. 18.

(Before G. W. STEVENSON, Esq., and R. P. SPICE, Esq., Arbitrators; Sir HENRY HUNT, C.B., Umpire.)

In the year 1877 the Corporation of Newcastle-under-Lyme obtained an Act of Parliament empowering them, among other things, to purchase the undertaking of the Newcastle-under-Lyme Gaslight Company, on giving due notice within three years of the passing of the Act, upon terms to be settled by agreement or arbitration. No agreement as to the terms of the acquisition having been arrived at, the matter was referred, and the proceedings commenced this day.

Mr. MICHAEL, Q.C., and Mr. T. B. UDALL appeared for the Company; Mr. LITTLE, Q.C., and Mr. UNDERHILL, Q.C., for the Corporation.

[At the commencement of the proceedings it was agreed that the evidence taken before the Arbitrators should, in case of a difference of opinion, be considered as evidence taken before the Umpire.]

Mr. MICHAEL, in opening the case, said the arbitration took place by virtue of the provisions contained in the Newcastle-under-Lyme Corporation Act of 1877, by the 19th section of which it was provided that the Corporation might, at any time within three years after the passing of the Act, require the Gas Company to sell their undertaking to the Corporation for such consideration in gross, or by annuities, and on such terms and conditions as might be agreed upon; in default of agreement, the terms to be settled by arbitration under the Railway Companies' Arbitration Act, 1859. A time was to be settled by agreement for the transfer, and it was provided that within three months from such vesting the Corporation should "produce to the Commissioners of Inland Revenue a copy of this Act . . . duly stamped with the *ad valorem* stamp duty of the same amount as would have been payable if the transfer of the undertaking had been by deed of conveyance;" in default of which the *ad valorem* duty, with interest thereon at the rate of 5 per cent. per annum from the vesting period to the day of payment, should be recoverable from the Corporation, with all costs and charges attending the same. By other sections of the Act it was provided that all the powers vested in the Gas Company should be transferred to the Corporation, who were not to manufacture or store gas on any land other than that described in one of the schedules to the Act. It was also provided "that the Corporation shall, if required by any Urban Sanitary Authority for the time being supplying gas within any part of the district of such Authority, sell to such Authority all the mains, pipes, and other gas-works of the Corporation within the district of such Authority (except such mains, pipes, and works, if any, as are used for service beyond that district), at such price as, in default of agreement between the Corporation and such Authority, may be determined by arbitration." Under the powers of the Act it would be for the Arbitrators to consider what should be the amount in gross—because the Company elected to take money instead of annuities—which should be paid for the sale of their undertaking. The power conferred by the Act of 1877 would have expired in August, 1880, but in the previous June the necessary notices were given. A very important point was the date at which the transfer should take place, because on this point would depend very much the amount that should be paid. The object of the Company was to facilitate matters for the Corporation, and either to allow the transfer to take place from June, 1880; from Jan. 1, 1881; or to carry on the undertaking for the Corporation, in accordance with the usual agreement entered into in circumstances like the present, at their risk, and acting as their agents, up to June, 1881. The question the Arbitrators had to determine was what was the amount in gross to be paid for the transfer of the undertaking. He (Mr. Michael) wished he could, on the present occasion, depart from the principle he had frequently laid down—but to which a ready assent had not always been given—viz., that the value of property was the value to the seller, and not the value to the buyer; but he could not stultify the position he had previously assumed, which was that the only principle which could govern the arbitration was the value to the seller and not the value to the buyer. In the present case a very large portion, both of income and property, would have to be handed over, for which no compensation could possibly be paid—that was to say, by the existing state of the law a thing would be handed over to the Corporation from which they would derive the utmost advantage, and for which they would pay no compensation whatever. The first thing to be taken into consideration was the previous history of the Company, leading up to their present condition. The Company were originally established by Act of Parliament in 1819, and, being unfettered by any Gas-Works Clauses Act, were entitled to make as large a profit as they possibly could. A subsequent Act was, however, obtained in 1855—to which the attention of the Arbitrator would mainly be directed—which was supplemented by a Provisional Order obtained at the same time; and then came the Act of 1877, by which the undertaking was to be transferred to the Corporation. By the Act of 1855 the capital of the Company was declared to be £15,800, divided into two equal portions, £7900 of which was allocated to the holders of shares under the Act of 1819, and the remainder either among the Shareholders or the general public, the whole bearing a dividend of 10 per cent., if earned. It would be important to notice that the Gas-Works Clauses Act of 1847 was incorporated with the 1855 Act and also with the Provisional Order. There was likewise a power given to raise further capital to the amount of £4200, but this was limited to a dividend of 7½ per cent., thus making the total capital of the Company £20,000. This capital being all expended, the Company in 1877 obtained a Provisional Order for raising a further sum of £6000, bearing a dividend of 7 per cent., making a total capital of £26,000, the entire amount of dividend amounting to an annual sum of £2315. Power was also granted for borrowing to the extent of £4000; but this sum being less than the usual amount, when the Provisional Order was obtained in 1877 there was granted with respect to the old capital a further power to borrow an additional sum of £1000, to raise the borrowing powers to the usual amount of one-fourth; and a further sum of £1500 with respect to the new capital of £6000 created by the Order.

The UMPIRE inquired if all the money had been spent.

Mr. MICHAEL said it had; and if the Gas Company had been wise, and could have foreseen what would happen, they might have been claiming a very much larger sum than they did at the present time, for they would have obtained the power of raising a much larger amount of capital, and not have skimped themselves, as they appeared to have done for many years, because their capital account had always been in debt to their current expenses account—that was to say, they had been continually borrowing on capital account, and using the money which had come in by way of profit to supplement the very small amount of capital they had expended on their works. The real thing to look at in cases like the present depended on two considerations—what was the amount of profit earned, and what was the certainty that such profit would continue. It was, therefore, customary to say that the condition of the works must be looked at, to see that they had been properly kept up; and to the multiplier of the number of years of the profit which was to constitute the gross sum of compensation the Arbitrators must add, or subtract from it,

the considerations derivable from the condition of the works—as to whether they were competent to earn the profit in perpetuity, and had been so kept up as to do so—and say whether there was a decrease or an excess. If there was a decrease in the character of the works, there must be a deduction. In these inquiries were included two considerations—first, the state of repair in which the works had been kept, and their freedom from depreciation, because it was part of the theory that in gas-works the plant was always as good as new, and that a sufficient sum of money was expended to keep it in this condition; and also that there was a sufficiency of power, in the way of meeting any contingency, to carry on the works without the possibility of loss; otherwise a deduction was to be made from the money paid as compensation. If there was an excess of power—if there were a larger number of retorts, or distributing power, or a greater quantity of land, it was usual to add a certain sum of money as representing the excess of power which would save in future an expenditure of capital. Since the year 1863 the Company had paid 10 per cent. upon £15,800, and 7 per cent. upon £4200; and, as the money had been raised, 7 per cent. had been paid upon the £6000 authorized by the Provisional Order of 1877. The maximum price of gas had been fixed at 5s. per 1000 cubic feet, but the price charged by the Company, subject to discounts, was 3s. 6d. per 1000 feet; there was therefore a limit of profit of 1s. 6d., which might be trenced upon to secure in the future the full amount of dividend. The accounts of the Company for the past year showed that there was an excess of profit of £1000—that was to say, that while the Company had only the power of dividing among the Shareholders £2315, they had made a sum equal to £3300, and this £1000 would be transferred to the Corporation without any compensation whatever. The Company had likewise expended on repairs and renewals a larger sum of money than was absolutely necessary; and there was a surplus structural value above what was required, making all due allowance for excess of power, to meet any contingency, which the witnesses would show was represented by several thousand pounds; and although he (Mr. Michael) was not going to claim anything for this, he put it in as showing the elements of value with which he was going to make up the sum claimed, and to influence the minds of the Arbitrators with respect to the multiplier they ought to use in estimating the gross sum which fairly represented the £2315 a year of which the Company were to be deprived. These elements of value were, shortly, the certainty of the production of the £2315; next the surplus power of the price—viz., 1s. 6d. difference between 3s. 6d. and 5s.—and the extra good condition of the works. Under these circumstances, what was the present value of £2315 a year, on a certain security, to those people who were to be deprived of it? In former times, when money could be invested to bring in 5 per cent., 20 years' purchase was the proper multiplier; but times changed, and people found it impossible to obtain a security, that was worth the name, which would repay them 5 per cent., and therefore for another long period 25 years was adopted. A period had now, however, been arrived at when 4 per cent. could not be obtained, and therefore he asked the Arbitrators to multiply the £2315 by 27 years' purchase. The undertaking was a localized one, and the neighbourhood must be looked at for it to be seen whether securities could be obtained equivalent to those which were being lost. The Shareholders in the Company could only look to local securities, such as water and railway companies, to ensure them the £2315, and he (Mr. Michael) submitted that this amount must be multiplied by 27 to obtain the capital sum. It should be remembered that nothing was asked for the power of an application to Parliament for the sliding scale, which had never been refused, together with the auction clauses and with the contingent advantages which might flow therefrom. There was also to be awarded what in reality represented another right appertaining to the Shareholders. By the Gas-Works Clauses Act, 1847, there was a power granted to the directors of a company to award to the shareholders any sum which had failed in any previous year to be paid, and which technically went by the name of back dividends. It had been argued that back dividends accrued from the very formation of a company; but he did not argue anything of the kind. His contention was that back dividends could only accrue from the time when the Company earned profits in excess of 10 per cent., and was therefore limited to the dividends which accrued between 1855 and 1863, and this figure was settled by Mr. Alfred Lass at a sum of £3377. If the Directors had applied to him (Mr. Michael) a little earlier, or had been wise in their generation, they would not have troubled the Arbitrators with back dividends at all, but would have paid them. The Directors, however, appeared to have been very cautious, and afraid in any way of infringing the law, and therefore there was a sum of money representing dividends they might have paid. They had been using it as capital, and continually debiting the capital account with a sum taken out of the money which had accrued, which they might either have allocated to the payment of back dividends, or have put aside to form the nucleus of a reserve fund. In the Act of 1855 and the subsequent Provisional Order there were incorporated various clauses of the Companies' Clauses Act of 1845. One of the clauses of this Act, which was continually acted upon by gas and water companies, was the power conferred by it to convert borrowed money into capital, and so reap the benefit of an increased dividend. At the present time the borrowing powers of the Company were to the extent of £6500, of which was at present at call. It had all been borrowed on bond, repayable at various periods, some being repayable at this very time, and might be convertible into capital, upon which an increased profit would accrue. The £1500 at 7 per cent. would, of course, have to be offered by auction in the same way as the original capital, and therefore nothing would accrue from this; but on the money borrowed under the Act of 1855—viz., £4000 and £1000—supposing some of it were borrowed at 4 per cent., and some at 4½ per cent., there would be the benefit of the difference between these rates and 10 and 7½ per cent., which would work out to a considerable sum.

At this point a consultation took place between Mr. Michael and Mr. Littler, after which

Mr. MICHAEL said it had been agreed to take the vesting period as from June 30, 1880, because all the accounts had been made up to this period, and had been settled by Mr. Lass.

Mr. LITTLER agreed that otherwise there would have been a great deal of trouble.

Mr. MICHAEL said the Company had conducted the business since the date he had named, and of course the profits, which had been considerable, would belong to the Corporation, while they would have to pay interest upon the award from June 30, 1880, at the rate of 5 per cent.

Mr. LITTLER thought it was scarcely usual to give 5 per cent., but he did not suppose his clients would care to question the matter.

Mr. MICHAEL said he knew he was only legally entitled to a less rate, but it was usual to put in more, because it was considered to be in some way penal and binding upon the Corporation. There was another very important matter—viz., that the vesting period dating from last June, the concern no longer belonged to the Company, and therefore an agreement must be at once drawn up that the Company were acting as agents for the Corporation, and conducting the undertaking at their risk.

Mr. LITTLER agreed to this proposition.

Mr. MICHAEL said that there were works now in progress, and he, on

the part of the Company, pledged himself that these works should be delivered up in proper condition to the satisfaction of the Arbitrators, if they would kindly undertake the duties.

Mr. STEVENSON suggested the words "perfect condition."

Mr. MICHAEL said "perfect" was a word which unhappily did not enter into mundane affairs, but he would say "in a proper, efficient, and working condition," such as would satisfy any gas engineer. His reason for intervening at this point was that a reference to the accounts would show the Company claimed a sum of £1216 for stock in hand, which was usually paid for on the transfer of a gas undertaking to a corporation. This was a matter which had been settled by Mr. Lass as representing the absolute stock-in-trade on the existing portion of the Company's works. With regard to the next item, he (Mr. Michael) was sorry to say he differed with his own witnesses, and it was one he could not insist upon. It was quite true it was a great hardship to the servants of the Gas Company that they might be deprived of their positions without compensation, but by law they could not ask for compensation. The sum of £1000 was put down, but it could not be insisted upon.

Mr. LITTLER: Surely it is not a *sequitur* that they will be dismissed; they may or may not be.

Mr. MICHAEL said it was in the option of the Corporation, but he hoped they would be kept on, although this remark would not apply to the Directors, Auditors, and so on. There was, however, another item—that of £1500 for winding up the concern; and as all the rights and privileges of the Company were to be transferred, he thought they ought not to be saddled with this expense. In round terms, he asked that the compensation to be awarded should not be on any fitful and fanciful principles, and that it should not be governed by any other considerations than that it was an amount of money passing from the hand of the buyer to that of the seller, and as really repaying to the seller the value of what he transferred to the purchaser. In conclusion, he would read the figures in accordance with the principles he had endeavoured to explain. The first item was £2315, and when this was multiplied by 27 years it came to £62,505. Then the amount of back dividend, as stated by Mr. Lass, was £3377. The conversion of the borrowed money into capital, in accordance with the Act of 1855 and the Provisional Order of 1877, was represented by £7371, or a lump sum of £273 a year multiplied by 27. Then the stock-in-trade, £1216, and the expenses of winding up, £1500, made a grand total of £75,969, which was the sum asked at the hands of the Arbitrators.

Mr. SPICE said he wished to call attention to one item which he was advised must be included in the agreement—viz., the expenditure of capital while the works were being carried on by the Company as trustees for the Corporation. There must be some special arrangement to provide the money by consent of the Corporation.

Mr. MICHAEL said this was a matter to be agreed upon between the parties.

The following evidence was then taken:—

Mr. Alfred Penny, examined by Mr. MICHAEL.

I have inspected the works of the Newcastle-under-Lyme Gas Company, their present condition being substantial, good, and sufficient. The quantity of apparatus is more than sufficient to supply the gas earning the present rental, and the distributing plant is equal to supplying half as much more gas as is now consumed. To satisfy myself on the subject, I had the pressure recently taken at the time of the largest consumption on a Saturday night, and found it was actually equal to the initial pressure at the works—a most unprecedented thing, showing that the mains were abundantly large for the supply of gas. I also found the same result at the out-district of Silverdale—two miles distant—the pressure being 20-10ths in both cases. I also found a very considerable surplus of manufacturing power; the retorts are equal to the make of 100,000 cubic feet in excess of the largest quantity made during the busiest nights. The storage is also equal to another 100,000 cubic feet, taking the proper quantity as two-fifths of the largest make in one day; and so on with regard to the rest of the apparatus. The condensers are rather larger. The purifiers are probably the weakest point; but they are amply sufficient. I made a very careful structural valuation of the whole of the property of the Company, and found that it amounted to some thousands of pounds more than the capital actually raised by them in loans and shares. The structural value of the works came out at £35,663, while the amount raised on capital and loans is £62,500.

By Mr. LITTLER: I valued them absolutely as new, because they are as good as new.

Examination resumed: During the last few years there have been larger sums spent upon repairs and maintenance than the annual sum which was required to keep up such works. I also examined the distributing plant, and found that a large portion of the trunk mains had been relaid very recently; and I satisfied myself as to the proper condition of the works, both as regards the amount and the power to supply the gas. The initial pressure being 18, I found 18.1 pressure in a part of the town where the mains were weakest; and I believe that in some parts where the point of consumption was higher than the point of departure, I should have found a much higher pressure if I had gone there. I have studied Mr. Lass's tables, and find that during the past five years the increase of consumption has been about 37 per cent. I think that for some years past the works must have been most admirably managed, the unaccounted-for gas only amounting to between 10 and 11 per cent.; and having regard to the fact that one portion of the district is undermined, where the loss would be great, I think that in the town the loss is very slight indeed. I find from the accounts of the Company that the profit earned in excess amounts to upwards of £1000, and this is produced by a very moderate price for gas; 3s. 4½d. per 1000 cubic feet being all they have obtained for the quantity sold. This is not the price charged, but the whole sum they have received, subject to discount, and including the public lights. The Company have power to charge 5s. per 1000 feet, which shows that the profits are not produced by a high price, for they charge very much less than they are empowered to do by their Act. From 1863 to the present time the maximum dividends have been paid; and during the last five years they might not only have paid their maximum dividends, but might very easily have paid up those back dividends we are now going to claim. Apparently, however, they have preferred to give the town the benefit of the low price, and have refrained from charging the price they might have done; for, in fact, they have spent out of revenue, for capital purposes, money which they might have used to pay their back dividends. From all I can gather, the Directors appear to have been impressed with the notion that their duty was to give satisfaction to the town, and they have acted in this spirit to their own prejudice.

Mr. LITTLER: That is the usual course with gas directors, is it not?

Witness: My idea of a gas director is that he ought to consider his own shareholders.

Examination resumed: If the Company had not expended those amounts out of revenue, they ought to have raised more capital; but they have not done so. They have chosen rather to avoid applying to Parliament, by finding the money out of their surplus revenue. During the past four years there has been expended upon maintenance nearly £4000, a portion of which ought, no doubt, to have been added to capital. My calculation is that 6d. per 1000 cubic feet sold should represent the

fair sum to be spent upon maintenance; but I find there has been spent an additional 4d. or 5d., which, in my judgment, ought not to have been spent for any such purpose. If the Company had dealt with the capital and revenue in the proper form, they would have had a much larger claim to make on the Corporation. By the Provisional Order of 1877 the money to be raised for further capital was made subject to the auction clauses, and I find that £976 accrued by way of premium, and was put into capital, receiving no dividend.

Mr. MICHAEL: Looking at the sum which works out at £15,800, with a dividend of 10 per cent., which amounts to £1580; and £4200 at 7½ per cent., which is £315; and £6000 at 7 per cent., which is £420, do you find that the total amount divisible among the Shareholders is £2315?

Witness: Yes; dividend on share capital; and looking at the history of the past, I believe this income is as secure as if the money were invested in Consols.

Examination continued: I advised the Company to pay the back dividends, but they had some scruples about the matter, and preferred to come here with their claim for them.

Mr. MICHAEL: Taking the £2315, and supposing you were obliged to give a sum in gross, what multiplier would you say ought to be used to represent the present value?

Witness: I should say 27 years, owing to the altered value of money. I consider, having stated that the dividends in this undertaking are as well secured as any money can be, the Shareholders are entitled to such a sum as will provide them with first-class securities. I do not know any first-class security that can be bought now to pay more than 3½ or 3¾ per cent., and therefore I take 27 years, because I think I am entitled to ask the Arbitrators to pay the gentlemen who are giving up their interest in the undertaking such a sum as will enable them to purchase first-class securities in its stead.

Besides the capital receiving 10 per cent., 7½ per cent., and 7 per cent., there was power to borrow money—which has been exercised in full by the Company—and a power, by the incorporation of the Companies' Clauses Act, to convert that money into capital. Taking this at the ordinary rate, what does it work out at?—It works out at £7087. In my original estimate I made the amount £8208; but Mr. Michael advised me that I was wrong in capitalizing the last £1500 borrowed.

Examination continued: I take the stock-in-trade which existed on June 30, 1880, at £1216 from the figures furnished by Mr. Lass. I think it is a fair assumption that the sum of £1500 will be required for expenses of winding up the concern.

Mr. MICHAEL: I have struck out £1000 for compensation to Directors and officers, which you put in.

Witness: Yes; and I am glad to hear it said that the Corporation will, as far as possible, remember the servants of the Company, and retain them in their employment.

If they are worth being retained?—Yes. Then I shall make another deduction of £1000.

That being the case, what does the total sum you claim amount to?—£76,692; and in my judgment it is a fair sum for the Company to receive for their undertaking.

The UMPIRE: Could you give us the details of the £7087?

Witness: Yes. I first take £4000 at 10 per cent., which is £400; then £1000 at 7½ per cent., which is £75. I then take the £5000—that is the 4 per cent., and the £1000 at 4½ per cent., at which it is now borrowed, which amounts to £212 10s. I take one from the other, and this leaves £263 10s., which I multiply by 27 years' purchase, and it comes out at £7087.

Mr. STEVENSON: Suppose the Company pay only 4 instead of 4½ per cent. interest on the £4000, that makes a slight difference?

Witness: Yes; it makes a little difference.

Mr. MICHAEL: You have taken the whole at 4½ per cent., whereas a large proportion of it is not, because £5250 is borrowed at 4 per cent. It may be taken in another way, which will save the calculation. The theory is that this money is paid out of the pockets of the Shareholders. If you take it at this rate, and subtract the money from it, that seems to show what it ought to be, and is the shortest way of doing it?

Witness: Yes; I answered the Umpire by explaining how I arrived at the figures.

Mr. SPICE: I do not quite follow this. What do you reduce the £8208 to? Witness: £7087. I had originally taken it as the right of the Company to turn the last £1500 of borrowed money into share capital; but Mr. Michael tells me I am wrong, and consequently I have to make this deduction, and the right to convert the £1500 being deducted from my £8208 brings me down to the sum I have mentioned—£7087.

Mr. MICHAEL: Then you have stock-in-trade £1216, and the cost of winding up £1500?

Witness: Yes. I have struck out the £1000 for compensation to Directors, &c., and taking off £1113 from £77,806 brings me to £76,693, and then I take another £1000 off.

Mr. STEVENSON: Ought it not to be £75,685?

Mr. MICHAEL said the latter amount was correct.

The following valuation by Mr. Penny of the undertaking of the Newcastle-under-Lyme Gas Company was handed in during the course of his examination:—

Share capital fully paid up—	
£15,800, carrying dividend at 10 per cent.	£1,580
4,200 " " 7½ " "	315
6,000 " " 7 " "	420
	£2,315

which is the amount of the statutory dividends.

The above I capitalize at 27 years' purchase, thus—£2315 by 27	£62,505
To this I add the amount of back dividends not yet paid to the Shareholders	3,377
For the right to convert borrowed money (£6500) into share capital under the Companies' Clauses Act, 1845, sec. 56, the difference between statutory dividends and interest now paid at 4½ per cent., amounting to £273, which, multiplied by 27 years' purchase, amounts to £7371	7,087
Stock-in-trade at June 30, 1880	1,216
Expenses of winding up	1,500
	£75,685

Cross-examined by Mr. LITTLER: I think the Company are entitled to all the compensation they claim, plus whatever expenses they may be put to in these proceedings. I should not think the stock-in-trade has been purchased out of capital. By "stock-in-trade" I mean chandeliers, pipes, fittings, meters unfixed, tubes, and many other things, which in this case cannot have been purchased out of capital, because all of it has been spent upon structural works. In the first instance it is probable that these things might have been paid for out of capital; but that time has long since passed away, because there is proof in this case that the capital expenditure has been greater than the capital raised. I have no evidence that the Company began the chandelier business early in their career; it might have been commenced at a recent period. In fact, I do not know what the stock consists of, but I take it from the Accountant that there is

a certain quantity which gas companies, in making a transfer, are usually paid for. Whether I should class an unset retort as plant would depend upon circumstances. If a company had plenty of capital, an unset retort would be a store. It is not a thing that should be paid for out of capital.

Mr. LITTLER: Why not? It depends upon whether it is an additional one or a substituted one.

Witness: Yes; but the Company's works have been filled up for a long time, and any retorts they may have in store now would be for replacing others.

Can you lay your finger on an item, and say specifically whether it has originally come out of capital or revenue?—I cannot; but I know that after an arbitration is over there is usually a valuation made of these things, and the company are paid for them, because they have to pay the tradesmen who supply them. They may owe for all of them.

Then if a company are in debt they are better off than when they are not?—That is the point I think I am justified in taking. You would not take this concern loaded with a couple of thousand pounds of debt.

Are these things paid for in the present instance?—I do not know whether they are or not; but I am assuming that the Company will not be asked to leave as a legacy to the purchasers any debt that may be represented by these very things, and therefore I say it is fair they should be paid for the stock, and left to pay their creditors what they owe them.

Mr. MICHAEL: There is one limitation you have not put in—viz., that the bond debt goes over with the concern, and is a liability which rests upon you.

Mr. LITTLER: That is one thing which puzzles me—why, on the one hand, we are to assume that the bond debt is converted, and on the other to take it.

Mr. MICHAEL: That is easily explained. Our theory is that we have paid the whole, and taken it up in shares, and we have deducted this from our account. We cannot have it both ways.

Mr. LITTLER: That is purely theory.

Cross-examination resumed: At the present moment we are paying interest upon our bond debt. A great portion of it is due, and the other is becoming due; we could not convert it until it became due, which will be in about six months.

Mr. LITTLER: We will take the back dividends next. I see you put down £3377 for this item on the assumption that you would be able to increase the price of gas without complaint on the part of the consumers?

Witness: No, I do not. I say it is one of the powers which the Company have, and which they might exercise if they thought proper.

Cross-examination continued: I know the price of gas in some of the neighbouring towns. In Burslem it is 3s. 6d. per 1000 feet. In Longton, Stoke, and Stafford it is also 3s. 6d. per 1000 feet; and in others 3s. 6d. to 8s. 8d. per 1000 feet.

Mr. STEVENSON said that in the Hanley case last session they had all this evidence *ad nauseam*.

Mr. LITTLER said they must have it in the present arbitration as a matter of fact. (To witness:) Then you think, practically, that the Directors of this Company are likely to raise the price of gas?

Witness: I do not think there is the least necessity for doing so, because I believe they could pay all their back dividends and do all they are doing out of the price they are now charging. It would only be necessary for them to refrain from using their surplus profits to supplement capital, and to raise the proper sum they require for their works, to enable them to pay their back dividends, convert their borrowed money, and find sufficient revenue to pay it all.

Do you think a concern would present itself well before Parliament after owning that they had abstained from paying back dividends for 17 years, and had reduced the price of gas in 1879?—If a Company exercise their parliamentary rights and powers, I do not think they would look bad before Parliament. They are entitled, under their Act, to back dividends, and also to convert their capital.

I want to know your view with regard to the management of this Company by the Directors?—My answer might, perhaps, not be agreeable to them.

Mr. MICHAEL: I do not think the witness is called upon to suggest motives to the Directors.

Witness: I have stated that the Directors appear to have been actuated by motives for the public good, rather than for the good of the Shareholders.

Mr. LITTLER: I have a note here—I do not know whether it is right or not—that they might have chosen to avoid applying to Parliament. Very likely this was the explanation, that they did not like to go?

Witness: That was only one of the reasons. They applied for a Provisional Order, and asked for only £6000, which is an unheard-of thing in a company. I said to them, "How on earth is it that when you go to Parliament you only ask for such a small sum?"

Mr. LITTLER: I can only explain it by your theory that they did not like Parliament.

Mr. MICHAEL: I think the answer is very obvious. They did not make any opposition to the Corporation taking their undertaking, and they seemed to have gone to Parliament for sufficient capital to last them over three years.

Mr. LITTLER: That is a very remarkable explanation, because we find they have not been to Parliament since 1865.

Witness: There is another answer, and it is that they were not properly advised from an engineering point of view.

You think that the Corporation ought to pay for the Company not being properly advised?—No; I do not say so. They are actually paying less by reason of not being properly advised—not more.

You say that if they had taken your advice they would not have come here; which seems to indicate that you would not get your back dividends?—I did not say so; I think they were ill-advised in not paying their back dividends, and so not making it a question here at all.

You say they have not paid lately more than 6d. per 1000 cubic feet in maintenance. Is it not a fact that within the last four or five years they have paid a great deal more than they did before?—My information does not go beyond five years. I am confined, in this sense, within the limits of Mr. Lass's examination.

Cross-examination continued: The Company might have had to borrow money from their bankers to pay their dividend; but this is a very common thing, and I should not attach importance to it. The Directors ought to have managed always to have a fair sum of money in their hands, but they have not chosen to do so; they have worked up everything very close, so as to enable them to reduce the price of gas, and make revenue do the work of capital. The works are like many others which were commenced many years ago—they have been continually adapted to present requirements. They are not architecturally charming, but are perfectly suitable for the work to be done. They might be called "patchwork" in the sense that additions have been made from time to time. I do, however, say that the offices and stores are cramped and insufficient.

Mr. LITTLER: We will now take the retort stacks—could they be extended, when you arrive at the end of your reserve, without having a re-arrangement?

Witness: I have not gone into this, because I contend that there is

already a reserve for the next three years, and those who purchase and come after must really take the responsibility. If the increase of business is so great as to make it necessary to re-arrange, the increased profits will pay for whatever sum may be necessary to be expended upon it.

If the consumption increases, they are bound to provide for it, and cannot help themselves; and, therefore, the Corporation are buying a certain expenditure at the end of three years?—I do not know that they are. There is a great deal of gas yet to be got out of the works. Three years is the very lowest period, in my judgment, that they would even be called upon to consider the question. It is possible there may be something required to be done, but not necessarily. If there is a fancy for tacking on more buildings and retorts, there may be a difficulty, but there is plenty of ground to erect them somewhere else. If the works have to be re-arranged, there is a piece of ground here [pointing it out on a plan] where the purifiers are, which might be made available for retorts, and the purifiers removed. This would cost money, but the profits from the increased business would pay for all the outlay. The actual number of retorts fixed is 83, but the greatest number in use during the present winter has been 54, leaving a surplus of 19 retorts.

Mr. LITTLE: I am told that the greatest make in 1879 required 62 retorts?

Witness: I take it from the Manager that the greatest number of retorts he has had in action during the past winter is 54, and that the greatest daily make was about 260,000 cubic feet, or something like it.

This was lower than in 1879, because in that year it was 312,000 cubic feet, which would take 62 retorts, would it not?—No; the Company get 5000 feet per retort; they are very large ones.

Mr. LITTLE: Our figures are 312,000 cubic feet with 62 retorts.

Mr. STEVENSON: My return from the same party is 307,000 cubic feet, so that the figures do not agree at all.

Mr. LITTLE: If there was a make of 312,000 cubic feet it would require 62 retorts.

Witness: These retorts are 27 in. by 15 in., and are quite competent to make 5000 cubic feet of gas per mouthpiece.

You are dealing with the year 1880. Are you aware that the greatest make in that year was less than in 1879?—It may be so, but I took the matter as it was during the last winter, and I also took the average of the three largest days' make, thinking this was the best way.

You took 10 per cent. as sufficient in case of accident?—That is what is ordinarily taken.

Mr. SPICE: You say that 312,000 cubic feet is more than 62 retorts are capable of making?

Witness: I took it from the carbonizing book. (To Mr. Winstanley, the Manager): Did you not give me these figures?

Mr. Winstanley: I did.

Mr. MICHAEL: Was there a larger amount made in 1879, at Christmas-time, than in 1880?

Mr. Winstanley: Yes.

Mr. MICHAEL: What was the largest amount made per day in 1879?

Mr. Winstanley: 312,000 cubic feet.

Mr. LITTLE: That is the explanation. Our figure is taken from 1879 and Mr. Penny's from 1880; so doubtless he is right.

Mr. MICHAEL: At 5000 cubic feet per retort this would be 62 retorts, and 10 per cent. on this would be 68, but we will call it 69. Then how many were there?

Witness: 83 retorts.

Mr. MICHAEL: Then there are 14 additional retorts which are not required?

Witness: 14 surplus retorts.

Mr. LITTLE: Is there also a corresponding additional condensing, washing, and scrubbing power?

Witness: I found two condensers there, one being in use, and the other not required. I have not taken anything for extra condensing power, because I consider the purifiers are hardly up to the mark, so that I have balanced one against the other. As regards the scrubbers, I admit they are deficient. I took the trouble to go into the question of the ammoniacal liquor made, and also its strength, and found that with the scrubber and washer they have in use they can sell 15 gallons of 13-oz. liquor for every ton of coal they carbonize; therefore there would not be very much wrong in that. They produce extremely good results with the greatest ease.

By Mr. STEVENSON: That is according to the present make.

Mr. LITTLE: Their administration is better than their theoretical capacity?

Witness: The scrubber and washer might be a little larger, but without any difficulty they produce excellent results.

If you had all the additional retorts in use up to within 10 per cent. limit—if you had 74 or 75 retorts in use—none of this apparatus would be so good?—Yes, it would.

Theoretically, it is bad now?—I do not say so; I say it might be larger, but it is perfectly equal to all the work it has to do.

I am not asking with reference to 54 retorts, but as to 74 or 75?—Yes; I say, speaking from knowledge, that it would.

Do you mean to say, if you were surprised to find it doing the work it does now, that it would do something very close on a third or a quarter more?—No; I was not surprised. I thought it probable that such a question might be put, and therefore I fortified myself by a thorough acquaintance with what the Company were doing, and how they were doing it; I looked at all the weak points as well as the strong ones.

Cross-examination continued: I do not know the make of ammoniacal liquor at Stafford; but I know there are many works where a great deal more, but weaker, liquor is made. I consider the exhausters and engines capable of doing all the work I have stated, in excess of what they now produce. There are two station meters. If I were asked to plan new works to commence with 1 million cubic feet per day, I should very likely place the things in a more consecutive form than they are; but it is only a question of having the pipes meandering about a little; the work is done just as well. The buildings are in a good state of repair. The retort-house is a very strong and substantial building, so much so that the last addition to it cost a larger sum than I valued it at. There were natural difficulties in the way with reference to foundations, and so on. There is a small group of dirty buildings which ought to have been pulled down long ago, but I have not valued them at anything; so that nothing can be taken off for them. There is a siding from the railway into the retort-house, which is only 19 feet high, but sufficiently high for the purpose.

Mr. LITTLE said he was told it was only 17 feet high.

Mr. MICHAEL said it might be taken at 17 feet, as it did not make much difference.

Cross-examination resumed: This is the first arbitration at which it has occurred to me to ask for 27 years' purchase, but a beginning must be made at some time. I have heard that the works were originally built at Rye Bank, and afterwards removed, but this does not come into my valuation.

Mr. LITTLE: It comes into what you found the Company had spent?

Witness: I dare say it does; but I assume the Company have all

through been carrying on the same principle of spending a portion of their earnings out of the capital expenditure.

You know the South Metropolitan Gas Company. That is a good investment, is it not?—Yes.

Mr. MICHAEL: It depends upon what you purchase at.

Mr. STEVENSON: As a security, I suppose you mean?

Mr. LITTLE: Yes. As gas securities go, it is as good an investment as can be obtained?

Witness: Yes. Their stock last week fetched £200 odd.

Was it sold to pay 5½ per cent. on the purchase?—Taking the extra dividend, it may be so.

Supposing a friend of yours had Newcastle-under-Lyme gas shares, you would not think he was unwise to exchange them for South Metropolitan shares?—I believe many of the Shareholders in the Newcastle-under-Lyme Gas Company would laugh to scorn the South Metropolitan or any other Gas Company.

But take an average purchase in the market—a man who wanted to raise money on the stock at his banker's, or wanted to sell—do you mean to say the South Metropolitan is not the more marketable security?—No; but that is not the point in the case. These people have put their money into the concern because it is a local one, and they know all about it, and the people who are managing it.

Is it not a fact that in 1877 your shares were sold by auction to pay 6 per cent.? I do not know; but that is not anything like a test. The shares, I am told, have been sold at £21.

Mr. STEVENSON: They were sold with a benefit *in futuro*, and so are the South Metropolitan.

Mr. LITTLE: I suppose you would rather have a certain 4 per cent. than a 5 per cent. *in futuro*?

Witness: I do not know that I would. If I had a concern which I was sure would yield me a dividend in perpetuity, no matter what you call it, I would not change under any circumstances. There is only one point with reference to this—I admit that when I wanted to sell I should find out it was not so valuable.

Is not the value of a gas share what it will fetch in the market?—Not to the owner of it, because he would say, "I do not want to sell." If I took £7000 on to the Stock Exchange, and said I wanted to buy South Metropolitan shares, I believe I should have to pay a great deal more than the market price for them.

Surely the value of everything is what it can be sold for, is it not?—I have given the value of this concern, and we are trying to sell it for 27 years' purchase.

You are asking what you will pardon me for calling a fancy price. Can you tell me where, in an arbitration, you have obtained even 25 years' purchase for a gas company's undertaking?—I am not able to say; but this is a case where you desire something, and come and take it away from people who do not want to sell it. They say, "If we take the money out of this concern, we want to know what we are to put it into."

But do you not know that the Company allowed the Corporation's Act of Parliament to pass without opposing it?—They acted without knowledge.

Mr. MICHAEL: Did they agree?

Witness: I do not know; they stood by, as the Stafford people did.

Cross-examination resumed: I believe the Shareholders hardly knew the meaning of the clauses in the Act, or what the operation of it would be; but some of them know better now. I was engaged in the Stafford case, in which there were back dividends remaining unpaid, but I am not quite sure whether they were claimed.

Mr. LITTLE: I am told they were not.

Mr. MICHAEL said he was engaged in the case, and they were claimed and allowed. They obtained 29 years' purchase.

Mr. LITTLE: There is £35,000 for structural value. This, of course, must have been for new works. Do you mean to say these works are worth as much now as they were 35 years ago?

Witness: They are, as a going concern. I consider 6d. per 1000 cubic feet ought to be spent on these works to maintain and keep them up; and if this is spent, they will be in as good a condition 30 years hence as they are now.

Upon what principle do you put two years' extra purchase—27 instead of 25 years? Why not take Consols price of 33 years?—I thought that would be unfair, because it would not fetch Consols price in the market. If, however, you think I have been too moderate, I am quite willing that the Arbitrators should take your view of it.

Cross-examination continued: The 6d. per 1000 cubic feet I mentioned includes renewals as well as maintenance. Supposing the retort-house fell down, I consider that if this sum were put away, it would enable the Company to build it again.

Re-examined by Mr. MICHAEL: In my estimate I have not made any allowance for any prospective increase. This will become the valuable property of the purchaser without a shilling being paid for it. I have taken as the basis of my valuation the revenue attachable to the capital and the profit derivable from it as existing at the present time. I have found the profit is increasing year by year.

Mr. MICHAEL: When you take three years as being possibly the time at which further extensions will be required, and the present works will be exhausted, have you charged anything for the additional amount of revenue that would be derivable from it?

Witness: Not a shilling.

Your basis is that of to-day, and not that of some three or four years hence?—It is the basis of to-day that the works are capable of producing at least 25 per cent. more gas, with a proper proportion of more profit, without the expenditure of further capital.

Taking the revenue as attachable to the capital expended, do you find this would be sufficient to pay not only the maximum dividends, but also the dividends attachable to the borrowed money if it were converted into capital, and also furnish a sufficient sum to pay the £3000 odd which remains due as back dividends?—I have just made this short calculation—that adding to the £2315 the present excess of £1000, it gives £3315 available revenue.

And this is handed over as profit year by year to the Corporation?—Yes. If the whole sum I am asking for is given by the Arbitrators, there will still be something like £500 a year profit available for any purpose the Corporation may choose.

Had we been enabled to ask for 25 years' purchase on the whole of the profit made, it would have amounted, I think, to over £80,000?—Yes; it certainly would. £77,000 at 4 per cent. would be £3080, and if this amount is taken from £3315 there is a surplus left; but my estimate has been reduced a little, so that there would be a *plus* sum in addition. Between one and the other there is a difference of £400 or £500, if every shilling is given that I ask for.

Supposing the Corporation are called upon to expend, say, £5000, or £10,000 even, without any increase of business—which, of course, must be assumed, or there would be no extension required—there would still be sufficient to pay the interest out of profits?—Certainly, even after they have paid the interest on the borrowed money.

So that, in whatever way you view it, there must be a transfer to the

Corporation of a valuable consideration for which they do not pay anything?—There must be, and so it was in the Stafford case, where the Corporation paid all their liabilities on borrowed money, and gave in one year, and still continue so to give £1500 to the rates.

You have been asked whether there are any cases of transfer in which 25 years' purchase has been assented to. Are there not a great many cases in which the very primary basis has been 25 years?—Yes; with very large additions.

Mr. UNDERHILL: You said 27 years.

Mr. MICHAEL: I acknowledge at once that this is the first time 27 years' purchase has been asked for, but this 27 years includes all other considerations for which nothing has been charged, and which might have been applied for if 25 years had been taken. (To witness:) If you had taken 25 years and all the other matters, would not the amount arrived at have come to quite as much as it does for the 27 years which you have now taken?

Witness: Yes; quite as much, or more.

The UMPIRE: With regard to the £1200 for the stock, supposing, in the ordinary course of business, the Company had sold this stock before the transfer took place, what would they have done with the money?

Witness: It would have gone into the general working of the concern.

They could not have divided it, could they?—They could not, if the concern was kept as a going one in their hands. It is a question of £1200 belonging to somebody, and the persons in possession have a better title to it than those who have nothing to do with it.

Mr. MICHAEL: I may as well say it is quite clear that the whole these people could have as a going concern is their maximum dividend, and this might have gone to aid the £2000 or £3000 that will be handed over in cash. There is a surplus of cash of this amount upon the basis of the accounts—keeping out of view the £1200—which will go to the Corporation, and must be handed over by the Company. But supposing the Company had ceased to supply chandeliers, had not required any meters, and had nothing else external to the work of a gas company, *quid* gas company, but carried on as a trading concern, they could not have divided this money as a bonus amongst the Shareholders.

Mr. LITTLER said they might have paid back dividends.

Mr. MICHAEL said they might have done so with this amount, or any other sum in their hands, and whatever surplus there might be would go to make up any deficiency.

Mr. LITTLER: And *pro tanto* reduce the claim for back dividends.

Mr. MICHAEL: Just so. At the same time, if we had paid the £2000 or £3000 we have in hand, instead of having handed it over, this would still have reduced our claim, because we cannot eat the cake and have it too. According to Mr. Lass's statement there will be a sum of between £2000 and £3000 to be handed over to the Corporation in hard cash, as representing the surplus which might have gone towards paying back dividends.

Mr. STEVENSON: And this is partly your reason for asking for 27 years' purchase.

Mr. LITTLER said he could not quite follow Mr. Michael with reference to the £2500.

Mr. MICHAEL said the Corporation were bound, according to their Act, to take over all the debts and liabilities of the Company. The usual way of proceeding was to pay the whole of the debts, and hand over the surplus to the purchaser. In the present case the Corporation would have the profit accruing from June 30, 1880, but there were a great many debts owing by and to the Company. These would have to be discharged on the one hand and received on the other, and the surplus—which he said was between £2000 and £3000—would be handed over in hard cash.

Mr. LITTLER: Of course, if it turns out to be so; but suppose it turns out the other way?

Mr. MICHAEL: If you look at the amounts you will see that it is so.

Mr. UNDERHILL remarked that there were the bad debts.

Mr. MICHAEL said bad debts in a gas company were practically *nil*. In the present case the bad debts were simply £44 a year.

Mr. LITTLER said he saw the balance was overdrawn.

Mr. MICHAEL said this was the sum that was due, and it would come in again.

Mr. STEVENSON: There is a balance standing to profit and loss account amounting to £3617 1s. 4d.

Mr. MICHAEL said this was a property subject to the payment of debts and liabilities; and there was cash in hand amounting to £1570 10s. As to the capital account, there was an amount overdrawn, which was charged to and must be paid out of capital, of £2130 14s. 11d.; and there was an amount owing by sundry persons of £1917 12s. 5d.

Mr. LITTLER presumed this amount had been received by the present time.

Mr. MICHAEL: That is most likely the case.

Mr. LITTLER said if Mr. Michael would agree on the basis of the account presented by Mr. Lass—that, whatever happened, the £2500 was to be handed over in cash, or credited to the Corporation in the matter of the purchase—he was perfectly prepared to agree to it.

Mr. MICHAEL: That is what I have said.

Mr. LITTLER: Then instead of saying it is a sum to come to us, say it is a sum due to us, and I am content.

Mr. MICHAEL said his difficulty was that he could not say how much of the £1917 12s. 5d. had been received. He was speaking *nunc pro tunc*, and supposed himself to be at June 30 or July 1, 1880. He should be bound to show vouchers that he had or had not received this amount, and that, on the other hand, he had paid £2972 8s. 5d., and the balance remaining on the account the Company would be bound to hand over to the Corporation.

Some further discussion having ensued,

Mr. MICHAEL said his learned friend did not appear to have followed his argument, and therefore he would recapitulate. On the basis of the account, the Company were bound to hand over, on the award of the Arbitrator, a certain sum. He would give an *x* sum, which would exclude any property derivable upon this account, and when the amount was calculated, whatever the balance was, it would have to be handed over.

Mr. LITTLER: I quite followed it, then.

Mr. MICHAEL: But it will be subject to two things—first, to the working account from June 30 to December, and anything arising from the fact that there was still due and owing to the Company a quarter's account of gas which cannot have been received up to Dec. 30.

Mr. LITTLER: How can that have anything to do with the July account? This is what I cannot understand.

Mr. STEVENSON: The assumed rentals supposed to be due on June 30 could not have been received when this account was made up, but the amount of rental is included.

Mr. LITTLER: All we say is put in a fixed amount, and what comes in after June 30 has nothing to do with it, because we are paying interest upon it.

Mr. MICHAEL: I say at once we have to settle with you on the basis of this account.

Mr. LITTLER: No; you have to settle this account, and not upon the basis of it. There is £2500 due, and if you give us this amount on account,

the Corporation will take it. It may, however, be adjusted to £1200 instead of £2500, and the Arbitrators may have given their award saying it was £2500.

Mr. MICHAEL: Again you have not followed me. I do not propose to alter the £2130 cash overdrawn, nor the £3697 balance of profit and loss account. All I say is that the amount which may possibly be altered is the amount owing to sundry persons. Supposing of this £1917 12s. 5d. we receive £50 less, you could not ask us, if we could not recover more than £1867 12s. 5d., to pay you the entire amount.

Mr. LITTLER: Yes, I could, because we have accepted Mr. Lass as Arbitrator in this matter, and he finds that amount due. If people have not paid within the discount time, you take the benefit of it. We cannot calculate, and I will not argue before an Arbitrator upon an unknown quantity. I must have a proved quantity.

Mr. MICHAEL: It does not enter into our calculation at all; it is an account external to the award.

Mr. LITTLER inquired why, if this was the case, it was introduced into the arbitration proceedings.

Mr. MICHAEL said it was put in as one of the stones with which he wanted to break the ice to show that the Company had handed over a sum of between £2000 and £3000, which, if the Directors had been wise in their generation, they would have allocated to the payment of back dividends without troubling the Arbitrators at all. The Company might have claimed back dividends precisely the same if not a farthing of this balance had existed. They would not derive any advantage, but the Corporation would.

Mr. LITTLER said it was an indirect claim.

Mr. MICHAEL said it was no claim at all, but was a sum that would be handed over.

The further proceedings were then adjourned till the following day.

(To be continued.)

SUGGESTIONS FOR PREVENTING LONDON SMOKE, AND MAKING IT COMMERCIALY AVAILABLE.

By Mr. W. D. SCOTT-MONCRIEFF, C.E., F.R.S.S.A.

[A Paper read before the Society of Arts, on Wednesday, Jan. 26, 1881.]

It is sometimes difficult to account for sudden movements of popular opinion. When once they begin, an element of momentum seems to take the place of the previous inertia, and the new form of social force appears frequently to be directly proportionate to the one which preceded it. We are now in the midst of one of these movements of opinion that is not difficult to account for. The interest which at present attaches to the question of how best to obtain the blessings of an uncontaminated atmosphere has arisen out of a state of things with regard to smoke and fog that is recognized as dangerous to the whole community. The work of relating the means to the end has commenced in earnest, and there is every likelihood that, before long, the public will be put in possession of information as to how the problem is most likely to be solved.

The present position of the question renders it far from easy to know how best to deal with it before a scientific audience who are well informed. Materials which were important contributions a few months ago, have already been assimilated, and no longer lend themselves to the further elucidation of the subject. I trust, therefore, I may be permitted to confine myself to the special scheme which I propose, and I need not say with what pleasure it is that I do so, when I tell you that although it has occupied my thoughts for years, this is the first occasion upon which I have addressed an audience on the subject.

I wish first of all to attempt to make clear to you in a few words what is the present aspect of the question as regards the methods and apparatus employed.

The classification of the methods may be arranged as follows:—1. Burning bituminous coal at a single operation, by exposing it to the heat of the fuel previously ignited. It is unnecessary to say that this method embraces nearly the whole of the domestic consumption of Great Britain, and a great part of the commercial consumption as well. 2. Separating the gas from a cheap quality of coal, heating it in an apparatus known as a regenerator, and using it without the solid residue. 3. Separating the gas from the coal at a comparatively low temperature, adding the partly caked residue of a previous charge to the fuel in the furnace, and passing the gas through the burning mass. 4. Using coke as a basis, and passing gas through the fuel as a means of supporting its combustion, both coke and gas having been obtained from a gas company. 5. Using fuel from which a certain proportion of gas has been extracted, which is the special subject of the present paper.

As regards the apparatus, it naturally follows the classification of methods or systems, and would far exceed the compass of an ordinary lecture to describe in any detail. It will be well, however, for me to say something of the more familiar appliances which are in every-day use, and to remind you of certain fundamental principles that are common to the whole of them. As you are all well aware, the combustion of bituminous coal depends upon the combination of certain gases, and of carbon and oxygen at a high temperature. It is also familiar to you all, that the oxygen necessary for this combustion is obtained from the atmosphere we live in. One necessary feature of the process is the creation of a draught, which is obtained, as you all are aware, by the action of a heated column of air in a shaft or chimney. But this invariable accompaniment of combustion is, in the nature of things, associated with a movement, not only of the air, but of the gaseous elements of the fuel, and it is almost inconceivable that the necessary quantities of oxygen can be obtained without this element of rapid movement. The question comes to be, then, whether or not the mean velocity of the air and gases necessary to supply the oxygen is compatible with the time that must elapse in order to obtain the necessary chemical combinations at the point of sufficient temperatures, which is in the body of the fire itself.

Now in the case of freshly-added bituminous fuel placed on the top of a burning mass, it is quite certain that the conditions of a draught are inconsistent with complete combustion; and this brings us to a consideration whether or not it is possible to consume bituminous coal perfectly at a single operation, and leads to doubt as to the possibility of using the first method successfully in any apparatus, however ingeniously it may be devised for the purpose. Certain proposed processes are sometimes so inconsistent with the operation of invariable natural laws, that a conclusion on the subject of their failure has the certainty of a complete induction. If an apparatus depended for its success on the tendency of water to run up hill, as in the case of many of our London house drains, we would be safe to predict its failure. The matter, as regards the complete combustion of fuel at one operation, is not quite in this elementary category; but, to my mind, it is very near to being so.

I am sure many present will sympathize with me in the great difficulty of making clear to others matters that do not contain within themselves all the elements of a complete induction. The induction may be so far complete, as regards oneself, that the mind is forced to a definite conclusion; but the discrepancies may, nevertheless, be the very elements which go to form a popular belief in another direction. I do not know of any better way of illustrating my meaning than referring you to several

well-known fields of invention which, at one time, seemed to be altogether open, but which have become gradually closed with the advance of scientific knowledge. For instance, in the early days of steam locomotion there must have been many persons who thought it presumption on the part of certain engineers to oppose themselves to the principle of the atmospheric railway. It must have appeared to them that it was wrong to predict the failure of science in one direction whilst anticipating its triumphs in another. And yet I have no doubt that men did appreciate at that time what was practically a complete induction in their own minds, however difficult it may have been to convey their arguments conclusively to others. Now I do not know of any problem which, at first sight, gives a greater promise of a simple solution than the burning of an ordinary piece of household coal. The elements of combustion not only seem available, but, up to a certain point, lend themselves readily to a partial solution of the difficulty. Nothing is more easy than to get a fire to burn in an ordinary grate, and nothing is more difficult than to get it to burn in such a way that no smoke shall escape up the chimney. To predict the failure of all appliances for all time coming to attain this object is, therefore, on the face of it, an apparently rash anticipation, and yet there is nothing in the scientific aspect of the problem that suggests any other conclusion to my mind. I am not so much inclined to this opinion because of arguments that present themselves readily as the result of experiments on a small scale, but more from those which may be gathered from the experience of persons engaged in the consumption of fuel on a large scale, where the opportunities for carrying out complete combustion are exceptionally favourable.

Taking the iron trade as a typical example, I may say that all experience in the direction of cleanliness and economy is tending rapidly towards a total abandonment of the attempt to burn bituminous coal at one operation. The appliance which perhaps presents the greatest exception to this rule is the blast furnace. The vast scale upon which the consumption of fuel is carried on in this apparatus would of itself place it in an exceptional position as affording peculiar facilities for obtaining an intense and constant temperature. Even here, however, the operation is becoming, to a great extent, divided, and the utilization of the waste gases for heating the air stores is of itself a proof that, even with all its peculiar advantages, the hot blast is unable to carry out complete combustion at one operation.

As regards other departments of the iron industry, the attempt to consume bituminous coal at a single operation is being altogether abandoned. The labours of Dr. Siemens, as embodied in his regenerative furnace, have gone far to bring about a change in the direction of scientific principles; and Mr. Price's furnaces, as now used at Woolwich Arsenal, are also an illustration of improvement that has taken place in the same direction. I shall have occasion to speak of these appliances presently. Now, without saying that arguments drawn from such channels are altogether conclusive, I must say that, along with other considerations, they go far towards the formation of an opinion that in cases where the scale of the consumption is smaller, success will be still more impossible of attainment. As regards the scale of appliances that come under the head of domestic apparatus, I believe that the problem of consuming ordinary bituminous coal at one operation will ultimately be abandoned altogether, but it is beyond all likelihood that it will ever be satisfactorily solved. A few years ago, this opinion would have been looked upon as unreasonable. I have long been convinced that it is a sound one, and this belief is supported, not only by several eminent authorities, among whom I may number Dr. Siemens, but also by the whole tendency of the practical improvements which have been carried out in our great national industries. I believe it is capable of a theoretical proof; but even if this were wanting, I think I am justified in pointing to the present condition of our large towns as a demonstration of the failure of existing appliances. When the vast amount of invention which has been expended upon the problem of the complete combustion of bituminous coal at one operation is taken into account, and when it is considered that not one appliance has ever been altogether successful, I think there is a strong *prima facie* case made out against the practicability of the proposal. If I may be allowed to put the argument as nearly as possible in the form of a syllogism with regard for domestic hearths, I might say all bituminous coal requires a high temperature steadily maintained for its complete combustion; domestic fires are incapable of producing a high temperature steadily maintained; therefore domestic fires are unfit for the complete combustion of bituminous coal. To hold an opposite opinion with regard to the element of temperature is inconsistent with the facts, and to insist on the high temperature being continually maintained is to deprive every citizen of his right to allow his fire to go down when the heat he obtains from it has become excessive. I might quote many authorities in support of these opinions. Even in the case of steam-boilers, where skilled labour is available, and where a high temperature, evenly maintained, is an important point, Dr. Angus Smith shows clearly that it is heat that is required for the complete combustion of the fuel, and that the supply of air in sufficient quantities is comparatively easy. I will suppose the case of an absolutely perfect domestic appliance for the combustion of bituminous coal, and I will ask the inventor of it where the heat has to come from that is essential to the process, when the fire has been allowed to go almost out, and the housemaid adds fresh fuel.

So far, I have tried to put the matter before you as regards temperature, but a moment's consideration of the actual process of combustion will, I think, make it equally impossible to escape from the conclusion to which I have come, even as regards the supply of air itself. Burning coals depend for their incandescence upon the passage of air among their exposed surfaces. In an open brazier, it may pass in from all sides, and underneath as well. So far this is a most favourable condition, but as air passes through the burning mass the oxygen is consumed, and it is impossible to ensure that the air does not reach some parts of the fuel in an exhausted state. I have here a simple illustration of my meaning. This common paraffin lamp is so arranged that a current of air passes in close contact with the flame from the wick, and the oxygen is consumed in its passage. I will now suppose that this piece of bituminous coal which I place over the top of the funnel holds an analogous place to that which it might assume in the most ingeniously constructed stove imaginable; that is to say, some point at which the air, which has already passed through the fire, reaches it exhausted of its oxygen. The temperature of the lamp flame is sufficient to produce an escape of gas, and upon passing my hand over the funnel this is proved by the pungent smell of the gaseous products. Now you will find that although the gas is escaping, the conditions are altogether inconsistent with combustion of any kind whatever. Upon striking a match, and bringing it near the top of the funnel, you will see that it is instantly extinguished. I now take a piece of smokeless fuel, and place it, instead of the piece of coal, over the funnel. It goes without saying that although there is no more chance of combustion in the one case than there is in the other, still no smoke escapes, and, as far as the atmosphere is concerned, no harm is done.

I might multiply arguments indefinitely; but I must ask even the unbelieving to accept my conclusions, and simply point out that if they are right, the idea of adapting domestic hearths to the complete combustion

of ordinary bituminous coal may be abandoned at once and for ever. If smoke were like certain gases that burst into flame at a low temperature when they escape into the air, there might be some chance of obtaining a satisfactory result. But the fact that it does not ignite, even in contact with a red-hot piece of iron, shows how temperature, beyond the capacities of an ordinary hearth, is essential to its perfect consumption. I have here a list of the gases contained in ordinary coal:—

	Manchester Gas.	Gas as supplied to the Houses of Parliament.
Hydrogen	52.71	41.71
Marsh gas	31.03	41.88
Carbon monoxide	4.47	4.98
Olefines	11.19	8.72
Nitrogen	—	2.71
Carbon dioxide	0.58	—
	100.00	100.00

Now, some of these gases combine with oxygen much more slowly than others, so that some of them, in the case of an apparatus depending upon a draught (and I know of none in the nature of a domestic appliance that does not depend on a draught), would be half way up the chimney before the combination was complete.

If these conclusions are right, an immense amount of ground is cleared as regards the solution of the problem, because the knowledge of what will be successful is, in nine cases out of ten, arrived at by discovering what cannot be successful in the nature of things. The conclusion means, in other words, either that the use of ordinary bituminous coal must be abandoned altogether, or that some apparatus must be devised for domestic purposes similar, on a small scale, to those which have been introduced in our great industries, more especially those in the iron trade, to which I have already referred. This brings me to speak of the second and third methods, and I shall do so in a few words as possible. I do not see how these can possibly be carried out, for the simple reason that on the large scale skilled labour and the means of maintaining a constant high temperature are essential features of complete combustion, and neither can possibly be present with any certainty in the case of domestic fires. Dr. Siemens has hit upon an ingenious plan, by which he makes use of the operations of gas companies to divide up the process of combustion, it may be, miles away from the point of domestic use. This is the fourth method I referred to. By burning coke with gas-flames burning through it, he avoids the difficulties of separation as regards the consumer, and carries out a scientific system of combustion at the same time. I propose, however, instead of this, to use a modified condition of bituminous coal, and I will try to show the advantages of doing so. It might be presumption on my part to say that I am the discoverer of this sort of fuel, but may say I am, so far as I know, the first to bring it into public notice.

First, I may state that, with regard to anthracite coal, if the principle of smokeless fuel is once recognized and enforced, the stone coal will fight its way, and be of great service, not only as a heating agent, but as a wholesome source of competition as well. It is as a means of saving our smoke and improving our light that I propose the sixth method, and I shall go on to describe it.

About ten years ago I made a series of experiments, upon the separation of the process of combustion, which led me to think very highly of the class of fuel to which I refer. I placed a small D-retort in a common Cornish steam-boiler, and by lowering the position of the fire-bars, arranged an apparatus for the distillation of gas from the fuel in ordinary use, and after some time had elapsed I discharged the gaseous contents of the retort into the furnace. In this way I secured practically complete combustion by a separation of the fuel into its constituent parts of solid carbon and hydrocarbon products. The semi-coke that resulted from this short distillation was practically smokeless, and I have since discovered that treating it with water when hot, as in the case of coke, renders it still more smokeless. So far as I am aware, it is the most perfect fuel imaginable, as it has all the cheerfulness of ordinary coal, with none of the disadvantages arising from the creation of smoke.

I must now ask you to turn your attention to the present condition of London as regards its fuel, and to make an effort to realize how matters actually stand. Leaving out of question the coke which is consumed by the public, I must ask you to remember that there are about 4 million tons of coal consumed in London every year. You may conceive of this more readily as a solid cube, with a base of about 200 yards, built square upon all sides, to the height of the cross on St. Paul's Cathedral. This is what is burned for the purpose of obtaining heat, in addition to the surplus coke sold by the gas companies. Bearing this in mind, I must now ask you to try to realize another quantity—viz., about 2 million tons—used for the purpose of obtaining light. This would be represented by a cube about 140 yards at the base, built up to a height of 430 feet. All this vast quantity is passed through retorts, and, after a large amount of bad gas has been extracted from it, it is converted into cinders and coke. Now it has entirely escaped observation that the gigantic appliances necessary for treating the one heap of coals on a long extraction, with bad results, is capable of extracting a small quantity from both heaps of coals, on a short extraction, with good results both as regards gas and fuel. The fuel would be similar to that which resulted from the experiments I have referred to, the illuminating power of London gas would be approximately doubled, and the aniline dyes and ammonia, and other products of the process of distillation, must be doubled as well.

To those who may be ready to exclaim against the vast capital that will be required to carry out this operation, I will now show you how it is that no additional plant is necessary in order to obtain this result. We will begin by a familiar illustration. Supposing one of the smaller gas companies were to commence to-morrow to advertise and sell coal, from which only 3000 cubic feet of gas per ton had been extracted. The fuel must be cheap to the consumer at 23s. per ton, and thus, to start with, the company would recoup its outlay for coal, which we will suppose cost them on an average about 16s. per ton. But, in order to keep up its normal production of gas, so soon as a retort was discharged it would simply need to be charged again. In this manner gas would be coming away from the retort all day long, just as formerly, with a slight loss of time to be allowed for the additional frequency of the charging. As, however, the gas under the proposed arrangement comes off much more rapidly than under the existing system, the supply at the end of the 24 hours would be in excess of that which is obtained from the long extraction, and in this way less and not more plant would be necessary to give the same quantity in a given time. But instead of bad 12-candle gas they would have 20 or 24 candle gas to dispose of, with double the quantity of bye-products, to the good, in addition. What applies to the case of one small company would, of course, apply equally to the whole combined.

I have already trespassed on your time at considerable length, but as there are, no doubt, many here present who prefer an ounce of practice to a hundredweight of theory, I think it well to tell you that my scheme has already been carried out at Woolwich Arsenal, when all other methods had failed to supply the establishment with sufficient light. When I say

my scheme, I say so with an important limitation in this particular case, because when I went to explain it to Mr. Wallace, who is one of the most scientific gas managers in the kingdom, I found he had already been in the habit of adopting it. Curiously enough, however, he had never generalized from the facts, and until I pointed out the wide applications of which it was capable, had not thought of it as a means of utilizing the smoke of our great cities. During the long winter evenings, the available plant at the Arsenal frequently falls short of the demands that are made upon it. Under ordinary conditions, the supply of 16-candle gas is just sufficient for the purpose of supplying light, and if we take the quantity of this to be, say, 100 cubic feet per unit of time, then if 20-candle gas were substituted the quantity of light would be increased proportionately; that is to say, from 100 to 125 in terms of a photometric measurement. Now, not only is this result obtained, as regards the quality of the gas, by simply removing one charge of coals at the end of four hours, and substituting a fresh one, but larger quantities of the better gas are obtained, and this for two reasons. First of all, the gas comes off in greater quantities per unit of time on an average short extraction than on an average long one; and the fuel used for heating the retorts being greatly superior to ordinary coke, assists the operation still further. In this way, then, the superiority of the short extraction is proved in all directions. I have here a few specimens of the fuel. No. 1 represents an extraction of 3000 cubic feet per ton, and if it were used in London would render it practically smokeless. I must explain, however, that an experimental retort does not give a fair specimen of the fuel. Measurement by the meter is the only method of guessing of the amount of extraction; but this is by no means a satisfactory test of the equable character of the distillation; that is to say, that the $\frac{1}{2}$ cubic feet of gas which may come away from 1 lb. of coal in an experimental retort, although a satisfactory test of the extraction being at the rate of about 3000 cubic feet per ton, may nevertheless have come to a great extent from the outer surface of the sample, leaving the interior both bituminous and smoky. In an ordinary extraction on the large scale, the fuel may be taken as smokeless, and in every way suitable for domestic consumption.

Perhaps the most pleasant way to conclude this paper would be to draw a picture of the present state of London, overcast, filthy, given to fogs grievous to breathe in, with the London of the future, clear as the tops of the Surrey hills, if the fuel I have been describing were in universal use. I must ask you instead, however, to follow me through a few figures which explain the financial bearing of my scheme upon the community generally.

First, then, as regards capital expenditure, I propose to take advantage of the existent plant of the gas companies. I find it is amply sufficient for the purpose. Instead of taking 10,000 cubic feet of gas per ton from the coal, I propose to take 3333 cubic feet, and to pass three times the quantity through the retorts, or any other proportion that may be found most convenient. The result of doing so is startling. The companies will have double the quantity of bye-products they have at present in the shape of tar and ammoniacal liquor; the community will have 24-candle gas instead of 16-candle gas; the fuel resulting from the process will light readily, and it will make a cheerful fire that gives out 20 per cent. more heat than common coal; London would become a smokeless city.

In dealing with the figures, I shall take them roughly, but in such a way that by including a few outlying corporations they could be made absolutely correct.

I take the total annual consumption of coal in London to be 6 million tons. Of this I take 2 million tons to be the annual consumption of the Gas Companies. The total quantity of fuel used for general purposes I take to be 4 million tons of coal and 1 million of coke sold by the Gas Companies.

We shall now see what would be the result if we treat the whole of the 6 million tons in the retorts on an extraction of less than three hours, instead of the six hours at present prevailing. The total quantity of 16-candle gas consumed in London may be taken at 20,000 million cubic feet. This would be, at the rate of 3333 cubic feet per ton upon 6 million tons, the total quantity of coal consumed in London. The residual smokeless fuel would amount to 5,100,000 tons. Of this, 1 million tons would be required for the extraction of the gas, leaving 4,100,000 available for the general uses of the community. This has to be compared with the 4 million tons of coal and the 1 million tons of coke already referred to as consumed at present. Now the smokeless fuel which results from an extraction of 3333 cubic feet of gas per ton has a heating capacity fully 20 per cent. greater than common coal, and 10 per cent. greater than coke. This gives us the exact equivalents of the 5 million tons of fuel at present in use.

So far the account as regards the fuel available for the community balances. We may now deal with the difference in value between 16 and 24 candle gas. As the value of the gas varies directly as its illuminating power, the calculation is very simple. If we take the average price of 16-candle gas to be 3s. 6d. per 1000 cubic feet, we shall find the total value of the 20,000 million feet consumed in London to be £3,500,000; but as we have by my scheme the same quantity of 24-candle gas, the value will be increased to £5,250,000. Here, then, we have an annual sum of £1,750,000 to place to the credit of the system.

Turning now to the bye-products, seeing the Gas Companies would, by the new arrangements, subject three times the quantity of coal to the heat of their retorts during the period when the tar and ammoniacal liquor pass off most rapidly, I do not think I am wrong in estimating the yield at double its present amount. Taking this upon the tar and ammonia to yield 3s. 9d. per ton of coal, we find the total value of these bye-products to be, at present, on the supposed consumption by the Gas Companies of 2 million tons of coal per annum, £375,000. This being doubled under my scheme, an additional sum of £375,000 must be placed to its credit.

But the basis upon which we have hitherto been arguing is that under the proposed scheme the Gas Companies are getting their coal for nothing. We have been supposing that the community become the purchasers of 6 million tons of coal, and hand it to the Gas Companies. At present London only pays for its general consumption on 4 million tons of coal and 1 million tons of coke. Let us now suppose that the Companies pay the same sum annually for their coals that they do at present; if so, they would pay upon 2 million tons, or an annual amount of £1,600,000, if their coals cost 16s. per ton. From this falls to be deducted the money they at present draw from their sales of coke, which, when taken at 6s. per ton of coal carbonized under the existing system, still leaves a sum of £1,000,000, which they could afford to pay per annum for the use of the 6 million tons of fuel as proposed in my scheme. We will now take the total payments of the community for their coal to be upon 6 million tons, for which we will further suppose they pay at the rate of 16s. per ton first cost. This would amount to £4,800,000 per annum. From this falls to be deducted the £1,000,000 contributed by the Gas Companies for the use of the fuel, also the £1,750,000 charged on the difference between the 16 and 24 candle gas already referred to, also the sum of £375,000 of additional income from the bye-products. This would leave a net sum paid by the community for its fuel under my scheme of £1,675,000. Under the present system they have to pay, say, 16s. per ton on 4 million tons of coal, and say 12s. per ton on 1 million tons of coke. This makes,

in all, the sum of £3,800,000 per annum. Here, then, we have a balance in favour of my scheme of £2,125,000 annually. This may be taken as the yearly value of London smoke, which I propose to convert into useful products by the plant at present in use.

I have only, in conclusion, to say one or two words about the efficiency of the scheme as regards the fuel. It lights easily, it does not give off any smoke, it makes a cheerful fire, it gives out more heat than either coal or coke, it will be cheaper per heat-unit than the coal at present in use, London would become a smokeless city, and all that would fall to be deducted from the sum of £2,125,000 per annum would be confined to a few items, such as the cost of additional workmen employed in charging the retorts, interest upon additional capital required for transit appliances, and the terms to be made with the companies for carrying out the scheme.

I have much pleasure in acknowledging the help I have received from Mr. Wallace, the Gas Manager at Woolwich Arsenal; and the valuable information obtained from Mr. Field's tabulated accounts of the London Gas Companies. I should say, in conclusion, that I have no pecuniary interest whatever in the scheme I propose.

After the reading of the paper, the following discussion took place:—

The CHAIRMAN (Mr. R. Rawlinson, C.B.) said the reader of the paper spoke of Dr. Siemens having proposed a mode of extracting a species of crude gas from the poorer classes of coal, but that it was not intended to be applicable for general purposes. This, however, was a mistake, as Dr. Siemens did intend to supply his gas for all heating purposes to town communities, and a Bill for the purpose was prepared and brought into Parliament for Birmingham. It was to be cheaply supplied, and distributed as ordinary gas was, for purposes only for which heat was required. Mr. Scott-Moncrieff had also spoken of 16-candle gas costing 3s. 6d. per 1000 feet in London, but the Companies in London were, with one exception, charging 3s. After a few further remarks the Chairman called on the meeting to discuss the paper, and asked them to keep as nearly as possible to the subject matter of it.

The SECRETARY then read a letter which had been received from Mr. R. Angus Smith; also the following one from Mr. Robert Morton:—"London Gaslight Company's Works, Nine Elms, S.W., Jan. 25, 1881. My dear Sir,—We used 155,468 tons of coal last year. One ton yields 10 gallons of tar; one ton yields, say, 25 gallons of ammoniacal liquor. Our tar last year was worth £17,814; liquor about £14,000. I drew a retort or two some days ago, after the charge had been in two hours. Found it very difficult to draw, the soft coke breaking up before the rake; the smoke, in drawing, was a nuisance. The coke was very friable, was difficult to quench, and would be little more than dust after once or twice handling. Moreover, to carbonize coal to that extent only would require a much larger quantity of fuel than is ordinarily used. I regret very much that I cannot be at John Street to-night.—Yours very truly, Robert Morton.—Robert Rawlinson, Esq."

Mr. HAUGHTON said if he had followed Mr. Moncrieff aright, the fuel which he proposed was practically identical with that which many years ago was universally used in locomotive engines; but now almost every railway company in England and France had abandoned the use of coke, and he always understood they did so because it did not pay to use it. He should like to know the precise cause of the abolition, because this was an experiment on a very large scale, carried on for a long time. With regard to the quality of the gas made, it appeared to him that, not perhaps immediately, but in the not distant future, the greater part of the gas consumed in this country would be of a lower illuminating power, but giving more heat, than that now in use; and they must look to the electric light, in some form or other, replacing, to a great extent, the present mode of lighting. He did not believe this would prejudicially affect gas companies, but he thought they would have to manufacture a different quality of gas, which would be used for cooking and heating, and as a motive power.

Mr. W. R. E. COLES (of the National Health Society) said there was about to be an exhibition of the various means by which the smoke of London might be prevented; and amongst those means gas would be particularly considered. He might say that the Committee had had various recommendations from several gas companies, and on the Committee they had an Engineer of one of the London Gas Companies.

Mr. HUGH CLEMENTS thought if the gas companies took up this question, and dealt with it in the manner proposed, it would be a great success, as the quantity and quality of gas would be much increased, and also the bye-products.

Mr. W. H. Y. WEBBER said he wished to ask Mr. Moncrieff one or two questions. He said that more heat was given out from the partially carbonized coal than from raw coal. If this was weight for weight, he (Mr. Webber) did not exactly see how coal from which a certain weight of combustible had been drawn could possibly give out as much heat as if all the combustible remained in it. Mr. Morton, in his letter, touched a very serious point when he said that he had tried drawing a charge of coal $1\frac{1}{2}$ or 2 hours after it was put in, and experienced great difficulty. He had had some experience in the matter, and he could bear out Mr. Morton's statement in this respect. It was always possible in a gas-works to see when the coal was properly carbonized, without going near the retort, for if it came out too soon it made a most tremendous smoke. Unless Mr. Morton's statement could be shown to be wrong—if only one-third of the gas was produced, three times the weight of coal could not well be burned off, and if this were so, the existing plant could not do the extra work. If it were possible to partially carbonize three times the amount of coal in the same time, the case was very different; but from Mr. Morton's statement, supplemented by the experience of every gas manager, he did not think it was altogether clear that this could be done. He mentioned the report of Dr. Ballard, who made a long inspection of various manufacturing processes where noxious vapours and smoke were given off, and he particularly drew attention to the fact that, when coal was not properly burned off in gas-works, a very great nuisance was occasioned in the neighbourhood. The present system might be all wrong; but if it were, the gas companies would not be at all backward in taking advantage of any better system would give them 1 or 2 per cent. more dividend.

Mr. LOWSON expressed the great pleasure he had felt in listening to so able and interesting a paper. To him the idea was theoretically perfect, and if it could be carried into effect, he had not the slightest hesitation in saying that London would be smokeless to-morrow. The volatile products were, of course, now being wasted and sent up the chimneys, and if they could be first utilized, as Mr. Moncrieff had shown, by destructive distillation in retorts, there was no doubt they would all be sources of revenue to the community, and it would clear the air of large towns of smoke. The last speaker had referred to the statement with regard to more heat being given out by the fuel than by coal, but this arose from the large amount of heat now being used in volatilizing the products of the raw coal. This heat disappeared, and would reappear in the fuel which would be supplied. He had been much struck with the figures given, showing the great economy which had been effected. Assuming 6 million tons of coal to be consumed annually in London, and taking them at an average price of £1 per ton, the cost was £6,000,000, on which it was reckoned there would be a saving of £2,000,000. But he did not

think account had been taken of the extra labour that would be required to work three times the present amount of coal in gas-works. He had not much hope of the scheme being adopted in London just yet; but if Mr. Moncrieff would go down to Birmingham and read his paper, and could show that a saving of £100,000 would be effected by it, he had little doubt it would soon be taken up.

The CHAIRMAN, in concluding the discussion, said he presumed Mr. Moncrieff would take his coal for coking purposes as new as possible. This was an important point, because gas coal was very volatile, and if it was exposed for any length of time, it very rapidly depreciated, from 5 up to as much as 25 per cent. With regard to the value of the waste products, if all the coal now burned in open fireplaces were so treated as to render the tar and residual products, which now went up the chimneys and only did injury, available as they were in gas-works, the result would be astonishing. Mr. Morton, in his letter read by the Secretary, told them that, at the London Company's works, about 155,000 tons of coal were carbonized per annum, and the realized profits from tar and ammoniacal liquor were £31,814. If they multiplied this by 13, which would bring the amount to nearly 2 million tons, it would represent a sum of £413,582, which was now sent into the London atmosphere to do nothing but mischief. It was quite true Mr. Moncrieff did not propose to exhaust the coal to the same extent as the gas companies did now, and whether that would reduce the volume and relative value of the residual products he was not prepared to say. With respect to the remarks of Mr. Morton as to the difficulty of drawing the retorts, no doubt there would be some difficulty with the retorts as they were arranged at the present time, because he knew Mr. Morton intimately, and knew him to be an extremely careful and intelligent man. Whether the process would be the same with partial distillation, whether the apparatus would be the same, whether the retorts would be the same, he was not prepared to say; but it was quite clear that coke could be made by different processes and in different manners. It was true, as had been said, that railway companies did once use coke entirely for their locomotives. He did not know that they had abandoned it so much on account of economy, though this had certainly come into the account; but the first engines were small, and the fire-boxes were also small, so that they could not use coal to raise their steam. They had now enlarged their fire-boxes, and arranged their apparatus so perfectly that they could use crude coal. But they did not formerly use the cheap coke Mr. Moncrieff contemplated, but used a specially made coke, from which all the residual products were turned into the atmosphere, smoke and all, and nothing came out but the bare carbon; which, according to the returns from the gas-works, really had the least value. If Mr. Moncrieff intended to preserve all the residuals and give coke as well, he did what the coke makers for railway companies never did. Again, though the old coke ovens were abandoned, the making of coke was not. It went on to a large extent, because it enabled coalowners to turn their small coal, which had little value, into a product which had great value for the purposes of smelting, puddling furnaces, and for steel making, whilst the heat coming from the ovens was not wasted, but was utilized for steam purposes.

Mr. SCOTT-MONCRIEFF, in reply, said perhaps the most important point raised was that mentioned in the letter from Mr. Morton, who had evidently made a practical experiment. This weighed very strongly with him, and he had no hesitation in saying that, if his plan were adopted, great skill—very likely competitive skill—would have to be brought to bear in the production of the best form of fuel. One of the samples he had with him, from which 6000 feet of gas per ton had been taken, was, like that described by Mr. Morton, exceedingly friable; but another sample was by no means so friable. In an experiment such as Mr. Morton spoke of, he believed an exceedingly spongy condition of coal ensued, which, no doubt, would have to be avoided. The tar began to exude; and at this particular stage of distillation the coal would hardly stand carriage at all. It might be that special means would have to be taken by the gas companies—the fuel might have to be compressed, or be treated in various ways; but if the object to be attained was such as it appeared to be the opinion of the meeting that it might be, he had no doubt that the fuel could be made perfectly available for carriage and for use. One sample had been with difficulty withdrawn from the retort; but with the others it was not so. The atomic or molecular condition of the material was exceedingly unstable, and some skill would, no doubt, be required to produce it to the best effect. The Chairman had already replied fully to the question put by Mr. Haughton as to early locomotives. As to the electric light, there were various views with regard to it, and they certainly could not say whether it would come into use next year, the year after, or in two or three years. If this were really a reasonable scheme for dealing with a nuisance which was affecting the health of the whole community, and it could be carried out at no great expense and without much trouble, even looking at it as a temporary remedy, it would be better to adopt it than to wait indefinitely for a light about which, to say the least, there was a great deal of discussion. Mr. Webber asked how the heat in this fuel could be greater than in coal. In estimating it at 20 per cent., he had spoken without exact information, but Mr. Lowson had pointed out the explanation of the present anomaly. If one took a piece of coal and a quantity of water, to turn the water into steam required an enormous quantity of heat, and the condition into which the water was converted was the thermal equivalent of the change. Just the same with the coal; it required a considerable amount of heat to convert it into gas, and there was a thermal equivalent in the one case the same as in the other. By treating it in an open fireplace, the appearance was very cheerful, but an immense deal of heat was absorbed in the process. It was for the same reason that the wick of a lamp was not consumed. It was very near the flame, which was at a very high temperature, and yet it was not consumed—except very slowly—because between the flame and the wick the process was going on of converting the oil into the gaseous constituents which represented the thermal equivalent, and kept the wick practically cool. A difficulty had also been suggested with regard to the smoke, but this was really a matter of detail, which could be very easily dealt with. A large funnel could be easily arranged over the mouth of the retort, with an exhaust fan which would carry off the smoke, and the men would be better off than at present, the smoke, of course, being taken into the furnace. He had not, as Mr. Lowson supposed, overlooked the question of additional labour, though he had not gone into it in detail, as it was difficult to estimate exactly. He believed it would approximately amount to trebling the number of men employed, in which case perhaps £100,000 might be expended.

The CHAIRMAN then proposed a vote of thanks to Mr. Scott-Moncrieff, which was carried unanimously.

SALE OF GAS SHARES AT CHATHAM.—At a sale by auction of shares in the Rochester, Chatham, and Strood Gas Company, which took place at Chatham on Tuesday, the 18th ult., three £50 shares in the Company realized £104 10s. each, and a number of the £12 shares £17 each. Some £8 10s. shares sold for £17 10s. per share. Three £10 shares in the Sheppy Gas Company were on the same occasion sold for £56 5s., and five of the Company's £3 6s. 8d. shares for £5 per share.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

In the course of my inquiries into the state of gas matters in Scotland towards the close of last year,* I thought it my duty to call attention to the treatment which the Aitken and Young analyzer had received in Hamilton, at the hands of a majority in the Council, who, having shortly before publicly washed some rather dirty linen, were inclined to crow loudly on the eminence which they considered they had attained. In doing so, my sole desire was to evoke from this triumphant majority the exact reason they had for dispensing with the analyzer, as the mystery attending its rejection had not been satisfactorily solved. Instead of obtaining a few unvarnished details, showing why the Gas Committee of the Corporation had decided to make gas for the supply of the town by the old method, I was asked to point to any individual who had recommended the adoption of the analyzer, and who was actually using it. As may be readily seen, this was a point which was entirely outside the nature of my query; but one instance which had come under my own observation I mentioned to Bailie Cassels, and referred him to the patentees for further information. At the same time I asked the Bailie one or two pertinent questions, and to these he has never replied. It now appears to me that the Bailie stands much in the same position as the Persian mercenary soldier who, in "*Le Monde comme il va*," is asked by Babouc the subject of the war with the Indians. "*Par tous les dieux*," said the soldier, "*je n'en sais rien; ce n'est pas mon affaire*." But there is, perhaps, this difference, that the question in dispute here is the Bailie's business, although I am inclined to give him credit for not knowing much about it. I have been led to make these remarks by the appearance, in the JOURNAL this week, of certain extraordinary letters which have passed between Mr. Henry Aitken and Bailie Cassels. These letters are instructive, and they show unmistakeably the quality of the material which requires to be cultivated before replies to the most common-place inquiries can be obtained. Two letters are sent to the Bailie, requesting the names of the gentlemen who he had insinuated were Directors of the Company formed to promote the interests of the analyzer; but, in reply, he not only declined to answer the question, but asked for the names of those who had reported favourably on the analyzer. With the utmost good taste Mr. Aitken complied, and one would naturally have supposed that the Bailie would then have admitted his error and apologized. Instead, however, of doing this, he coolly says that he has obtained the information which "the correspondent of the London JOURNAL was unable to give." The Bailie here, with a somewhat characteristic disdain for detail, entirely overlooks the fact that I mentioned three parties who had reported favourably on the apparatus. But I need not go further into a correspondence, regarding which every one is able to form his own opinion. I would only add that it does not excite astonishment in the minds of those who pay attention to the high-handed way in which the gas affairs of the Corporation of Hamilton are conducted. I have given the Bailie the opportunity, and I think ample time, to formulate his reasons for rejecting the apparatus; but, as he has not availed himself of such an opportunity, I may briefly refer to the introduction and subsequent treatment of the analyzer, which is likely to prove as interesting in the history of gas matters as the spinning-jenny is in the history of weaving. At the outset I may state that the analyzer is the result of unwearied application and experiments conducted at great expense over a long series of years, and that it was introduced to the public only after the inventors and patentees had been convinced that better results could be obtained from this mode of making gas, and at a cheaper rate than by existing methods. Nothing could be fairer than the conditions under which it was to be erected at Hamilton. The patentees put it up at their own expense, and if satisfactory results were not obtained they were bound to remove it. In the event of success, however, a certain percentage was to be paid upon the gain. The machine was put up and set in action, and subsequently, about the end of 1876 and the beginning of 1877, a Committee of the West of Scotland Association of Gas Managers made long experiments with the apparatus, and gave the favourable report upon it with which all gas managers are familiar. If it were necessary for the case I desire to make out, I could quote from this report to show the high esteem with which the invention was regarded; but as I feel that such a course would, at this time of day, be a mere waste of space, I will rather hurry on to the period when it was thought proper to dispense with the use of the analyzer. And this brings me down to August, 1875. Between the dates to which I have referred, the former Manager was dismissed, and a new Manager appointed. It is nothing against the position of the latter gentleman that before his appointment he was not in the same line of business. On the 1st of August, 1878, after "careful observation of the working of the patent for the last eleven months," the new Manager reported unfavourably of it. He questioned in his report whether the consumers derived the benefit of the increased illumination obtained through the use of the analyzer. As the gas was heated up to over 200° Fahr., in order to absorb the light hydrocarbons contained in the tar, and as, in passing through the mains, the temperature was reduced, the light vapours which had enriched the quality of the gas were, in his opinion, recondensed and deposited where they were not wanted, and caused mischief. This was the substance of his report, and it was submitted to the Corporation and approved of, with the result that the analyzer was subsequently removed. Now, without entering into the physics of the question, I may state generally that it has been established that gas manufactured in this manner is more permanent than gas made by ordinary methods; and this general contention is, I think, borne out by the report of the Committee of the West of Scotland Association, who tested for the illuminating power not only at the gas-works, but at the foundry, fully a mile from the works in a westerly direction, and found that practically there was no difference. With these facts, stated generally, I leave the readers of the JOURNAL to their own conclusions. I would only ask that the authorities for and against the analyzer be considered, and then any one can imagine for himself the cause of the disinclination which Bailie Cassels exhibits to give information on the points to which I directed his attention.

Had Edinburgh been entirely dependent on gas during the weeks of severe frosty weather, I am afraid that certain districts would have been under a pall as dense and gloomy as that which enshrouded the Egyptians in olden times. But fortunately, at least for the afflicted, such articles as tallow candles and paraffin oil lamps can be obtained, and these have been brought largely into requisition. Shops and private houses alike have been subjected to the annoyance of frozen pipes and gasless burners. The occasion has been so exceptional that the whole energies of the two Gas Companies have not been sufficient to cope with the insidious enemy of vapours in suspension. With the return of thaw, which set in yesterday, the gas-pipes have been relieved; but those unfortunate people whose water-pipes were also frozen have just got rid of one annoyance to be pestered with another. Through the expansion of ice in the water-pipes, "bursts" have been reported on every hand, whole tenements have been inundated, and plaster work ruined. In Perth the citizens were deprived of the pleasure of listening to the eloquence of Rev. A. Fleming, of St.

* See JOURNAL, Vol. XXXVI., p. 736.

Paul's Cathedral, who had come to the "Fair City" to recount his travels in America. The audience had assembled, and then, all too late, it was discovered that the gas-pipes were frozen. If the lecturer might be likened to the trumpet of Baron Munchausen, he might thaw at an inopportune moment, and the Perth audience would be deprived of his eloquence if he should happen to be outside the city.

In Edinburgh during the past week there has been a good deal of political excitement in connection with the contest between the Lord Advocate and Mr. E. Jenkins, for the representation of the city. It is not usual on such occasions for gas matters to crop up; but at a meeting of the electors last Tuesday evening one of them, a Mr. Ramage, asked Mr. Jenkins whether he would bring in a Bill to abolish rents for gas-meters. The announcement of the question was received with loud laughter, and apparently the candidate thought it so unimportant that he did not answer the query. Why there should be laughter, and why there should be no reply, I am at a loss to understand. The question is one of considerable importance, and I am certain that within a very short time more will be heard about it. It is time there was a readjustment of many of the modes of charging, and a uniform system adopted.

From the number of gas explosions which have recently taken place in Edinburgh and elsewhere one would almost imagine that they were contagious. Within the past week a dairyman named Blake had his hands and face burned by an explosion of gas in a house in Tarvit Street; an explosion occurred at Leith Docks, in the neighbourhood of some hydraulic machinery, and the dock-headman, Alexander Bain, was badly burned about the head and face; and a third explosion took place in a drapery establishment at 10, Bristo Street, which resulted in considerable damage to the fixtures. Two young ladies in the shop were slightly scorched and greatly frightened.

The split between the parishes of Panbride and Barry, as to the water supply of the village of Carnoustie, is likely to be healed up soon—at least it is so to be hoped. The village lies in the two parishes; and, as I have already stated, the one parish wants to introduce a particular scheme, which is objected to by the other. A memorial has now been sent to the Dundee authorities to see on what terms they will supply the village with water, and this memorial has been remitted to the Works Committee to be reported on at the next meeting. The Committee met on Thursday, and the general feeling seemed to be to put Carnoustie in the same position as Newport and Broughty Ferry, by coming within the compulsory area the first time the Commissioners go to Parliament for other purposes.

From the fortnightly statement of the Edinburgh Water Trust it seems that the total quantity of water in the reservoirs last Tuesday was 2,304,967,000 gallons, as compared with 2,344,729,000 gallons on Jan. 11.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

By way of supplement to the statistics given in last week's "Notes" regarding the gas supply of Glasgow during the recent frost, which was almost unparalleled in its severity, I may mention one or two additional facts bearing on the number of retorts in use. The average number of retorts in actual use during the month of December at the three stations belonging to the Glasgow Corporation Gas Commissioners was—Dalmarnock, 614; Dawsholm, 394; Tradeston, 394; and the maximum numbers in use at any one time were 622, 427, and 422 respectively. I am unable to say at the moment how many retorts there are now at each of the different stations, with the exception of Dawsholm, where there are 648. However, in the month of August, 1878, there were 1843 in all at the four stations then existing—namely, Dalmarnock, 664; Dawsholm, 619; Tradeston, 440; and Partick, 120. Of course, the last-named station no longer exists, and hence 120 may be cut off the total just given. At one time there were 840 retorts available for actual use at the Dalmarnock Gas-Works, and at present many of the ovens contain seven retorts each, as against five formerly; and at the Tradeston station there have also been sundry alterations made from time to time.

It will, doubtless, be gratifying to many gas managers and engineering friends to learn that the vacancy caused in the managership of the Dawsholm Gas-Works by the resignation of Mr. Mitchell, in order to take office under the Directors of the Edinburgh Gas Company, has been or is likely to be filled by the election of Mr. David Terrace, of the Corporation Gas-Works, Arbroath. The appointment has already been practically made, inasmuch as this gentleman was the choice of the two Conveners to whom was remitted the duty of recommending a successor to Mr. Mitchell; and as their recommendation has been approved of this week, first by the Works Sub-Committee, and then by a full meeting of the Gas Committee, the appointment now only remains to be formally confirmed by the Town Council sitting as the Gas Commissioners at their ordinary meeting next Thursday. I understand that the selection of Mr. Terrace for the vacant post was due in a great measure to the fact that he is a thorough-bred mechanical engineer, and that his skill in this capacity may be turned to good account in working out the mechanical stoker of Mr. Foulis in actual practice as an appliance for economizing labour in one of its most exhausting phases. Mr. Terrace was, I believe, long employed with Messrs. R. Laidlaw and Son, the well-known Gas Engineers of this city.

Taking advantage of the fact that Dr. C. W. Siemens was in Glasgow this week for the purpose of delivering one of his most instructive and suggestive lectures under the auspices of the Glasgow Science Lectures Association, the Corporation Gas Committee arranged to have a conference with him in reference, I believe, to the possible adoption of his heat regenerative system to the working of the retorts at one or more of their gas manufacturing stations. So far, I think, Dr. Siemens's system of applying heat to gas retorts has not been adopted in this country; but on the first blush of the thing there does not seem to be any good reason why it should not be applicable in the manufacture of gas as well as in glass-making, copper-smelting, steel-melting, &c. We shall doubtless hear more about the matter by-and-by.

Owing to the extraordinary intensity of the recent frost, and the great length of time it continued, the gas supplied from the Dawsholm station was more than once decidedly under the parliamentary standard of illuminating power. At one time, when it was tested within the city, the illuminating power was only 23.53 candles, the minimum allowed by the Glasgow Gas Act being 25 candles. But it ought to be stated that the testing station is probably not less than 2½ miles from the manufacturing station, and that for a portion of its course the main-pipe leading from the works is exposed to the atmosphere, or but very slightly covered. Then, again, it is the case that the very best canal coal within the establishment was used as the raw material from which the gas was made. Facts have been accumulated which abundantly prove, if proof were necessary, that in canal gas there are rich illuminants which can be condensed by such low temperatures as are still possible in our latitudes, and which may afford us some faint notion of the nature of the glacial period of the earth's history.

I am not yet at liberty to give the actual results arrived at by Dr. Wallace and his fellow-jurors in the elaborate series of tests made upon gas-meters submitted by various manufacturing firms that took part in the Exhibition of Lighting and Heating Appliances, &c., recently held in this city; but I may mention that at a conference held last Tuesday at the meter-

works of the Glasgow Corporation Gas Commissioners, in connection with the competition, there were present representatives from four firms whose meters were exhibited last autumn—namely, Messrs. W. and B. Cowan, Messrs. D. Bruce Peebles and Co., Messrs. Alder and Mackay—all of Edinburgh; and Messrs. George Glover and Co., of London. Mr. Keith, of Arbroath and Edinburgh, entered for adjudication on the part of the London Gas Meter Company, but no appearance was put in on his account. The meters that had been tested were opened in presence of the representatives of the respective firms and the jurors, and the general results were stated; but the details were held over for the purpose of being embodied in a report which will by-and-by be formally submitted, along with others, to the Philosophical Society of Glasgow. All the reports are anxiously waited for by many persons, but as most of the jurors are professional gentlemen whose time is closely occupied, an unexpected delay in bringing the work to a close has been unavoidable.

A very large amount of business has been done in the Glasgow pig iron warrant market during the week, chiefly for investment. The surplus of production of G.M.B. iron is all readily absorbed. There seems to be a fair prospect of a good spring trade opening up, and the improvement in the American demand is maintained. Small quantities are being bought almost daily for United States ports. The fluctuations in price during the week were of limited extent, and the close yesterday was—buyers, 52s. 4d. cash, and 52s. 6d. one month, sellers asking 1d. per ton more.

Prices continue steady in the coal market, but in some instances both house and shipping varieties have been a little advanced in price.

THE BIRKENHEAD CORPORATION GAS AND WATER BILL.—A special meeting of the Birkenhead Town Council was held on Wednesday last for the purpose of confirming the proceedings of the Council at their meeting on the 12th ult., when the preamble and clauses of the Corporation Gas and Water Bill were discussed and agreed to. The Mayor (Mr. W. Laird) presided, and opened the proceedings by formally moving a resolution sanctioning the promotion of the Bill in the present session of Parliament, and after a short discussion the motion was carried unanimously.

INSTITUTION OF CIVIL ENGINEERS.—The Council of the Institution have just announced that meetings of the Students will be held on the under-mentioned dates, for reading and discussing the following papers:—Feb. 4, "Boilers," by William Marriott, Stud. Inst. C.E.; Feb. 11, "The Internal Corrosion of Cast-Iron Pipes," by Mathew Buchan Jamieson, Stud. Inst. C.E.; Feb. 18, "The Road to Northampton Railway," by John Edward Waller, Stud. Inst. C.E.; Feb. 25, "Sewer Work," by Robert Henry Thorpe, Stud. Inst. C.E. The chair will be taken at 7 o'clock on each evening, and successively by Mr. Bramwell, F.R.S., Mr. Rawlinson, C.B., Mr. Bruce, and Sir Joseph Bazalgette, C.B., Members of Council. It has been intimated that a second series of meetings will be appointed if a sufficient number of suitable papers are received.

SALE OF CRYSTAL PALACE AND CROYDON GAS COMPANIES' SHARES.—On Thursday last there were submitted for public competition, at the Greyhound Hotel, Croydon, by Mr. John F. Moon (of the firm of Robert W. Fuller and Moon, Auctioneers, Croydon and Reigate) 109 £5 (fully paid) shares in the Croydon Gas Company, and 200 £6 shares, on which £1 10s. per share has been paid up, in the Crystal Palace District Gas Company. The dividend paid on the Croydon Company's shares last half year was 9 per cent. (under the provisions of the sliding scale), while the Crystal Palace Gas Company's shares bear a fixed dividend of 7 per cent. The 109 shares in the Croydon Company sold for £927 15s., or a little over £8 10s. per share on the average. The other shares realized £3 each, or a premium exactly equal to the amount paid up per share.

THE BRADFORD CORPORATION AND THE BINGLEY WATER SCHEME.—The contest, referred to in last week's JOURNAL, between the Bradford Corporation and the Bingley Improvement Commissioners relative to the supply of water at Bingley, has ended. A special meeting of the Commissioners was held last Tuesday, under the presidency of Mr. Ecroyd. The proceedings were conducted in private, but it is said that arrangements have been made by which all opposition by the Commissioners to the Bradford Corporation Water Bill of 1881 will be withdrawn. The Sunnydale scheme will be abandoned by the Commissioners, and the opposition of the Bradford Corporation to the Water-Works Bill of the Commissioners will also be withdrawn on condition that the Commissioners agree to pay a sum of £400 per annum for water supplied to Bingley by the Corporation of Bradford.

THE OPPOSITION TO THE BRIGHTON AND HOVE GAS COMPANY'S BILL.—A public meeting of the owners and ratepayers of Brighton was held in the Town Hall on Monday last week for the purpose of consenting to the opposition by the Corporation to the above-named Bill, and to the application of the district fund, or other public rates now or hereafter under the control of the Town Council, to the payment of the costs of opposition. The Mayor (Alderman D. Smith) presided, and in opening the proceedings stated that the Town Council wished to be authorized to go to Parliament that they might have *locus standi* in case there should be any necessity for them to take active measures against the Bill now being promoted by the Company. He then moved a resolution conferring such authority, and this, having been seconded by the Ex-Mayor (Alderman Davey), was carried unanimously.

BRIGHTON AND HOVE GENERAL GAS COMPANY.—A special meeting of this Company was held at the London offices, 29, St. Swinham's Lane, on Friday, the 21st ult.—Mr. F. E. Webb presiding—for the purpose of considering the Company's Bill in Parliament this session. The Secretary (Mr. W. H. Hardy) having read the notice convening the meeting, the provisions of the Bill were explained by Mr. Somers Clarke, the Solicitor to the Company. The Chairman then proposed, and Mr. R. H. Jones, J.P., seconded the following motion:—"That the Bill intituled 'A Bill to authorize the Brighton and Hove General Gas Company to purchase the undertaking of the Brighton Gaslight and Coke Company, or to amalgamate with the said Company, and to purchase the undertaking of the Aldington, Hove, and Brighton Gas Company, to acquire lands, and for other purposes,' be, and the same is hereby approved." This resolution was carried unanimously, and the proceedings closed with a vote of thanks to the Chairman for presiding.

THE WATER SUPPLY OF FULWOOD.—Operations were recommenced at the trial borings at Fulwood last week, when the emptying of the water from the bore-holes—the diameter of which, at the bottom, does not exceed 10½ inches—was begun. This was done by means of a large pump, raising at each lift 126 gallons, and making 60 lifts per hour. The water commenced at 90 feet from the surface, and was 183 ft. 6 in. in depth. In the first hour the depth of water was reduced 30 feet, but afterwards little impression was made on it. From this fact it is considered that so far as quantity is concerned the result of the boring will be highly satisfactory. The boring is to be continued in the expectation that the total depth of 300 feet will be obtained. Samples of the water have been taken, and one sent to Dr. Campbell Brown, of Liverpool, the County Analyst, and another to Mr. P. Holland, of Manchester, the Borough Analyst for Southport, and a report from these gentlemen may be expected shortly.

When this has been received, the Local Government Board will be requested to send down an Inspector to report on the scheme. The water brought to the surface on Monday was tested by Mr. Veevers (Chairman of the Local Board), and the temperature was found to be 52° Fahr.

THE POLL ON THE LINCOLN CORPORATION BILL.—The poll on the subject of the Bill deposited in Parliament this session to give effect to an agreement for the transfer to the Corporation of the Lincoln Gaslight and Coke Company's undertaking, and for other purposes, has closed, and has resulted in the signal defeat of the proposal. It was arranged that voting papers should on or before Friday, the 21st ult., be delivered to parties entitled to vote and that the collection should be made on Wednesday last; but to provide for any omission the Mayor attended at the Guildhall on Saturday, Monday, and Tuesday, for the purpose of supplying voting papers to those who had been passed over. The counting of the votes took place on Thursday last at the Guildhall, before the Mayor, and the following was the result:—

In favour of the Bill—		
Owners	352	
Ratepayers	681	1033
Against the Bill—		
Owners	214	
Ratepayers	3762	4006
Majority against		2970

THE RECENT FATAL GAS EXPLOSION IN GLASGOW.—A meeting of the subscribers to the fund raised for the relief of the sufferers by the fatal gas explosion in Henderson Street, Glasgow, on the morning of New Year's Day, was held in the Council Chamber, Glasgow, on Monday, the 24th ult. The Lord Provost presided, and in opening the proceedings said the object of the meeting was to resolve upon some means of administering the fund that had been raised on behalf of the sufferers by the recent accident. When the explosion happened he instructed the Police Superintendent of the district to make the necessary investigations into the circumstances of all the persons who were affected by the catastrophe; and he also gave him authority to attend to these people in any way which might be deemed necessary—to see that lodgings were provided, and that those who were in destitute circumstances should be clothed. The result was that up to the present time a small sum had, in this way been expended—he believed some £50. Since the mishap about £300 had been collected, and it was therefore thought right to obtain the authority of the subscribers to the appointment of a small Committee who would take in

hand the whole matter of its distribution. It was of consequence that those who did so should be somewhat conversant with the circumstances of the cases, and so see that no one suffered unduly. A Committee of seven gentlemen was then appointed to co-operate with the Lord Provost, who remarked, in reference to the adequacy of the amount collected, that it would, of course, depend in a great degree on the extent of the necessity that existed, whether the sum in hand would suffice, but he believed if more money were wanted, the public would come forward to aid the Committee.—At the close of the subscribers' meeting a meeting of the Committee was held, at which the disbursements already incurred were approved of, and a Sub-Committee was appointed to investigate the circumstances of those affected by the explosion, and prepare a report on the subject, to assist the Committee in meeting the claims of sufferers.

ANOTHER SERIOUS GAS EXPLOSION IN GLASGOW.—At an early hour on the morning of Sunday, the 23rd ult., a somewhat serious explosion of gas occurred in Lanark Street, Glasgow, whereby two constables were injured, and some damage done to property. It appears that a constable named M'Intosh informed two of his comrades—David Donaldson and Walter M'Dermid—who were coming along Greendyke Street, that there was a strong smell of gas in Lanark Street, near the back of the Old Clothes Market, where there is an open space about 2 feet wide, 3 feet deep, and 30 feet long beneath the pavement, and it was close to this spot that the smell of gas was perceived. Whether the officers were aware of the small chamber is not known, but on proceeding to the spot both Donaldson and M'Dermid lit matches and threw them on the pavement. Those thrown by M'Dermid ignited the gas escaping through the joints of the stones, and immediately there was a blaze. Donaldson ran to put his foot on it in order to extinguish it, but M'Dermid decamped. He was not a moment too soon, for the gas confined in the well exploded. The whole of the range of pavement along the back of the Old Clothes Market was forced up and thrown a considerable distance; some of the pieces falling on and through the roof of a wooden erection on the other side of the wall opposite, a distance of about 20 feet. A gate belonging to the market was thrown down, and a very large number of windows were broken. The explosion also severely injured two of the three men—Donaldson and M'Intosh—who were thrown to the ground. M'Intosh sustained a number of cuts on the face, besides several bruises on the left leg. Donaldson had his left knee broken, his right wrist severely injured, and was cut about the face. Both men were at once removed to the Royal Infirmary, where they are doing well. The gas officials were informed of the occurrence, and men were promptly sent to cut off the gas. An investigation in the course of the day showed that the main-pipe, a foot or two south of the vacant chamber, had been burst by the frost, and that the gas had percolated through the earth, and been stored up in the empty space.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Jan. 26, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.3	16.8	17.0	Station closed	for	14.1	0.1	0.0	0.0	None.	In excess.
	Camden Town	17.0	16.7	16.8	15.3	12.8	14.1	0.0	0.0	0.0	"	"
	Dalston	16.8	16.5	16.7	13.9	11.2	12.4	0.0	0.0	0.0	"	"
	Bow	18.0	15.0	16.5	12.0	10.0	10.8	0.9	0.2	0.5	"	"
	Chelsea	17.1	16.5	16.7	14.5	8.1	11.5	0.2	0.0	0.1	"	"
	Kingsland Road	22.0	20.1	21.1	21.5	14.2	16.6	0.4	0.1	0.2	"	"
South Metropolitan Gas Company	Westminster (cannel gas)				20.1	8.7	14.0	0.1	0.0	0.0	"	"
Commercial Gas Company	Peckham	17.5	16.7	17.0	13.8	7.0	10.3	0.4	0.0	0.2	"	"
	Old Ford	17.6	17.1	17.3	14.7	12.3	13.5	0.1	0.0	0.0	"	"
	St. George-in-the-East	17.3	16.5	16.9	11.9	7.9	9.8	0.0	0.0	0.0	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

Share List of Gas and Water Companies.

Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Cent. p. Ann.	Latest Quotations.
59000	10	Gas Companies.	£ s. d.	£ s. d.	£	6200	5	Gas Companies.	£ s. d.	£ s. d.	£	500000	Sk.	Gas Companies.	£ s. d.	£ s. d.	£
		Alliance and Dublin	10 0 0	10 0 0	16-17			Georgetown, Guiana	5 0 0	7 0 0	4 1/4-4 1/2			South Metropoln.	100 0 0	11 15 0	200-205
10000	20	Anglo-Romano	20 0 0	9 10 0	21-23	300000	100	Glasgow Corpora-	100 0 0	9 0 0	223-228	12000	5	Tottenham & Ed-	5 0 0	10 0 0	8 1/2-9
5000	20	Bahia (Limited)	20 0 0	6 0 0	15 1/2-16 1/2	115000	100	Do., do.	100 0 0	6 15 0	164-169			mon-ton	6 0 0	7 0 0	7-8
1000	20	Do., 1st pref.	20 0 0	10 0 0	25-27		100	Grimsby Gas, A.	100 0 0	0 0 0	180-190	2861	10	Do., do.	10 0 0	10 0 0	14 1/2-15
1500	20	Do., 2nd pref.	20 0 0	7 10 0	20-22		100	Hampton Court	10 0 0	10 0 0	16-17	1500	10	Wandsw. & Putney	10 0 0	7 10 0	12 1/2-13 1/2
40000	5	Bombay (Limited)	5 0 0	7 10 0	53-64	7800	10	Hong Kong (Lim.)	10 0 0	10 0 0	15-16	1500	10	Do., do.	10 0 0	7 0 0	11 1/2-12
10000	5	Do., fourth issue	5 0 0	7 0 0	1-1 pm.	5000	10	Hornsey	10 0 0	10 0 0	15 1/2-16 1/2	4000	10	Do., do.	5 0 0	10 0 0	9 1/2-10
5000	10	Bournemouth	10 0 0	8 0 0	13 1/2-14 1/2	250000	100	Imperi. Continental	100 0 0	10 0 0	137-200	26000	5	West Ham	5 0 0	10 0 0	6 1/2-7
229700		Brentford	100 0 0	9 0 0	152-155			Gas Association	100 0 0	10 0 0	137-200	10000	5	Do., do.	3 0 0	10 0 0	14-16
50000		Do., 5 per cent. pref.	100 0 0	5 0 0	100-105			Kingston	10 0 0	8 0 0	11 1/2-12 1/2	2400	5	West Kent	10 0 0	10 0 0	14-16
5100	20	Brighton	20 0 0	10 0 0	36-38	3500	10	Lea Bridge	10 0 0	8 0 0	11 1/2-12 1/2			Woolwich, Plumstead, and Charlton	5 0 0	12 5 0	8-10
5000	20	Brighton and Hove	20 0 0	10 0 0	31-36	561000	100	Liverpool United	100 0 0	10 0 0	183-185						
14000	20	Brighton (Limited)	20 0 0	10 0 0	34-35	1691000	100	Do., B. per cent.	100 0 0	7 0 0	140-142						
7282	20	Cagliari (Limited)	20 0 0	8 0 0	19	390000	Sk.	London	100 0 0	10 0 0	180-185						
1500	10	Colney Hatch	10 0 0	5 0 0	9-11	150000	Sk.	Do., 1st pref.	100 0 0	6 0 0	128-133						
55000	Sk.	Commercial	100 0 0	11 5 0	187-190	7622	25	Do., A shares	25 0 0	6 0 0	30-32						
105180	Sk.	Do., new stock	100 0 0	8 5 0	141-146	266134	Sk.	Do., Debenture stock	100 0 0	5 1/2 & 6 1/2							
20000	20	Continental Union	20 0 0	7 0 0	20 1/2-21			5 Malta and Mediter-	5 0 0	3 0 0	21-23						
23000	20	Do., new	20 0 0	7 0 0	par. 1pm.			anean (Limited)	5 0 0	7 10 0	5-5 1/2						
10000	20	Do., preference	20 0 0	7 0 0	24-25			Do., preference	5 0 0	7 10 0	5-5 1/2						
75000	Sk.	Crystal Palace Dis-	100 0 0	10 0 0	172-177	6000	5	Mauritius (Limited)	2 5 0	1 2 6	13 1/2-14 1/2	615600	100	Chelsea	100 0 0	6 10 0	200-205
		trict				23000	31	Monte Video (Lim.)	20 0 0	6 0 0	16-17 1/2	1624700	100	East London	100 0 0	6 10 0	205-210
121000	Sk.	Do., 7 per cent.	100 0 0	7 0 0	128-132	29000	20	Nietheroy, Brazil	10 0 0	6 0 0	5-6	10798	50	Grand Junction	50 0 0	7 10 0	115-120
50000	Sk.	Do., preference	100 0 0	6 0 0	119-123	8000	10	(Limited)	10 0 0	6 0 0	5-6	5840	25	Do., 4 shares	25 0 0	7 10 0	57-60
25000	6	Do., ordin. 7 p. c.	1 10 0	7 0 0	9 1/2-1 pm.			Do., new shares	4 0 0	9 0 0	64-73	6160	25	Do., new ditto			
7100	25	Edinburgh	25 0 0	10 0 0	50-51	30000	5	Ottoman (Limited)	5 0 0	3 0 0	2-2 1/2			max. div. 7 1/2 p. c.	25 0 0	7 10 0	40-45
23400	10	European (Limited)	10 0 11 0	0 0	19-20 1/2	30000	5	Do., new shares	4 0 0	9 0 0	64-73	5551800	100	Kent	100 0 0	9 0 0	280-290
12000	10	Do., new shares	7 10 0	11 0 0	6-7 5 pm.	10000	5	Pará (Limited)	10 0 0	5 0 0	63-74	7818000	100	Lambeth	100 0 0	7 0 0	202-208
35400	10	Do., new shares	5 0 11 0	0 0	4-5 pm.	10000	10	Richmond (Surrey)	10 0 0	9 0 0	17-18	3261500	100	Do., max. 7 1/2 p. c.	100 0 0	7 0 0	178-183
481430	Sk.	Gaslight & Coke A.	100 0 11 0	0 0	183-185	3000	10	Do., new	10 0 0	9 0 0	15-16	442	100	New River	100 0 0		375-385
100000	Sk.	Do. B.	100 0 0	4 0 0	78-82	3000	10	Rio de Janeiro	20 0 0	10 0 0	24-26	4475	100	Do., deb. ex. 4 p. c.	100 0 0	4 0 0	107-110
200000	Sk.	Do. C 10 per cent.	100 0 0	10 0 0	211-216	37500	20	(Limited)	32 10 0	12 0 0	197-198	6688000	100	Southwark & Vauxh.	100 0 0	7 10 0	218-223
300000	"	Do. D do. do.	100 0 0	10 0 0	211-216	1500	32	Shanghai	100 0 0	10 0 0	195-197	3247000	100	Do., pref. stock	100 0 0	5 0 0	127-132
165000	"	Do. E do. do.	100 0 0	10 0 0	211-216	135000	100	Sheffield, A.	5 0 0	8 0 0	53-61	1265000	100	Do., D shares	100 0 0	7 10 0	173-178
30000	"	Do. F 5 do. do.	100 0 0	5 0 0	102-107	92700	100	Do., C	100 0 0	10 0 0	195-197	3247000	100	West Middlesex	61 0 0	10 0 0	168-173
60000	"	Do. G 7 1/2 do. do.	100 0 0	7 10 0	152-157	10597	5	Singapore (Lim.)	5 0 0	8 0 0	53-61	15073	61				
1300000	"	Do. H	100 0 0	7 0 0	136-139	2000	5	Do., preference	5 0 0	7 10 0	53-61						

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

W. M.—It is a practice to be avoided whenever possible; but, as far as we know, is not illegal except as regards the Metropolis, special provisions on the subject having been inserted in the Metropolis Gas Act, 1860.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 8, 1881.

THE HALF-YEARLY REPORT OF THE DIRECTORS OF THE GASLIGHT AND COKE COMPANY.

THE report of the Directors of The Gaslight and Coke Company to be submitted to the Proprietors at the half-yearly ordinary general meeting to be held on Friday next, gives a very satisfactory account of the working of this great undertaking during the half year which expired on the 31st of December last; and in reference to the document itself, and the statement of accounts with which it is accompanied, we take this opportunity of expressing our appreciation of the unexampled alacrity displayed by the officers of the Company, in preparing accounts of such magnitude for official audit within twenty-seven days of the expiration of the period covered by them.

The Directors have, to begin with, to make a confession that the ordinary annual rate of increase in the consumption of gas during the first part of the winter season has not, in the present instance, been maintained. The report does not go into figures with reference to this falling-off, as a dislike of statistics is with the Board apparently unconquerable; but we will endeavour to supply the want in respect of the

figures relating to the total consumption of gas. It appears, then, that whereas the consumption of the Company's common and cannel gas in the last six months of 1879 exceeded that of the corresponding period of the previous year by 3·79 and 1 per cent. respectively, the consumption of common gas during the past half year exceeded that of the corresponding half of 1879 by 2·73 per cent. only, while the quantity of cannel gas sold actually decreased by 2·15 per cent. We have no means of knowing among what classes of consumers the lessened consumption chiefly showed itself, but the Directors endeavour to account for it by referring to the "exceptional" mildness and brightness of a season as remarkable for the "absence, as recent corresponding seasons have been for the "prevalence of dense fogs, accompanied by a very low temperature," and they anticipate that the unexampled severity of the weather which followed shortly after the commencement of the New Year will hereafter be shown to have exerted a compensating effect, by advancing the rate of consumption. We trust that this idea may be as well founded as it is intelligible. It is, however, difficult to believe that meteorological conditions can be fairly credited with the whole of the evil influence which has made itself felt in such a marked manner upon the progress of the Company. When the reports of the working of the other Metropolitan Companies, in the past half year, are published, it will be seen if the falling-off in gas consumption, like the weather, has been tolerably uniform over the whole of the Metropolitan district. Unless this shall appear to have been the case, it will look as though the Directors of The Gaslight and Coke Company have suffered loss from other causes.

The actual gas-rental for the past half year amounts to £986,124, as compared with £1,009,341 for the corresponding period of 1879. It must be remembered that the price of gas had been reduced by twopence per thousand cubic feet between the two periods; and this alone, in default of increased consumption, would have caused a difference far in excess of the actual diminution in the revenue. The course of trade has, however, amply justified the action of the Directors in making their two successive reductions in the selling price of gas. In the first place, they have provided for the supply of coal, under most favourable terms, for a period extending to the middle of 1884; and, secondly, the market for the vast quantity of residuals of which they have to dispose remains tolerably favourable to them. Their coke sold rather better than during the previous corresponding period, and tar brought in £78,652, as against £54,980; but tar products, on the other hand, made only £14,411, as compared with £34,615 entered under this head in the Christmas 1879 accounts. There is also a marked increase in the value of breeze; and ammoniacal liquor and sulphate of ammonia returned respectively £4170 and £11,788 more. On the other side of the account, there is a comparative reduction of no less than £31,769 in the amount charged for repairs and maintenance, and purification has cost £4000 less; while minor savings are shown with gratifying uniformity in other expenses—but not, we are pleased to remark, in the remuneration of the Company's faithful staff. The net result of the working account is the production of the respectable balance of £445,147, being £40,717 more than was earned during the corresponding period of 1879.

The Directors give a pleasing account of the settlement of the claims for compensation arising from the Tottenham Court Road explosion in July last, the greater portion of which have been already disposed of. Much credit is due to the Board for the prompt and just manner in which they acted in reference to this matter. We are now told that all the claims have been rigidly investigated, but that there has not been any necessity for a resort to legal proceedings in a single case. This is as it should be, and when it is further announced that the whole of the damages caused by this unfortunate occurrence will be covered by the sum of £20,000—to be drawn from the insurance fund—the satisfaction of the Proprietors should be as complete as that of the claimants is shown to have been. Although the accident in question was of a peculiar character, there can be no doubt of the applicability of the Company's special insurance fund to such a case, and this has indeed been recognized by Mr. C. H. Parkes, the Official Auditor.

The Directors refer with pardonable pride to the high prices realized for the £50,000 worth of ordinary stock issued in the course of the half year, when the average price of £185½ per cent. was obtained; and it may be pointed out that such a large proportion of premium is as beneficial to the consumers as to the Proprietors, for 85½ per cent. of bonus capital helps strongly in the direction of cheap gas.

The initial price of the Company's gas, under the sliding scale clauses of their Act of 1876, is 3s. 9d. per thousand cubic feet, and as their price for gas during the past half year was 3s. 4d. per thousand feet, or fivepence under the standard, the Proprietors become entitled to dividends equal to $11\frac{1}{4}$ per cent. upon the ordinary stock; but with commendable prudence the Directors recommend the payment of a dividend at the rate of only 11 per cent. per annum on the ordinary stock, and the addition to the reserve fund of the unappropriated balance of divisible profits.

Altogether the Directors of the Company must be congratulated on the results of their management of the great interests committed to their charge, during the past half year; and we may, in addition, be permitted to hope that the check which has been experienced in the regular extension of the operations of the Company will be only temporary in character, as it has so far been unimportant in its effect upon the Company's great position and magnificent prosperity.

THE CITY OF LONDON WITHOUT THE ELECTRIC LIGHT.

THE late severe weather caused a considerable amount of trouble to gas manufacturers and their customers; but either the climate or something else has had a much worse effect upon the proposed illumination of the thoroughfares and bridges of the City of London by various systems of electric lighting, of which we heard so much last year. This scheme hangs fire in a remarkable manner. At first it was to have been inaugurated last autumn; then it was announced that the 1st of February would see a gorgeous vision of tall light-houses strung along the side walks, and superseding the gas-lamps. Now it is said that the 1st of March was intended for the commencement of the new system, but that the late snowstorm and frost have so obstructed the preliminary work, that it is yet uncertain when the electric lamps are to make their appearance. Meanwhile, the streets and bridges continue to be lighted by the doomed gas-lamps; for, with an amount of discretion for which they are not always credited, the City authorities have not given the Gas Company positive orders to turn off the gas from the street lanterns on a fixed date, although, of course, unless they wish to go on paying for gas and electricity as well, the day will come when the services of the Gas Company will be dispensed with—for the time being. The Corporation do not appear desirous to hasten the electric lighting contractors, who, we may hope, will give the public a good show after keeping them without it for so long. Perhaps, however, these astute persons are calmly waiting for summer previous to lighting up, in order to get settled to their work before next winter. There have not been any symptoms of popular discontent with the existing state of things, or of a yearning after a better arrangement; but the Commissioners of Sewers should bestir themselves, and get their experiment well forward before Mr. St. George Lane Fox, or some other electrician with equal experience in street lighting, brings forward a new system in order to upset Messrs. Siemens, Brush, and Jablockhoff together.

PROVINCIAL GAS COMPANIES' MEETINGS.

THE half-yearly meetings of several Gas Companies are already announced, and one or two have actually taken place. Among these is the York United Gaslight Company's meeting, which was held on the 3rd inst. This Company are doing well with a selling price of 2s. 6d. per thousand cubic feet for their gas, and they also have a good fitting business, on which they make a profit of considerably over £1000 per annum. The total profit on the half year's working is £7868, sufficient to pay full dividends, and also to add £800 to the reserve fund. The construction of the new works, of which Mr. V. Wyatt is Engineer, is progressing at a fair rate; the viaducts and railway, which are a special feature of these works, are both in an advanced state, and the railway connection between the new and the old works will probably be completed during the present half year. In consequence of the outlay on the new works, the Directors propose to make a call on the new £5 shares, on which at present only £3 is paid.

The Cambridge University and Town Gaslight Company is another "early bird" in the matter of half-yearly meetings—earlier even than the York Company, for their meeting was held on the 27th ult. The Company pay full dividends, but in order to do so they have had to draw upon their floating balance to the extent of £1663. This step was necessitated by the expenditure on renewals, during the past half year, being unusually heavy. The Directors are somewhat troubled in consequence of the new poor-rate assessment, which they consider excessive, but do not intend to appeal against. The

Company's Bill in Parliament was, of course, mentioned in the Directors' report; but as this subject was brought before a special meeting held immediately after the general meeting, and the objects of the Bill are, moreover, of a very ordinary character, there was nothing in it to excite much discussion. It was stated that the consumption of the Company's gas during the past half year had been unusually large, and that the new works had been thereby brought into full operation.

THE SLIDING SCALE AND THE TRANSFER OF GAS-WORKS.

THE arguments before the Arbitrators in the case of the proposed transfer of the Newcastle-under-Lyme gas undertaking to the Corporation of Newcastle (our report of which is completed in the present issue) included at least one contention which possesses the charm of novelty. It was used only incidentally, and was not insisted on or supported by evidence; but it is destined, we think, to take a more prominent place in similar cases in the future, and may well exercise a material influence upon the value to be awarded. The Newcastle-under-Lyme Gas Company had expended all their capital, and, having to meet the demands of a constantly increasing consumption, must necessarily have made an early application to Parliament for further powers. The authority to raise and expend more money would have been coupled with the sliding scale clauses, and it is quite reasonable to assume that the initial price would not have been fixed at a lower rate than the charge then being made to the consumers. Now, as the accounts of the Company proved that the profit of the year 1879 was equal to the payment of a dividend at the rate of eleven per cent., and also to allow of a reduction in price, which would have enabled the Directors—assuming they had the power—to declare and divide this dividend; and as, further, it was reasonably certain that the power required would have been promptly obtained, the argument suggested was that the terms of purchase might be based upon a dividend of eleven instead of ten per cent. No one could be better able than Mr. W. H. Michael, Q.C., the Counsel for the Company, to estimate the value of any argument for or against his clients, and as he did not press the point, but only named it as an element in the value of the property the Company were required to sell, we assume that it could not well be insisted on. It is clear, however, that if the operation of the sliding scale continues to increase the rate of dividend earned by Gas Companies—as, indeed, it was anticipated and intended by the Legislature that it should—then the mere fact that a Company required to sell their business to a Corporation are kept, for a year or even more, from the enjoyment of the larger profit, cannot prevent the prospective increase being an important factor in determining the value of the undertaking.

COMPLAINT AGAINST THE HUDDERSFIELD CORPORATION GAS SUPPLY.

A SAD complaint is raised at Huddersfield in respect of the Corporation gas supply. A local paper circulating in this busy manufacturing town gives prominence to expressions of discontent emanating from a gas consumer who pretends to speak for his class. The chief grievance appears to be that while gas is continually being reduced in price, the quarterly bills are higher than ever, and at the same time the quality of the gas is unsatisfactory—it smokes, blackens ceilings, and hardly gives a better light than a paraffin lamp. We have heard this sort of thing before, but generally in reference to the gas supplied by a Company, and in such cases the righteous indignation of the consumer and ratepayer has frequently been echoed within municipal council chambers. But to what power will the malcontent with Corporation gas management appeal? It is sad to find that universal contentment is not the invariable attendant of public control in the matter of gas, even if the gas consumer does know that the profits he helps to make are not swallowed up by a greedy monopolist Company, but, at least to some extent, relieve his own pocket of undue strain for rates. Of course, we know very well that the dissatisfaction of the Huddersfield resident is baseless, for no public authority would rob their constituents in one way in order to make it up to them in another; but the baselessness of like imputations would not be generally allowed in the parallel case of a Company. In all probability some of the Town Councillors, who may, in the present instance, express their surprised sorrow at being suspected of preposterous trickery in unduly swelling the gas accounts, would have thought themselves quite justified in ascribing such conduct to the Directors of a Gas Company. Now, however, they will find a repetition of proof, if such were needed, that it is not easy to satisfy gas

consumers, even if the shadow of a temptation to do anything else cannot be suspected. We may, perhaps, remark that the complaint of bad light, smoky ceilings, &c., goes to show that a little popular instruction in the composition and method of using gas to the best advantage would not be wasted even in Huddersfield.

DR. C. W. SIEMENS IN GLASGOW.

IN another column will be found a report of the highly interesting lecture on Gas and Electricity as Heating Agents, delivered by Dr. C. W. Siemens in Glasgow, on Thursday, the 27th ult. The address, as might have been expected from the character of the lecturer, is thoroughly practical throughout, and dealt with first principles only to the extent required to explain the methods by which they were applied to the purposes described. It is impossible to give a clear idea, within the compass of a single paragraph, of the many divisions of Dr. Siemens's comprehensive survey of the field of enterprise in which he has for so many years been an untiring worker. We can but recommend a close study of this remarkable address, and a course of careful reflection on its many hints and allusions, to any one who may seek to know in what relation coal gas stands to the general work of lighting and heating, and also to electro-magnetic energy considered as a source of the same effects. Much of Dr. Siemens's discourse is strange, and may, perhaps, strike one as bordering on the imaginative; but it may be truly said that if Dr. Siemens occasionally dreams, he also works to some purpose, and, therefore, has a right to occasionally indulge in visions. And it is very hazardous, in view of the work that Dr. Siemens has done in the past, and is even now contemplating for the near future, to set rigid bounds for the development of his ideas, and despite his reference to the prospective accomplishments of the rising generation, it is impossible to say what new departures in heat, light, and electricity may be yet inaugurated by the brothers Siemens. It will not be forgotten, after perusal of his lecture, that although, among other things, an electrician, Dr. Siemens is so far from anticipating the speedy disappearance of gas as an illuminating medium that he has followed the example of his brother—whose regenerative gas-lamp was recently described in our columns—and has invented a gas-burner with the express purpose of developing the light afforded by ordinary gas. This is in striking contrast to some fledgling electricians we wot of, who never cease from prophesying that gas lighting *will* go out and *must* go out—apparently because while it is in existence their own feeble night-lights have no chance.

THE IMPROVED STREET LIGHTING AT BIRMINGHAM.—As an evidence of the effectiveness of the improved street lighting at Birmingham, carried out under the direction of Mr. Charles Hunt, and already several times referred to in our pages, it may be stated that, at the quarterly meeting of the Town Council last week, the following memorial, signed by all the shopkeepers and tradesmen in New Street, was read, and referred to the Public Works Committee:—"Your memorialists have observed with satisfaction the great improvement adopted by the Council in the lighting of the open space in front of the Council House. The new lamp-posts are of an elegant design, and with the increased lights have been a source of attraction, so much so that they draw away from New Street a large number of persons who might be customers at our shops or business premises. Your memorialists believe it would be a great public convenience if the improved lighting were extended the whole length of New Street, and they believe that their business transactions would be thereby increased. The rateable value of property in New Street exceeds £39,000—being a larger amount than is assessed upon property in any other street in the borough. Your memorialists, therefore, respectfully urge that as they are heavy ratepayers, their wishes should have due consideration at the hands of the Council. Your memorialists, therefore, pray that the Council will cause the whole of New Street to be lighted in the same manner as the space in front of the Council House is lighted."

THE LAW AS REGARDS THE RATEABILITY OF MACHINERY, TOOLS, AND WORKING PLANT.—At the last monthly meeting of the Manchester Scientific and Mechanical Society, Mr. C. G. B. Corbett read a paper with the above title. He discussed the principles upon which mills, works, manufacturing, mines, &c., are at present assessed for the purposes of the poor law, and cited a large number of cases and decisions in Courts of Law with respect to such rating, and as showing the present state of the law upon the subject. The practical effect of these decisions was, he said, to settle that, while the looms in a silk or cotton mill were not to be included in valuing the premises for assessment, the whole of the machinery in gas-works, iron-works, or any other works requiring machinery attached more or less firmly to the freehold, was rateable. The Judges had, however, repeatedly stated that although the degree of attachment to the premises generally favoured the guide to the rateability of the machine or utensil, the rule was subject to considerable exceptions. If the law was to be altered—and such alteration appeared to be necessary—it seemed to be best that it should be so altered as to include in the rateable hereditament all machinery, plant, or furniture that was placed on the premises for permanent use by the occupier during the continuance of his occupation. In this case houses would be assessed at their rent as furnished houses, and mills as furnished mills. The total rateable value of the country would then be largely increased, and rates consequently be at a less sum in the pound. The question was, however, surrounded with difficulties, but he trusted it would as often as possible be brought under the attention of the public, so that, when legislation took place upon the incidence of taxation, legislators would have the advantage and assistance of an enlightened public opinion. A discussion followed the reading of the paper.

Water and Sanitary Affairs.

IN the House of Lords on Tuesday last, the Earl of Camperdown expressed his anxious desire that the Government should introduce their Metropolitan Water Bill in that House, instead of the Commons. He ventured to predict that, unless this course were adopted, the Bill would either fail to get through Parliament this session, or it would at least not receive that consideration which its importance demanded. The Earl of Dalhousie, in replying on behalf of the Government, expressed his regret that he was not able to give "an explicit answer" to the question of his noble friend. The matter was "under consideration;" but he went so far as to suggest that, while there "were some excellent reasons" for introducing the Bill, in the first instance, in the Upper House, there were also "one or two reasons in the other direction." This was delightfully vague; but the answer, on the whole, was apparently adverse to the views of Lord Camperdown, who perhaps may now feel a little less anxious, looking at the change which has since been effected in the proceedings of the House of Commons. It was certainly to be anticipated, before the session began, that political complications would interfere with the attack which the Home Secretary was meditating on the London Water Companies. For the present, Sir W. Harcourt may busy himself, if he pleases, with taking such measures as may prevent the Fenians—if so diabolically disposed—from dropping into the water supply something worse than the "moving organisms" to which Dr. Frankland occasionally makes reference. There is also a fair substitute for the Metropolitan Water Bill, in the discussion of measures for the prevention of floods and the general management of rivers. Both Lords and Commons are occupied with this question, and if they can give it a satisfactory settlement, they will deserve the thanks of the nation at large. Perhaps Lord Camperdown has already had his enthusiasm kindled by the statement of Professor De Mauley in *The Times* of yesterday, that by the proper storage of the waters of the Thames above London, the Metropolis "might be supplied with water at an infinitesimal cost." It is strange that the Water Companies have not long ago found this out. In the meantime, there is a good deal more water in London than is wanted. The wharf walls and embankments of the Thames require to be raised six inches higher than Sir J. Bazalgette originally anticipated, and the phenomena are altogether so peculiar that *The Times* makes a playful allusion, seemingly half in earnest, to the "grim suspicion" that London may be settling down to the extent of a few inches—a result partly to be attributed to the pumping up of water from deep wells. It may be proper to consider just now the possible results of taking the entire drinking supply of London from the chalk. Already it is suggested that the recent "subsidence" on Blackheath are due to the deep wells of the Kent Water-Works Company. Moreover, if the intakes above Teddington were abolished, might not the floods above Woolwich be so much the worse? Such speculations may seem a little wild, but they are at least as reasonable as a good many which pass current on the water question.

In the present number of the *Analyst* the promised reports on water supply begin to make their appearance. A monthly series of analyses is to be given, under the auspices of the Society of Public Analysts, and the towns included are to be, as far as practicable, those which appear in the weekly mortality tables of the Registrar-General, with the addition, from time to time, of other towns where the water supply may seem to possess features of public importance. At present, neither the Society nor its members by whose signatures the returns are authenticated, express any opinion as to the relative qualities of the waters, beyond those contained in the figures and facts of the analyses themselves; but we are told it is possible that at a future time some expression of opinion may be made. The results are given in grains per gallon, a method to which we have before adverted, and which the Society have adopted, "after mature deliberation, as that which, in the judgment of the majority, would render the analyses most valuable to those who have to consult the tabulated figures." It is announced that the returns for next month will probably comprise all the towns which appear in the Registrar-General's weekly list, and possibly some six or eight places not included among those which are already reported upon. The present returns include eleven of the towns on the Registrar-General's list, besides London, eight being omitted; while, on the other hand, there are twelve extra towns included, making in all twenty-three in addition to the Metropolis. Altogether there

are twenty-four analysts engaged in the work, Messrs. Winter and Harland analyzing six of the waters.

The Water-Works Committee of the Derby Town Council having raised the salaries of some of the officers connected with the works, the Council have passed a resolution that the Committee have no power to do this at their own instance. This decision seems perfectly reasonable, and we are rather surprised that the Committee should so have mistaken their position. As it happens, there is no objection to the increase proposed. The Committee have only to make a "recommendation," and the advance will be made as they desire. In the course of the discussion on this subject, it was stated that a marked improvement was taking place in the finances of the water-works, and in a few years the undertaking would become "a very fine property." According to one of the local papers, "the Derby Water-Works form a gigantic concern, for which the ratepayers 'have paid heavily.'" It will gratify the ratepayers to learn that, although they think they have paid a high price, they are likely to make a good profit by the bargain.

The Society of Arts have decided upon awarding "three silver medals for the three London houses which, among those submitted for competition, are furnished with the best 'appliances for sanitary purposes.'" How can the Society of Arts possibly decide among the crowd of competitors who will come before them? Do not all our Metropolitan sanitarians live in highly scientific and sanitary abodes? Might we not enumerate a score of hygienic celebrities, who cannot be supposed to tolerate any but the most perfectly refined sanitary arrangements? Their dwellings, we should imagine, are oases of healthiness in the midst of the Metropolis. Or may we expect that in this, as in one other case, the Society of Arts will decide that there is nothing which comes up sufficiently close to their exalted ideal to deserve any award at all, and so the silver medals will remain unappropriated? The conditions on which the medals are to be competed for have been drawn up by Sir H. Cole and Mr. Rawlinson, so that there is the satisfaction of having at least two formidable candidates excluded from the contest, while there is also the assurance that "all the latest improvements" will form part of the programme. There must be no bursting of the kitchen boiler, no freezing of the water-pipes, and no naphthaline or ice to obstruct the passage of the gas. Snow must not penetrate the roof, nor foul gases come up from the drain. The builder is to be honest, and the plumber disinterested. *The Times* may be right in saying that "a 'good Building Act' would be of material service in this matter, only we fear that the requisite degree of goodness is beyond the reach of Parliament. Certainly something might be done, especially with regard to house drainage, concerning which the sanitary authorities ought to exercise more supervision than is their wont. We regret to find *The Times*, while discussing the sanitary condition of London houses, going somewhat astray as to the responsibilities of the Water Companies in seasons of severe frost. It seems to be implied that when the pipes are frozen in the house—confessedly through faults of design and construction—the Companies ought to convey the supply to the householder by some other means, such supply to be delivered "within the walls." That is to say, the Water Companies shall, by their servants, not only put up the stand-pipes, but carry the buckets and cans. This might be made law, perhaps, but the public would have to pay for the performance, and very likely there would be an objection to the cost. If ever the projected "Water Trust" comes into existence, we wonder what the "responsible public authority" will say to the notion of carrying buckets to all the frozen-up houses in London!

GAS BILLS FOR 1881.

In accordance with our annual custom, we begin our summary of prospective business in the present session of Parliament in relation to gas and water undertakings. Of the twenty Bills now before Parliament relating to gas, there are eight referring to the incorporation of Gas Companies. They are as follows:—

The *Alnwick Gas Bill* is for the purpose of dissolving and re-incorporating the Alnwick Joint-Stock Gas Company with powers of supplying gas. The old Company was first established in 1849, and was duly registered under the Joint-Stock Companies' Act, 1856, with a capital of £5000, the whole of which has been expended, and the works of the Company have been kept up out of revenue until they are now estimated to be worth £10,000. The Bill defines the Company's district, as being limited to the parish of Alnwick, in Northumberland, and includes the letting and dealing in

gas-fittings among the purposes for which the Company are incorporated. The original capital of the Company is put at £10,000 fully paid-up stock, to be vested in the present Shareholders. The Company also seek power to raise by auction £10,000 additional seven per cent. capital, and propose to adopt the sliding scale, with 4s. 3d. per thousand cubic feet as the initial price. It is also intended to obtain borrowing powers to the extent of £2500 on the original capital, and of an equal amount in respect of the new capital. The Company intend to carry on the existing works until a new station can be erected on land to be acquired from the Duke of Northumberland, whereupon the present site is to be cleared of all plant and sold to the Duke, who is moreover to be authorized to lend to the Company a sum of £6000, which is to be a first charge on the revenues of the undertaking. This special loan is to be exempt from the operation of the clauses of the Bill having reference to the power to borrow in respect of additional capital, as to conversion of borrowed money into capital, and debenture stock. The Company intend to supply fourteen-candle gas under the usual conditions as to pressure, and will allow $2\frac{1}{2}$ per cent. discount on all gas accounts for over 30,000 cubic feet, if the same be paid within two weeks after becoming due.

The *Goole and District Gas and Water Bill* proposes, amongst other things, to incorporate the Goole and District Gas and Water Company, and to enable the Company to acquire the gas undertaking at Goole belonging to the Undertakers of the Navigation of the Rivers Aire and Calder. By an Act of 1879, the Navigation Company were authorized to supply gas to the town and port of Goole and the neighbourhood thereof; and they are now willing to dispose of their gas undertaking to the proposed Company, which is to start with a capital of £60,000 in £10 shares. The vendors are to be permitted to subscribe, within two months of the passing of the Act, the sum of £20,000, or any part thereof; and, with the consent of the Local Government Board, the Local Board of Goole are to be allowed to contribute a like sum of £20,000 of the capital of the new Company. If required, each of the two aforesaid subscribers are to subscribe additional sums, but the total subscription in either case is not to exceed £30,000, or one-half of the nominal amount of the total capital of the Company. The Company seek power to borrow £15,000 in respect of their capital. The Vendors and the Local Board are each to nominate a Director for every complete sum of £10,000 held by them in the capital of the Company. The Company propose to give to the Vendors £33,000 for the undertaking, excluding stores; and the sale is to be effected on the 30th of June next. The Company are to supply gas to the Vendors upon as favourable terms as they are at the same time selling a like quantity of gas to any other consumers. The maximum price chargeable for gas is to be 5s. per thousand cubic feet; the gas to be of fourteen-candle power, and to be supplied under the usual condition as to pressure, &c. The Vendors schedule certain alterations and improvements of the existing works and distributory plant which they intend to execute in connection with the undertaking.

The *Hexham Gas Bill* has for its object the re-incorporation of the Hexham Gaslight Company, Limited. The Company was formed in 1878 (for the purpose of purchasing certain gas-works and property at Hexham), with a capital of £15,000, of which £8100 has been called up, and the Company owe £2000 on debentures. It is intended that the present paid-up capital shall form the original capital of the incorporated Company, with the addition of £15,900 new seven per cent. capital to be raised under auction clauses. Power is sought to borrow £2000 in respect of original capital, and £6000 in respect of the additional capital. The Company seek to acquire by agreement two acres of additional land. The maximum price for gas in the township of Hexham is intended to be 5s. 6d. per thousand cubic feet, and 6s. 6d. per thousand cubic feet in any other part of the Company's district.

The *Westbury-upon-Trym Gas Bill* (No. 1) is intended to incorporate a Company for the supply of gas within the parishes of Henbury and Westbury-upon-Trym, in the county of Gloucester. The Bristol United Gaslight Company's Act of 1853 gives that Company the right of supplying gas within the parishes named in this Bill, but the right has not been exercised by the Company within the districts that are specified in the Bill, which includes the Avonmouth Docks. The capital of the proposed Company is to be £14,000, with borrowing powers to the extent of £3500. The Company seek for compulsory powers to take land for their works, within a period of three years after the passing of the Act; and propose to charge 5s. 6d. per thousand cubic feet as the initial price under the sliding scale for sixteen-candle gas.

The *Westbury-upon-Trym Gas Bill* (No. 2) is for incorporating a Company, originally formed last year, for supplying gas to so much of the parish of Westbury-upon-Trym as lies in the county of Gloucester. The Company seek to be enabled to supply gas or "inflammable air," and to be vested with the rights and property of the limited Company. It is also proposed to extinguish the rights of the Bristol United Gaslight Company in the district. The capital of the incorporated Company is to be £10,000, of which £430 is to be vested in the persons who are the registered members of the limited Company. Power to borrow £2500 is sought in respect of this capital. The Company desire compulsory power for the acquisition of certain land which is now in the possession of a Rural Sanitary Authority, and to purchase, by agreement, ten acres of additional land. The Company propose to levy a maximum charge of 5s. per thousand cubic feet for fourteen-candle gas.

The *Westgate and Birchington Gas Bill* is to incorporate a Company for the supply of gas to Westgate-on-Sea. Certain existing works at Birchington are to be vested in the Company, who intend to start with a capital of £24,000, in addition to which £6000 is to be borrowed. The Company wish to let or deal in stoves and fittings, and to take by agreement five acres of land in addition to the site of the works as set forth in the schedule. The Company propose to charge 4s. 9d. per thousand cubic feet as the maximum price for fourteen-candle gas.

The *Woking Gas and Water Bill* is to incorporate a Company with a capital of £48,000, and power to borrow £12,000, for the purpose, among other things, of supplying gas and gas-fittings at Woking, Surrey. The Company propose to sell fifteen-candle gas at the maximum price of 7s. 6d. per thousand cubic feet within a radius of two miles from the gas-works, and 8s. per thousand cubic feet beyond this radius. It is proposed that the Company's share capital may be divisible into half-shares, of which one half-share shall be preferred and the other half-share shall be deferred. The rate of dividend on the preferred half-shares is not to exceed six per cent., nor is the total dividend on the preferred and deferred half-shares, taken together, to exceed the dividend which would have been payable thereon if the shares had not been so divided.

The *Woking Water and Gas Bill* has among other objects that of incorporating a Company for the supplying of gas to Woking, Surrey, and the neighbourhood, including nearly the same district as in the preceding Bill. The Company's capital is to be £48,000, with power to borrow £12,000; and the original shares may in this case also be divided into preferred and deferred half-shares. The quality and price of gas are to be identical with the provisions contained in the previous Bill.

(To be continued.)

AN IMPROVED GAS-GOVERNOR.

It has been remarked that "the gas-governor, though automatic in action, is only so in relation to one pressure at a time; when this has to be changed, weight in some form must be transferred." It might have been added, with equal truth, that only in rare cases will even this one pressure be continuously maintained; for the fact is that the automatic action of the governor is generally much less complete than the satisfactory control of the pressure requires. It is, for example, usually found inadequate to counteract the disturbing effect of alterations of the initial pressure, such as arise from the cupping or uncupping of telescopic gasholders, changing from one holder to another, or even the varying weight of the same holder at different points of immersion. We desire to call attention to an improvement in the governor—recently patented by Mr. William Cowan, of Edinburgh—having for its object the removal of this defect, and the necessity for the frequent, and often anxious personal attention it occasions.

The introduction of concentric governors has tended to increase the deranging influence of the initial pressure; for though there is, in principle, no objection to the concentric arrangement of the stand-pipes, there can be no doubt that by its enabling makers to reduce the size of the bell, the disturbing effect of the inlet pressure has been augmented by the relatively larger area on which it acts. The lessened size and cost of concentric governors have led to their extensive adoption, and in certain circumstances they perform their functions fairly well. Where, however, there are considerable variations of inlet pressure to contend with, the action of a governor with a comparatively small bell must always be more or less unsatisfactory and troublesome. It would follow from this that a return to the large and cumbersome bells of former days would, in many cases, be advisable; but the invention about to be described, makes this unnecessary as regards new governors, and also shows how existing governors may be adapted to deal with the most extreme changes of the initial pressure.

We are not at present concerned with either the principle or the general details of the governor in its various modifications. We

take it for granted that the only valid objection to the cone form of valve is the disturbing effect exerted upon it by changes of inlet pressure; and that if this could be prevented, the cone governor would then be as perfect as, even in its present condition, it is indispensable. The improvement before us appears to be efficient for the purpose in view, and further to possess, as we have said, the additional advantage of easy adaptability to existing governors. This is a point of much importance, and one likely to commend the invention to the favourable consideration of our readers.

A reference to the accompanying illustrations will show that upon the roof of the governor bell rests an annular tank, into which dips a bell of the same area as the base of the cone. This tank being fixed to the governor bell, moves with it. The smaller bell in the annular tank does not move, but is retained in position by the cross-bar above, from which it hangs into the liquid of the annular tank. Into this fixed bell, pressure from the inlet is introduced by means of

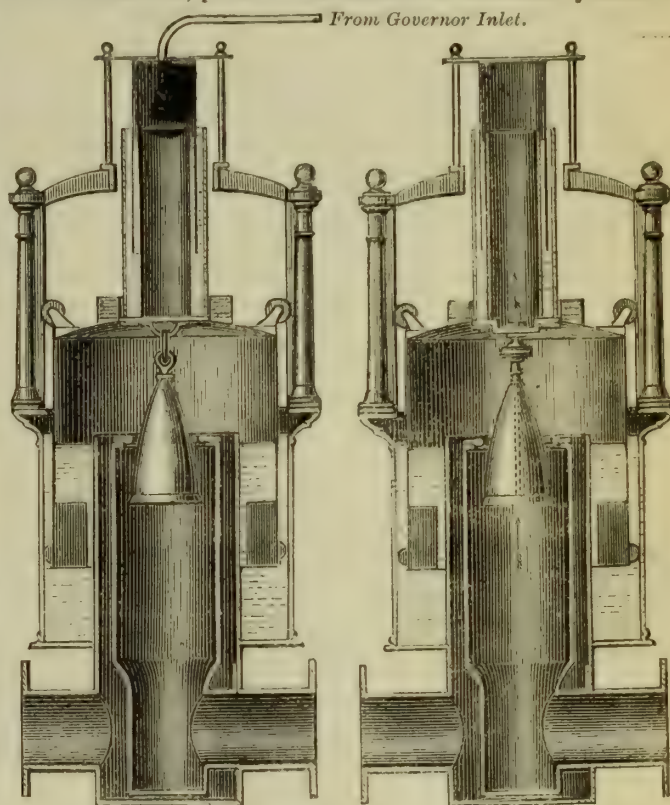


FIG. 1.

FIG. 2.

the pipe shown in fig. 1, or directly upwards through the centre of the cone, as in fig. 2. It follows that the influence of the inlet pressure on the base of the cone will, under all circumstances, be balanced by an equivalent effect produced in the fixed bell and moving tank. When increased inlet pressure on the base of the cone would tend to force it upwards, and so, by lightening the bell, derange the pressure the governor was loaded to maintain, the same influence exerted over a similar area above the roof of the governor bell will prevent the action referred to taking place, and the adjusted pressure will therefore not be disturbed. In like manner when diminished inlet pressure would, by its less supporting influence on the base of the cone, tend to increase the weight of the governor bell, and so to derange the outlet pressure, the reduction of support to the cone will be accompanied by a corresponding diminution of the pressure above the roof of the governor bell, with the result that the perfect equilibrium will remain unaffected.

It will be observed that, to avoid the necessity for lengthening the pillars of a governor constructed according to this system, the usual cross-bar is made with a ring in the centre, through which the moving tank passes. Upon the upper side of this ring there are pillars, which support the smaller cross-bar to which the fixed bell is attached.

In altering governors, according to this invention, the changes to be introduced would be wholly exterior, and in no way interfere with the principle, or the internal arrangement of the governor. The object is to correct by simple means, applied to the exterior, certain inherent defects which are known to exist in most gas-governors.

Notes.

ELECTRIC SHADOWS.

Dr. O. J. Lodge lately delivered a lecture at the London Institution, upon the relation between electricity and light, in the course of which he referred to the late James Clerk Maxwell's electro-magnetic theory of light—the hypothesis which deems light to be an electrical phenomenon. In relation to this theory, the curious phenomena called electrical shadows, lately described by Herr Holtz to the Göttingen Academy, may possibly possess much significance. These phenomena can be produced from a Holtz electric machine, by fixing to the discharging-rod a large concave disc, to which a smooth piece of silk adheres electrically. When the machine is put in motion, there appears at the point of the opposite discharge-rod a small,

feebly luminous star, and on the disc a luminous circle, upon which the shadows are shown when objects are interposed between the two lights. These shadows differ from merely optical shadows in the respect that not all opaque objects give them. They are produced for the most part by conductors or semi-conductors; large insulating bodies may give them, but only for a time. Conductors do not need to be insulated from the earth in order to throw shadows. Curiously enough, besides modifications of shape in the shadow, due to the form of the darkened surface, a strip of material gives (within a certain limit) the same shade, whether it is placed with its broad side or its edge towards the disc. Hence a series of strips, placed edgewise, gives the same shadow as a continuous piece. Various peculiar effects may be produced by mixing conductors and insulators in the construction of the shadow-giving material, the difference between them being in all cases reproduced on the disc; while strange dissolving effects may be produced by heating or damping certain insulators which become conductors when hot or wet.

THE CONTAMINATION OF WATER BY SEWAGE.

The meaning of the expression respecting the presence of so-called sewage in drinking water, frequently found in analysts' reports, is not clear to many people, and therefore the *Brewers' Guardian* has given an interpretation to the term, from which the following abstract is taken. Water, in percolating down through the earth, passes through a series of strata, each of which gives up to it some soluble constituents. Near the surface there is often much decaying animal and vegetable matter, from which the water takes a quantity of nitrogenous substances, and even living organisms. Hence the cause of the general impurity of water from shallow wells and streams, which always requires filtering before use. When water finds its way down to great depths, it is gradually purified from its surface pollution by the mechanical and chemical action of the deep strata. The nitrogenous matters undergo oxidation, and become nitrates. Should any organic matters escape oxidation and become mixed with these nitrates in solution, they exert a reducing action, and by abstracting oxygen from the nitrates, convert these salts into nitrites. Thus both nitrates and nitrites are formed from organic substances, and their presence in water indicates that it was at one time polluted by decaying matter—in analysts' language, it gives signs of previous sewage contamination. The presence of nitrates in water is therefore suspicious; for, although harmless enough in themselves, they prove that the water containing them has not always passed a pure existence. Nitrites must be considered still more dangerous, for they show that fresh organic matters have found their way into the water, and that its serious pollution may have been of very recent occurrence.

PRESSURE OF WIND.

The great gale and snowstorm which passed over London on the 18th of January last, gave the following maximum wind-pressures at Greenwich Observatory:—

10 to 11 a.m.	51 lbs. per square foot.
11 to noon	47 " "
Noon to 1 p.m.	47 " "
1 to 2 p.m.	51 " "

So that for four hours continuously a most dangerous pressure of wind prevailed—never before experienced in the London district. The greatest pressure recorded above was even exceeded, as the pencil of the anemometer at Greenwich went to the end of the scale when it arrived at 51 lbs., and ceased to record further. Such wind-pressures as these on gasholders and other exposed structures, having drifted snow on the leeward sides of roofs, must have put them to the severest test. These pressures mean a broadside burden of about 400 tons on a large gasholder, and of about 500 to 600 tons on a large Beckton retort-house roof. The velocity of a 50-lb. gale is 100 miles per hour. The greatest previous recorded gale in the London district was 37 lbs. per square foot.

A PROPOSED PHOTOMETER FOR PHOTOGRAPHERS.

Mr. Warnerke has proposed to construct for the use of photographers a kind of photometer, or rather, as he prefers to call it, a standard sensitometer, for measuring the actinic power of light. Artificial light is now so generally used by photographers, that some means of estimating the capability of any source of light of doing useful work in the camera has become necessary. The requirements of photographers in this respect are stated by the *Journal of Photography* to be as follows:—A standard light; a reliable and accurate method of graduating the light in order to form grades or tints of known relative value; and, ultimately, the establishment of a standard unit of light. The standard light proposed by Mr. Warnerke consists of a phosphorescent plate or tablet excited by means of magnesium light, and the graduating scale consists of a series of tints of gradually increasing opacity. It is said the absolute regularity of the amount of phosphorescent light given off by, say, sulphide of calcium, or other so-called "luminous paint" material, may be relied on, and that the exciting power of magnesium wire when burnt as closely as possible to the phosphorescent surface is also quite uniform, and is unaffected by accidental variations in the weight of metal consumed. Mr. Warnerke also states that it is quite possible to produce any quantity of tinted glass, by the Woodburytype process, of graduated degrees of opacity, and in such ratio to each other that the greatest range and delicacy of reading through them is easily secured. Although Mr. Warnerke's apparatus is only intended to gauge the actinism of light, and not especially its illuminating power as understood by gas engineers, his success in the department of research which he has taken upon himself to explore will be keenly watched by all who are interested in the measurement of artificial light.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

SIZES OF SERVICE-PIPES AND METERS.

SIR,—Much as I regret to differ with such an authority as Mr. W. Livesey upon any point of law in connection with the supply of gas, I am bound to say I cannot see the application of clause 17 of the Gas-Works Clauses Amendment Act, 1871, to the case raised by "D," as to the insufficient size of a proposed meter.

The expression in the clause is that the meter shall be "in proper order for correctly registering." I do not see how the supply could be refused, if the meter being in proper order for correctly registering, were too small for the number of lights proposed to be lit therefrom.

I am aware it might be urged that the meter would not be likely to continue to work properly if overtaxed; but this is not, in my view, covered by the words of the clause.

Commercial Gas Company's Offices, Stepney,
Feb. 2, 1881.

H. E. JONES.

MR. SCOTT-MONCRIEFF'S SYSTEM OF CARBONIZATION.

SIR,—I need hardly say how highly I appreciate your review of the paper I read last week before the Society of Arts, "On the Prevention of London Smoke."

In using the expression "interdependence between gas manufacturers and the general public," both as regards light and fuel, you really hit upon the whole gist and meaning of my proposals. So completely does the 6-hour charge seem to have absorbed the attention of the gas interest, that I searched for information upon the subject of coal products obtained from different stages of distillation, and found a total blank. A firm of chemical brokers in the City have written to me, offering to analyze any specimens of tar I may send them as samples of different stages. They seem to be in ignorance quite as great as my own.

I have no doubt you are right in saying that the public would not pay more for their gas than they do at present, whether it was 50 per cent. better or not. I do not think, however, that this affects the basis of money calculations as a ready means of estimating actual values. Whether the value is turned into money or not does not matter, so long as the sum of the national wealth is added to in a measure represented by money figures. From the point of view of money motive, which is a necessary element in all commercial exertion, if my system supplies enough convertible value to add to the dividends of the gas companies under additional parliamentary powers, I think they may possibly exert themselves. One great point in its favour is that, as regards the public, no disturbance or expenditure on appliances is called for. All other proposals I know of include the necessity for trouble and expenditure on the part of the community. In my scheme the trouble would rest with corporations who have made the subject their business, and who could say positively what prices would be required to make it worth their while.

As regards the fuel obtained from retorts on a short extraction, I have no sympathy with objections based upon its character as at present known. One thing is certain, which is that it represents the smoke of London in a gasholder instead of in the air we breathe. I am quite sure that for a few pence per ton it could be made to bear a greater crushing strain than coal itself. In the case of towns like Manchester, the separation of the carbon and hydrocarbon products, as regards the coal consumed for fuel by the community, might be carried on independently of the gas companies, so as simply to pay for the process, with something over as profit on the undertaking.

I trust that some discussion may take place in your columns, and that information may be obtained sufficient to justify trials on a proof scale.

W. D. SCOTT-MONCRIEFF.

9, Barton Street, Westminster, Feb. 5, 1881.

THE OXIDATION OF SULPHUR IN COAL GAS.

SIR,—The position which you take up in your foot-notes to my letters, with reference to the proof of whether the sulphur from burned coal gas exists in the air of rooms in the state of sulphur dioxide (SO₂) or sulphuric acid (H₂SO₄), is rather illogical. You assume that it is present as sulphur dioxide. The position I have taken up negatives this. You then practically cast the *onus probandi* upon me as to its not being sulphur dioxide; my position involving the assumption of the existence of the sulphur as sulphuric acid. Again you lay the *onus probandi* upon me to make good the inference that it is sulphuric acid.

I am quite willing to take the side of the sulphuric acid; but this being so, in colloquial language, "what is sauce for the goose is sauce for the gander;" and it certainly becomes logically incumbent on you to prove the case of the sulphur dioxide. But the fact is, as I have before stated, the few chemists who have assumed that the sulphur dioxide is the state in which the sulphur exists, have not done anything more than attempt to prove that it does not exist as sulphuric acid. Even in this they have had to content themselves with the statement that the sulphur does not *all* exist as sulphuric acid. They do not appear to have attempted to prove that the sulphur exists as sulphur dioxide.

If you would say that the disproof of the sulphuric acid must be one of the arguments for the dioxide, I agree to this line of proof most heartily, for one of my contentions is "that there appears not to be a particle of evidence that sulphur dioxide has been detected in the air of a gas-lit room at any distance from the burner, or, in fact, in close proximity to it." *Ergo*, the dioxide not existing, the sulphuric acid must exist. It certainly appears to me, when gas is burned containing 40 or even 20 grains of sulphur per 100 cubic feet, that a chemist who assumes that it is converted into sulphur dioxide (as such exists in the air) ought to be able to point to some slight positive experimental evidence of its existence. This I cannot obtain myself, and I await it on the part of those who deny the existence of sulphuric acid. The present statement on their side of the case would appear to be that the sulphur dioxide

exists, but that the conditions are such that it gives nothing but the chemical reactions for sulphuric acid.

In this state I am willing to leave the question for the present, but I am in hopes of doing some further work upon the subject myself; and, if so, will ask to be allowed to lay before you any results which may accrue on this undoubtedly interesting question.

Manchester, Jan. 29, 1881.

HARRY GRIMSHAW.

P.S.—It has been doubted whether the injury which the leather bindings of books suffer in gas-lit rooms, in certain cases, arises from the action of the gas, or of the sulphur in gas. The two instances to which I alluded in my last letter were the following:—In the first case, the books upon the upper and middle shelves of a library were deteriorated; those upon the lower shelves but slightly, or not at all damaged. In fact, the deterioration proceeded from a maximum on the top shelf to a minimum on the bottom shelf; that is to say, in the upper portion of the room, where the products of combustion were greatest in amount and highest in temperature, the damage was also greatest. Now, upon chemical analysis, the amount of sulphuric acid in the bindings of the books was found to proceed in the same ratio; the largest percentage being in the upper shelves, and became progressively smaller towards the lower ones. The second instance is equally interesting. The private library of a gentleman, in splendid condition, became equally divided between two of his sons, in whose possession the books remained for a length of time, and one of whom eventually became possessed of the entire library. The son of this gentleman was my informant, and superintended the re-arrangement of the library upon this new addition. He found that whilst his father's books remained as perfect in binding as when new, the bindings of the other half of the same library were almost ruined. The library in which the damaged books had been kept was lighted by gas in the ordinary way; the sound portion had never been subjected to the action of gas lights—no other difference of condition being noticeable. Coal gas in rooms containing valuable books and pictures should be burned, if indispensable, in the form of a sunlight in the ceiling.—H. G.

[The only way open to us to deal with our correspondent's remarks—viz., by appending editorial notes to his letters—is manifestly very inconvenient; and we gladly avail ourselves of the opportunity of deferring further discussion of the question, until we are put in possession of the results of the experiments now promised by Mr. Grimshaw. We shall then have much satisfaction in re-opening the whole subject. Meanwhile, it is only justice to say that the question whether the sulphur exists in the atmosphere of a gas-lighted room as sulphur dioxide (SO_2), sulphurous acid (H_2SO_3), sulphur trioxide (SO_3), or sulphuric acid (H_2SO_4), must, in the present state of our knowledge, be attacked by indirect methods. We have not as yet any chemical test which will give us information of the sulphur without condensing it. Under certain conditions, not obtaining in an ordinary gas-lighted room, we can condense all the sulphur from a gas-flame as sulphuric acid; and under certain other conditions, not obtaining in a gas-lighted room, we can condense all the sulphur from a gas-flame as sulphurous acid. No chemist has directly proved the presence of sulphur dioxide at a distance from the burner in an ordinary room, because, we believe, the test employed is incapable of detecting the presence of such a small proportion of sulphur dioxide in an oxidizing atmosphere. We have positive evidence that the sulphur leaves the gas-flame as sulphur dioxide. What we require is positive evidence that the sulphur dioxide exists as a gas mixed with the air of an ordinary gas-lighted room, or positive evidence that sulphuric acid exists as a vapour or fine cloud mixed with the air. We only add that if gaseous sulphur dioxide, steam, and oxygen, do unite rapidly at ordinary temperatures to form sulphuric acid, the manufacturers of oil of vitriol have wasted a great many tons of sodium nitrate in the production of that unnecessary go-between, nitric oxide.—Ed. J. G. L.]

Legal Intelligence.

SHOTLEY BRIDGE COUNTY COURT.—MONDAY, JAN. 10.

(Before Mr. E. J. MEYNELL, Judge.)

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY v. CONSETT IRON COMPANY, LIMITED.

This case, which was tried to-day, was to recover damages for the breakage of certain gas-mains, caused by subsidence of ground occasioned by the undermining operations of the Consett Iron Company.

Mr. BARNES appeared for the Gas Company; Mr. COOPER for the Iron Company.

Mr. BARNES produced a plan of the locality, showing the breakages at three different points; and stated that the Consett Iron Company were the lessees of the mineral in the district, and had worked out the coal near to and underneath the highway, causing it to subside, and so break the main-pipes which the Gas Company, by authority of their Act of Parliament, had laid under such public highway. The amount claimed in consequence was £2 6s. 6d.

Mr. W. H. Hedley, Viewer for the Iron Company, produced the working plan of the defendants, which proved that the coal had been extracted at Bar House—i.e., the site of No. 1 breakage; but at the other two breakages they had not approached within 28 yards of the highway, while beyond this, on the west side, the whole of the coal had been extracted. Witness stated as his opinion that no damage would have occurred had there not been intervening works between the surface and the coal workings—which was the old ironstone workings—the No. 10 band seam and the No. 1 seam. These had been wrought before the Consett Iron Company came into possession of the royalties; but he admitted that the coal workings, having now approached nearer the highway, seemed to have contributed to the subsidence. At breakages Nos. 2 and 3 the ironstone mining had taken place 22 and 30 years ago.

Mr. W. Rippon, Surveyor to Consett Local Board, stated that the highway had subsided considerably for 100 yards in length; and that in May, 1879, he had repaired the damage and received payment from the Iron Company for such repairs. Since that date the Company had frequently repaired the road themselves, several houses having been damaged by the same subsidence.

Mr. COOPER submitted that the case could not be sustained by the Gas Company, inasmuch as the Lanchester Common Act, 1773, had reserved to the Lord of the Manor all minerals, and the powers of working them, without giving compensation for damage. He here quoted, at considerable length, from the Act in question, showing that the Lessees had full

liberty to do every act necessary for searching and winning the minerals, without paying any damages or making any satisfaction for so doing; also that the Act itself provided a special fund out of which damages to the Allottees were to be defrayed, and if this fund was insufficient, then all the Proprietors were to be rated to meet the expense and damages done within the Common inclosure. He also quoted the case of the *Duke of Buccleuch v. Wakefield*; as well as that of *Gill v. Dickinson*, in the Manor of Wolsingham, in support of the present arguments. He contended that the Gas Company were not a public concern, but a private trading body endowed with statutory powers; and, incorporating in their own Act the Gas-Works Clauses Act, were simply to confine their transactions within certain limits, and as such must rank under the Lanchester Common Act, and take their course amongst others. He further quoted section 59 of the Gas Company's special Act, by which the Company were allowed to supply gas of 12-candle illuminating power in consideration of the pipes being liable to breakage by railways, undermining, and other causes. This itself, he contended, was a compensation clause, as it was well known that the ordinary quality or illuminating power of gas was 15 candles. Lastly he held that the pipes having been all laid after the mineral had been wrought, the Gas Company could not sustain their case.

Mr. BARNES replied briefly, and stated that the cases of the *Duke of Buccleuch v. Wakefield* and *Gill v. Dickinson* both related to private lands, whereas this was a public highway; and that these points had been all dealt with in a Superior Court before the Lord Chief Baron and Baron Cleasby, in the case of the *Benfieldside Local Board v. Consett Iron Company*. In this latter case the Iron Company had been proved liable to pay compensation for damages to the highway. The Gas Company had a perfectly legal right to lay their pipes in or under the said highway, and the Iron Company having done an illegal act in letting down the highway, could not take advantage of other Acts of Parliament to exonerate themselves from this.

His Honour, having heard the evidence, said he could not give his decision to-day; but would take time to look into the Act, and give judgment at some future time.

STONEHOUSE COUNTY COURT.—TUESDAY, JAN. 18.
(Before Mr. M. FORTESCUE, Judge.)

THE SUPPLY OF WATER FOR TRADE PURPOSES.

Mr. T. Cammiford, a butcher, carrying on business in Cumberland Street, Devonport, was summoned by the Devonport Water Company, to recover £4 5s. for water supplied to him.

Mr. J. SHELLEY appeared for the Company; Mr. G. H. E. RUNDLE for the defendant.

Mr. SHELLEY stated that £3 15s. had been paid into Court, so the only amount in dispute was 10s.; but the principle involved was one of considerable importance. The 19th section of the Company's Act of 1876 provided that the rates of payment for water supplied for domestic purposes to the owner or occupier of any house within their district should be proportionate to the rack-rental or value of the house. This was the only provision made in the Act for specific rates of payment, and it only applied to water supplied for domestic purposes. The 20th section of the Act, however, prescribed that the Company might supply any person with water for any purpose for which no specific rates were made, upon such terms and conditions as might be agreed upon between the Company and persons desirous of obtaining a supply. In 1878 the Company framed a scale of charges for the supply of water for trades, manufactories, and other special purposes, and included in this list were butchers' shops, for which a charge of 2s. per half year was made. The defendant, being a butcher, was charged this amount in addition to the domestic charge, but had refused to pay the trade charge, and the Company declined to accept the amount due for the domestic supply to the house in Cumberland Street, without the trade charge for the shop attached to the premises. The sums due were 15s. domestic charge and 2s. trade charge for five quarters from July, 1878, and he (Mr. Shelley) contended that the defendant having paid the domestic charge into Court had admitted his liability to the other provisions of the Company for the payment of the trade charge.

Witnesses on behalf of the Company—Mr. Francis, the Manager, Mr. Kingcombe, the Collector, and others—were called to testify, that the defendant carried on part of his business on his premises in Cumberland Street, that there was a water-tap in the shop, and that the water was used for business purposes. The defendant was also called, but denied that the Cumberland Street premises were used as a butcher's shop, or that there was any use of water other than for ordinary domestic purposes. The shop was kept mainly for the sale of ham and bacon, whilst the bulk of his meat business was carried on in the market.

Mr. SHELLEY produced newspaper reports of certain meetings of the Devonport Mercantile Association, at one of which the defendant was reported to have said: "The Company have called upon me to pay 4s. a year as a butcher, but I do not intend to pay it, and if they cut off my water I will summon them for doing so."

His Honour, without calling upon Mr. Rundle, said whichever way the case went the defendant would ultimately have to pay for the supply of water to his shop in Cumberland Street, because power was given to the Company to charge extra for trade supplies, and if he refused to pay, then the Company had power to stop his supply of water. At the same time he did not think Mr. Shelley could carry the case further, because it was evident, from the 20th section of the Company's Act, that there must first of all be an agreement between the Company and any person using water for trade purposes. In this instance there not only was not an agreement, but a positive refusal to pay the charge from the time of its being levied; and under these circumstances he did not think the Company could recover. Their course would be to enter into a contract with the defendant, and if he still refused to pay, they had the power to cut off the supply. There was nothing exceptional in the powers given to the Company in their Act. Every Water Company in the Metropolis, and he thought he might safely say in the world, had a clause in their Act of Parliament empowering them to make a charge for trade supplies; and if the defendant chose to carry on a trade in connection with his domestic premises, he was liable to be charged for the trade.

Mr. RUNDLE said his argument was this: That if the defendant paid both charges on the same premises, the part of the premises which was charged for at the trade price should be considered in estimating the water-rate for the domestic portion of the premises, and a reduction to that extent made in the water-rate levied for domestic purposes.

His Honour pointed out that it was not for the shop, but for the trade itself that the second rate was levied. He gave a verdict for the defendant for the 10s. in dispute, with leave to the Company to appeal.

Mr. SAMUEL HAYNES, who for nearly 40 years has been Engineer and Manager to the Lichfield Gaslight Company, was at the last municipal election returned as a Town Councillor of the City of Lichfield, at the head of the poll, over 14 candidates. Mr. Haynes is a Dissenter, and in politics a Conservative.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION, 1881.

PROGRESS MADE TO SATURDAY, FEB. 5.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.
Aberdeen Corporation Bill	Lords	Jan. 27	Jan. 28	Feb. 2
Alnwick "Gas Bill"	Commons	Jan. 27	Jan. 28	..
Barrow-in-Furness Corporation Bill.	Lords	Jan. 27	Jan. 28	Feb. 2
Beverley "Water Bill"	Commons	Feb. 4	..	..
Bingley "Water and Improvement)	Lords	Jan. 27	Jan. 28	Feb. 2
Bill	Commons	Jan. 31	Feb. 2	..
Birkenhead Corporation (Gas and	Lords	Jan. 27	Jan. 28	Feb. 4
Water) Bill	Commons . . . .	..	..	..
Bradford Water and Improvement)	Lords	Jan. 27	Jan. 28	..
Bill	Commons . . . .	..	..	..
Bray Township Bill	Lords . . . .	..	..	..
"	Commons . . . .	..	..	..
Brighton and Hove Gas Bill	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 27	Jan. 28	..
Cambridge University and Town)	Lords	Jan. 27	Jan. 28	..
Gas Bill	Commons	Jan. 27	Jan. 28	..
Cheltenham Corporation Water Bill.	Lords	Jan. 27	Jan. 28	Feb. 2
"	Commons . . . .	..	..	..
Cleator Moor Local Board Bill " . .	Lords	Feb. 4	..	..
"	Commons	Jan. 28	Jan. 28	Feb. 3
Colne and Marsden Local Board Bill.	Lords . . . .	..	..	..
"	Commons	Feb. 2	Feb. 3	..
Dudley Gas Bill. "	Lords	Jan. 28	Jan. 31	..
"	Commons	Jan. 27	Jan. 28	..
Dundalk Water Bill	Lords	Jan. 28	Jan. 28	..
"	Commons . . . .	..	..	..
Eastbourne Water Bill	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 28	Jan. 28	..
East London Water "Bill.	Lords . . . .	..	..	..
"	Commons	Jan. 27	Jan. 28	Feb. 2
Egremont Local Board Bill.	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 27	Jan. 28	..
Fylde Water Bill "	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 27	Jan. 28	..
Goole and District Gas and Water)	Lords	Jan. 27	Jan. 28	..
Bill	Commons	Jan. 28	Jan. 31	..
Hexham Gas Bill	Lords	Jan. 28	Jan. 31	..
"	Commons	Jan. 31	..	..
Holland " (Parts of) and Sutton)	Lords	Jan. 31	..	..
Bridge Water Bill	Commons	Jan. 31	..	..
Hyde Gas Bill	Lords	Jan. 28	Jan. 31	..
"	Commons	Jan. 31	Feb. 2	..
Irvine Burgh Bill	Lords	Jan. 31	Jan. 31	..
"	Commons	Jan. 28	Jan. 31	..
Kirkcaldy and Dysart Water Bill . .	Lords	Jan. 28	Jan. 31	..
"	Commons	Jan. 28	Jan. 31	..
London Sea Water Supply Bill . . .	Lords	Jan. 28	Jan. 31	Feb. 1
"	Commons	Jan. 28	Jan. 28	..
Lower Thames Valley Main Sewer-)	Lords	Jan. 27	Jan. 28	..
age Board Bill	Commons	Jan. 28	Jan. 28	..
Matlock Water Bill	Lords	Jan. 27	Jan. 28	Feb. 1
"	Commons	Jan. 28	Jan. 28	..
Oban Burgh Bill	Lords	Jan. 27	Jan. 28	Feb. 4
"	Commons	Jan. 27	Jan. 28	..
Paisley Burgh Bill	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 27	Jan. 28	Feb. 4
Reading Corporation Bill	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 27	Jan. 28	..
Richmond Gas Bill "	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 31	Feb. 2	..
Ryton Local Board (Water) Bill . .	Lords	Jan. 31	Feb. 2	..
"	Commons	Jan. 31	Feb. 2	..
Sevenoaks Gas Bill "	Lords	Jan. 31	Feb. 2	..
"	Commons	Jan. 27	Jan. 28	..
Sheffield Water Bill	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 27	Jan. 28	..
South Metropolitan Gas Bill	Lords	Jan. 27	Jan. 28	..
"	Commons	Jan. 28	Jan. 31	..
Stalybridge Extension and Improve-)	Lords	Jan. 28	Jan. 31	..
ment Bill	Commons	Jan. 31	Feb. 2	..
Stirling Water Bill	Lords	Jan. 27	Jan. 28	Feb. 4
"	Commons	Jan. 27	Jan. 28	..
Westbury-upon-Trym Gas (No. 1))	Lords	Jan. 27	Jan. 28	..
Bill	Commons	Jan. 27	Jan. 28	..
Westbury-upon-Trym Gas (No. 2))	Lords	Jan. 27	Jan. 28	..
Bill	Commons	Jan. 28	Jan. 31	..
Westgate and Birchington Gas Bill.	Lords	Jan. 28	Jan. 31	..
"	Commons . . . .	..	..	..
Woking Gas and Water Bill	Lords . . . .	..	..	..
"	Commons . . . .	..	..	..
Woking "Water and "Gas Bill . . .	Lords	Jan. 28	Jan. 31	..
"	Commons . . . .	..	..	..

HOUSE OF LORDS.

MONDAY, JAN. 31.

The Examiners reported that the Standing Orders applicable to the following Bills had been complied with:—Birkenhead Corporation Gas and Water; Irvine Burgh; Ryton Local Board Water; Sevenoaks Gas; Stirling Water.

TUESDAY, FEB. 1.

The Examiners reported that the Standing Orders applicable to the following Bills had been complied with:—Beverley Water; Dudley Gas.

THE METROPOLITAN WATER TRUST.

The Earl of CAMPERDOWN, who had given notice of his intention "to ask whether, considering the present condition of public business, it is not advisable to introduce into the House of Lords the Bill providing for the creation of a Metropolitan Water Trust," said: I do not know whether it is constitutional for your lordships to possess or to obtain any knowledge of the progress of business in another place; but it has been stated in the public journals (and there is some reason to believe the statement) that public business in that other place has not yet commenced, and in this House the

progress has been very slow indeed. I must say, however, that if your lordships have not proceeded with business, it has not been because you were unwilling to proceed with it, but because so very little has been placed before you. I am free to admit that there are many classes of Bills which are of a nature that they could not properly be first introduced in this House, and I was not surprised the other night that the Government declined to introduce either the Irish Coercion Bill or the Irish Land Bill into this House. But there are many Bills of such a nature that they might be introduced into this House with great advantage, both to the public and to your lordships, especially considering the present position of public business in the House of Commons. The Home Secretary has given notice in another place that it is the intention in the present session of Parliament to introduce a measure for the creation of a Metropolitan Water Trust, which is a subject that has for many years been before your lordships, and one that has attracted the attention of the Metropolitan Board of Works. It appears to me that this is a Bill which could with great advantage be introduced into this House; and not merely is this the case, but if the Bill be not introduced into this House, I go so far as to say that either it will not pass at all this session, or at all events, will not receive that consideration which its importance demands and deserves of Parliament. This subject is of great Metropolitan interest, and your lordships' attention has been called to it for several years. The Metropolitan ratepayers are now thoroughly alive to its importance, and moreover I think there is a general belief that it would be a good thing if it were possible to at once take some step in the matter. At all events, it seems to me that the measure might be introduced into this House. I believe that the Metropolitan ratepayers have the greatest confidence in your lordships' judgment. It is a subject with which, from your well-known experience of business, your lordships are well adapted to deal. There is one objection to introducing the Bill into this House which I hope I shall not hear to-night, and that is that the Metropolitan Water Trust Bill is a Rating Bill. I have been some years in your lordships' House, and I notice that when a Bill of this kind is proposed to be introduced, which it is inconvenient for them to discuss, the Government—I am not speaking of the present Government particularly, but all Governments—found their objection to it on the ground that it contains rating clauses. And, moreover, I have observed that members of the Government who have taken this objection have within a few days themselves introduced a Rating Bill. I remember that a noble Lord not now present (Earl Cairns), who objected to some measures on that ground, himself introduced, a very short time afterwards, a Bill, every clause of which involved the levying of rates. After the introduction of the Thames Floods Prevention Bill into this House, I hope we shall hear no objection to the Metropolitan Water Trust Bill being introduced here because it is a Rating Bill.

The Earl of DALHOUSIE: I am sorry that I cannot give an explicit answer to the question of my noble friend. The matter is still under the consideration of the Secretary of State, and up to the present moment he has not arrived at any decision in regard to it. My noble friend has given your lordships some excellent reasons why the Metropolis Water Bill should be introduced in the first instance into your lordships' House. I may say that there are one or two reasons in the other direction; but as I cannot give a positive answer to the question of my noble friend, it is unnecessary for me now to go into these reasons. All I can say at present on the part of the Government is that careful attention will be given to the observations of my noble friend.

HOUSE OF COMMONS.

MONDAY, JAN. 31.

The petitions were presented for the following Bills, which were ordered to be brought in:—Birkenhead Corporation Gas and Water, by Mr. MacIver and Sir P. Egerton; Holland (Parts of) and Sutton Bridge Water, by Mr. C. Lawrence and Sir W. Welby-Gregory; Irvine Burgh, by Colonel Alexander, Mr. Patrick, and Mr. R. Campbell; Ryton Local Board (Water), by Colonel Joicey and Mr. C. Palmer; Sevenoaks Gas, by Sir C. Mills and Viscount Lewisham; Stirling Water, by Mr. Bolton and Mr. Campbell Bannerman.

TUESDAY, FEB. 1.

A petition against the Matlock Water Bill was presented from William Lucas.

WEDNESDAY, FEB. 2.

The petition was presented for the Dudley Gas Bill, which was ordered to be brought in by Mr. Staveley Hill and Mr. Hastings.

A petition against the Eastbourne Water Bill was presented from the Hailsham Rural Sanitary Authority.

FRIDAY, FEB. 4.

The Select Committee on Standing Orders reported that in the case of the petition for the Cleator Moor Local Board Bill the Standing Orders ought to be dispensed with.

Petitions against the following Bills were presented:—

Bingley Water and Improvement, from Joseph Haley Freeman and others.
 Bradford Water and Improvement, from (1) Shipley Gaslight Company; (2) Joseph Haley Freeman and others; (3) Clayton, Allerton, and Thornton Gas Company; (4) Pudsey Coal Gas Company.
 Brighton and Hove Gas, from Corporation of Brighton.
 Holland (Parts of) and Sutton Bridge Water, from Samuel Chatterton.
 London Sea Water Supply, from (1) Fulham District Board of Works; (2) Conservators of the River Thames.
 South Metropolitan Gas, from Conservators of the River Thames.
 Petitions were presented for the following Bills, which were ordered to be brought in:—Beverley Water, by Mr. Sykes, Mr. Samuelson, and Mr. Lewis; Cleator Moor Local Board, by Mr. Wyndham and Mr. Ainsworth.

SATURDAY, FEB. 5.

Petitions against the following Bills were presented:—

Brighton and Hove Gas, from Brighton Gaslight and Coke Company.
 Goole and District Gas and Water, from Corporation of the Level of Hatfield Chase.

Miscellaneous News.

GAS AND ELECTRICITY AS HEATING AGENTS.

By Dr. C. W. SIEMENS, F.R.S., &c.

[A Lecture delivered, Thursday, Jan. 27, at Glasgow, under the auspices of the Science Lectures Association.]

On the 14th of March, 1878, I had the honour of addressing you "On the Utilization of Heat and other Natural Forces." I then showed that the different forms of energy which Nature has provided for our uses had their origin, with the single exception of the tidal wave, in solar radiation; that the forces of wind and water, of heat and electricity, were attributable to this source; and that coal formed only a seeming and not a real exception to the rule—being the embodiment of a fractional portion of the solar energy of former geological ages.

On the present occasion I wish to confine myself to one branch only of the general subject—namely, the production of heat-energy. I shall endeavour to prove that for all ordinary purposes of heating and melting, gaseous fuel should be resorted to; but that for the attainment of extreme degrees of heat, the electric arc possesses advantages unrivalled by any other known source of heat.

Carbonaceous material, such as coal or wood, is practically inert to oxygen at ordinary temperatures; but if wood is heated to 295° C. (593° Fahr.), or coal to 326° C. (619° Fahr.), according to experiments by M. Marbach, combination takes place between the fuel and the oxygen of the atmosphere, giving rise to the phenomenon of combustion. It is not necessary to raise the whole of the combustible materials to this temperature in order to continue the action. The very act of combustion, when once commenced, gives rise to a great development of heat—more than sufficient to prepare additional carbonaceous matter, and additional air for entering into combination. Thus a match suffices to ignite a shaving, and this in its turn to set fire to a building.

The first effect of combustion is, therefore, to heat the combustible, and the air necessary to sustain combustion, to the temperature of ignition; but in dealing with the combustible called coal, other preparatory work has to be accomplished besides mere heating, in order to sustain combustion. The following is an analysis, from Dr. Percy's work on "Fuel," of a coal from the Newcastle district:—

Carbon	81.41	Nitrogen	2.05
Hydrogen	5.83	Sulphur	0.71
Oxygen	7.90	Ash	2.07

This shows at a glance that nearly 16 per cent. of the total weight consists of such permanent gases as hydrogen, oxygen, and nitrogen. These gases are partly occluded or absorbed within the coal, but are also combined with carbon, forming volatile compounds, such as the hydrocarbons and ammonia; so that when coal is subjected to heat in a closed retort, as much as 34 per cent. passes away from the retort in a gaseous condition and as vapour of water, partly to condense again in the form of tar and ammoniacal liquor, and partly to pass into the gas-mains as illuminating gas—a mixture mainly of marsh gas (CH₄), olefiant gas (C₂H₄), and acetylene (C₂H₂); its value as an illuminant depending upon the percentage of the last two constituents, rich in carbon. The result of the distillation of a ton of coal will be as follows, from data with which Mr. Alfred Upward has kindly supplied me:—

Coke	Cwt.
Tar	13.60
Ammoniacal liquor	1.20
Gas	1.45
Carbonic acid	3.15
Sulphur—removed by purifying	0.18
Loss	0.30
	0.12

So great is the loss of heat sustained in an ordinary coal fire, in consequence of the internal work of volatilization, that such a fire is scarcely applicable for the production of intense degrees of heat, and it has been found necessary to deprive the coal in the first place of its volatile constituents (to convert it into coke), in order to make it suitable for the blast furnace, for steel melting, and for many other purposes where a clear intense heat is required.

In the ordinary coke oven the whole of the volatile constituents are lost, and each 100 lbs. of coal yield only 66 lbs. of coke, including the whole of the earthy constituents, which on a large average may be taken at 6 lbs., leaving a balance of 60 lbs. of solid carbon. In burning these 60 lbs. of pure carbon 220 lbs. of carbonic anhydride (CO₂) are produced, and in this combination 60 × 14,500 = 870,000 heat units (according to accurate determinations by Favre and Silbermann, Dulong, and Andrews) are produced.

The 34 per cent. of volatile matter driven off yield—when the condensable vapour of water, ammonia, and tar are separated—about 16 lbs. of pure combustible gas (being equal to about 10,000 cubic feet per ton of coal), which in combustion produce 16 × 22,000 = 352,000 heat units. The escape of these gases from the coke-oven constitute a very serious loss, which may be saved, to a great extent at least, if the decarbonization is effected in retorts. The total heat producible from each 100 lbs. of coal is in that case 870,000 + 352,000 = 1,222,000 or 12,220 units per pound of coal. Deduction from this must, however, be made for the heat required to volatilize 34 lbs. of volatile matter for every 100 lbs. of coal used, and also for heating the coke to redness, or say to 1000° Fahr. Considering the multiplicity of gases and vapours produced, it would be tedious to give the details of this calculation, the result of which would approximate to 60,000 heat units, or 600 units per pound of coal treated.

We thus arrive at 12,200 – 600 = 11,600 heat units as the maximum result to be obtained from 1 lb. of best coal. Considering, however, that the coal commonly used for industrial purposes contains more ashes and more water than have been here assumed, a reduction of, say, 10 per

cent. is necessary, and the calorific power of ordinary coal may fairly be taken at 10,500 units per pound.

In applying this standard of efficiency to actual practice, it will be found that the margin for improvement is large indeed. Thus in our best steam-engine practice we obtain one actual horse power with an expenditure of 2 lbs. of coal per hour (the best results on record being 1.5 lbs. of coal per indicated horse power). A horse power represents 33,000 × 60 = 1,980,000 foot-pounds per hour, which is 1,980,000 ÷ 2 = 990,000 foot-pounds, or units of force, per pound of fuel. Dr. Joule has shown us that 772 foot-pounds represent one unit of heat, and 1 lb. of coal therefore produces 990,000 ÷ 772 = 1282 units of heat, instead of 10,500, or only one-eighth part of the utmost possible result.

In melting steel in pots in the old-fashioned way, as still practised largely at Sheffield, 2½ tons of best Durham coke are consumed per ton of cast steel produced. The latent and sensible heat really absorbed in a pound of steel in the operation does not exceed 1800 units, whereas 2½ lbs. of coke are capable of producing 13,050 × 2.5 = 32,625 units, or 18 times the amount actually utilized.

In domestic economy the waste of fuel is also exceedingly great; but it is not easy to give precise figures representing the loss of effect, owing to the manifold purposes to be accomplished, including cooking and the heating and ventilation of apartments. If ventilation could be neglected, close stoves such as are used in Russia, would unquestionably furnish the most economical mode of heating our apartments; but health and comfort are, after all, of greater importance than economy, and these are best secured by means of an open chimney. Not only does the open chimney give rise to an active circulation of air through the room, which is a necessity for our well-being, but heat is supplied to the room by radiation from the incandescent material, instead of by conduction from stove surfaces. In the one case the walls and furniture of the room absorb the luminous heat-rays, and yield them back to the transparent air; whereas in the latter case the air is the first recipient of the stove heat, and the walls of the room remain comparatively cold and damp, giving rise to an unpleasant musty atmosphere, and to dry rot or other mouldy growth. The adversaries of the open fire-place say that it warms you on one side only, but this one-sided radiant heat produces upon the denizens of this somewhat humid country, and indeed upon all unprejudiced people, a particularly agreeable sensation. This is proof, I think, of its healthful influence. The hot radiant fire imitates, indeed, the sun in its effect on man and matter, and before discarding it on the score of wastefulness and smokiness, we should try hard, I think, to cure it of its admitted imperfections.

If incandescent coke is the main source of radiant heat, why, it may be asked, do we not at once resort to coke for our domestic fuel? The reasons are twofold—the coke would be most difficult to light, and when lighted would look cheerless without the lively flickering flame.

The true solution consists, I venture to submit, in the combination of solid and gaseous fuel when brought thoroughly under control, by first separating these two constituents of coal. I am bold enough to go so far as to say that raw coal should not be used as fuel for any purpose whatsoever, and that the first step towards the judicious and economic production of heat is the gas-retort or gas-producer, in which coal is converted either entirely into gas, or into gas and coke, as is the case at our ordinary gas-works.

When, in the early part of the present winter, London was visited by one of its densest fogs, many minds were directed towards finding a remedy for such a state of things. In my own case it has resulted in an arrangement which has met with a considerable amount of favour and practical success, and I do not at all hesitate to recommend it to you also for adoption. One arrangement of this grate is here represented.* The iron dead plate, c, is riveted to a stout copper plate, a, facing the back of the fire-grate, and extending 5 inches both upwards and downwards from the point of junction. The dead plate, c, stops short about an inch behind the bottom bar of the grate, to make room for a ½-inch gas-pipe, f, which is perforated with holes of about 1-16th of an inch, placed at distances of ½ inches along the inner side of its upper surface. This pipe rests upon a lower plate, d, which is bent downwards towards the back, so as to provide a vertical and horizontal channel of about 1 inch in breadth between the two plates. A trap-door, e, held up by a spring, is provided for the discharge of ashes falling into this channel. The vertical portion of the channel is occupied by a strip of sheet copper about 4 inches deep, bent in and out like a lady's frill, and riveted to the copper back-piece. Copper being an excellent conductor of heat, and this piece presenting (if not less than ½-inch thick) a considerable sectional conductive area, transfers the heat from the back of the grate to the frill-work in the vertical channel. An air current is set up by this heat, which, in passing along the horizontal channel, impinges on the line of gas-flames, and greatly increases their brilliancy. So great is the heat imparted to the air by this simple arrangement, that a piece of lead of about half a pound in weight introduced through the trap-door into the channel melted in 5 minutes, proving a temperature exceeding 619° Fahr., or 326° C. The abstraction of heat from the back has, moreover, the advantage of retarding the combustion of the coke there while promoting it at the front of the grate.

This fire-place was set up at my office, which is a room of 7200 cubic feet capacity facing the north. I always found it difficult during cold weather to keep this room at 60° Fahr. with a coal fire, but it has been easily maintained at this temperature since the grate has been altered to the gas-coke grate just described.

In order to test the question of economy, I have passed the gas consumed in the grate through a Parkinson's 10-light dry gas-meter supplied to me by the Woolwich, Plumstead, and Charlton Consumers' Gas Company. The coke used was also carefully weighed. The result of a day's campaign of 9 hours was a consumption of 62 cubic feet of gas and 22 lbs. of coke—the coke remaining in the grate being in each case put to the debit of the following day. Taking the gas at the average London price of 3s. 6d. per 1000 cubic feet, and the coke at 18s. per ton, the account stands thus for 9 hours:—

62 cubic feet of gas at 3s. 6d. per 1000 feet	2.604d.
22 lbs. coke at 18s. per ton	2.121
Total	4.725d.

or at the rate of 0.525d. per hour. In its former condition, as a coal-grate, the consumption generally exceeded 2½ large scuttles a day, weighing 19 lbs. each, or 47 lbs. of coal, which at 23s. a ton equals 5.7d. for 9 hours, being 0.633d. per hour. This result shows that the coke-gas fire, as here described, is not only a warmer but a cheaper fire than its predecessor; with the advantages in its favour that it is lit without the trouble of laying the fire, as it is called, and keeps alight without requiring to be stirred, that it is thoroughly smokeless, and that the gas can be put off or on at any moment, which in most cases means considerable economy.

A second and more economical arrangement as regards first cost consists

* A diagram was shown similar to that reproduced in the JOURNAL of Nov. 23 last year, Vol. XXXVI., p. 807.

of two parts which are simply added to the existing grate, viz.:—(1) a gas-pipe with a single row of holes about 1-16th inch diameter, 1·5 inches apart along the upper side, inclining inward, and (2) an angular plate of cast-iron, with projecting ribs extending from front to back on its under side, presenting a considerable surface, and serving the purpose of providing the heating surface produced by the copper plate and grill-work in my first arrangement. In using iron instead of copper, it is necessary, however, to increase the thickness of the plates and ribs in the inverse ratio of the conductivity of the two metals, or, as regards the back plate, from $\frac{1}{4}$ -inch to $\frac{3}{4}$ -inch. An inclined plate fastened to the lower grate-bar directs the incoming air upon the heating surfaces, and provides at the same time a support for the angular and ribbed plate, which is simply dropped into its firm position between it and the back of the grate. The front edge of the horizontal plate has vandyked openings, forming a narrow grating through which the small quantity of ashes that will be produced by combustion of coke or anthracite in the front part of the grate discharge themselves down the incline towards the back of the hearth, where an open ash-pan may be placed for their reception.

In adapting the arrangement to existing grates, the ordinary grating may be retained to support the angular plate, which has in this case its lower ribs cut short to the level of the horizontal grate.

A considerable number of grates have now been constructed or altered in accordance with my plan, and have given great satisfaction to the users, on account of convenience and economy, which are conditions essentially necessary, if we are to make any way towards the more important, I may say national result of a smokeless London, a smokeless Manchester, and a smokeless Glasgow.

But it may be asked—Are you sure that the coke and gas grate you advocate will do away with fogs and smoke? My answer is, that it would certainly do away with smoke, because the products of combustion passing away into the chimney are perfectly transparent. Mr. Aitken has, however, lately proved, in an interesting paper read before the Royal Society of Edinburgh, that even with perfect combustion a microscopic dust is sent up into the atmosphere, each particle of which may form a molecule of fog. We have evidence, indeed, that the whole universe is filled with dust, and this is, according to Professor Tyndall, a fortunate circumstance, for without dust we should not have a blue but a pitch black sky, and on our earth we should be, according to Mr. Aitken, without rain, and should have to live in a perpetual vapour bath. The gas fires would contribute, it appears, to this invisible dust, and we should, no doubt, continue to have fogs, but these would be white fogs, which would not choke and blacken us.

Granted the cure of smoke, it might still be questioned whether such a plan as is here proposed could be carried out on so large a scale as to affect our atmosphere, with the existing mains and other plant of the gas-works. If gas were to be depended upon entirely for the production of the necessary heat, as is the case with an ordinary gas and asbestos grate, it could easily be proved that the existing gas-mains would not go far to supply the demand. Each grate would consume from 50 to 100 cubic feet an hour, representing in each house a consumption exceeding many times the supply to the gas lights. My experiments prove, however, that an average consumption of from 6 to 8 cubic feet of gas per hour suffices to work a coke-gas grate on the plan here proposed. This is about the consumption of a large Argand burner, and therefore within the limits of ordinary supply.

But independently of the practical question of supply, it is desirable, on the score of economy, to rely upon the solid carbon chiefly for the production of radiant heat, for the following reason:—1000 cubic feet of ordinary illuminating gas weigh 34 lbs., and the heat developed in their combustion amounts to $34 \times 22,000 = 748,000$ heat units. 1 lb. of solid coke develops in combustion, say, 13,400 heat units (assuming 8 per cent. of incombustible admixture); and it requires $748,000 \div 13,400 = 56$ lbs., or just half a hundredweight, of this coke to produce the same heating effect as 1000 cubic feet of gas. But 1000 cubic feet of gas cost, on an average, 3s. 6d., and half a hundredweight of coke not more than 6d. (at 20s. a ton), or only one-seventh part of the price of gas.

If heating gas could be supplied at a much cheaper rate, it would in many cases be advantageous to substitute incombustible matter, such as balls of asbestos for the coke or anthracite. The consumption of gas would in this case have to be increased very considerably, but the economical principle involved (that of heating the air of combustion by conduction from the back of the grate) would still apply, and produce economical results as compared with those obtained by the gas-asbestos arrangements hitherto used.

To illustrate the efficiency of this mode of heating the incoming air by what is called waste heat, I will show you another application of the same principle, which I have made very recently, to the combustion of gas for illuminating purposes. Gas engineers have until now been under the impression that a supply of cold air was favourable to the production of a brilliant flame. This is a misconception, which was very general also as regards the combustion of solid fuel in furnaces, until it was disproved by Stirling, by Neilson, and by the introduction of the regenerative gas furnace. The "duplex burner" owes its brilliancy to the heating effect of the one burner upon the other; and my brother, Mr. Frederic Siemens, has more recently constructed a burner in which the flame of the gas is reversed in its action, in order to heat in its descent the ascending current of flame-supporting air.

By the application of the principle of conduction before described, I obtain the hot-air current, in a most simple manner, without interfering with the free action of the flame. The construction of my burner is the same as an ordinary Argand burner, but it takes its supply of gas through an enlarged vertical copper tube. This copper pipe terminates in a rod of highly conductive copper, which passes upwards through the burner, and carries at its top a ball of porcelain or other refractory material. The rod is coated with platinum or nickel to prevent oxidation when heated (almost to redness) by the heat of the flame. The tube is armed with radial plates of copper, presenting a considerable aggregate surface, and abutting externally against a covering of asbestos or other non-conductive material. The waste heat of the flame, or that portion of the heat produced in combustion which is not utilized in luminous rays, serves to heat the ball of refractory material and the conductive rod; and the heat is thus transferred by conduction to the tube, with its laminar radii, between the extensive surfaces of which currents of air are free to ascend toward the Argand burner. The air is thus heated to from 700° to 800° Fahr. before meeting the gas, and the ultimate temperature of the flame is increased to at least the same amount, causing a larger proportion of the heat developed in combustion to reach the point of luminous radiation.

But not only the quantity of light but its quality is improved by the higher temperature obtained. It may appear surprising, but it is a fact susceptible of accurate proof, that the light obtained in the consumption of a given amount of gas may thus be increased by some 40 per cent., and that in this large proportion the deleterious influences connected with gas lighting may be diminished. Gas will thus be better able to hold its position against its more brilliant rival, the electric light, except for such large applications as the lighting of public halls and places, of harbours, railway stations, warehouses, &c., for which it is pre-eminently suited.

Add to these improved applications of gas the ever-increasing ones for heating purposes, and I have only to express regret that I am not a gas shareholder.

If, however, gas is to be largely employed for heating purposes, it will have to come down in price; and considering that heating gas need not be highly purified, or be possessed of high illuminating power, the time will come, I believe, when we shall have two services, one for illuminating, and the other for heating gas. In many towns two systems of gas-mains already exist; and it would only be necessary to appropriate the one for illuminating and the other for heating gas. The ordinary retorts could be used for the production of both descriptions of gas, it being well known that even ordinary coal will give up gases of high illuminating power during a certain portion of the time occupied in their entire distillation. The gases emitted from the retort when first charged are to a great extent occluded gases of low illuminating power, such as fire-damp or marsh gas, and these should be turned into the heating gas mains. In the course of half an hour these occluded gases, together with the aqueous and other vapours, will have left the coal, which is then in the best condition to evolve olefiant gas and other gases rich in carbon, and therefore of high illuminating power. The period during which such illuminating gases are emitted extends over probably two hours, after which the retorts should again be connected with the heating gas mains, until the end of the process. The result of this *modus operandi* would be that the illuminating gas supplied, say, in London, would probably exceed 20-candle power from Newcastle coal, instead of 16 as at present, whereby the objectionable results of gas lighting would be greatly diminished, and there would be, say, an equal volume of heating gas available, consisting for the most part of marsh gas, which although greatly inferior to olefiant gas in illuminating effect, would be actually more suitable for heating purposes, because less liable to produce soot in its combustion.

The total cost of production would not be increased by this separation of the gases, and the price might, with advantage both to the supplier and to the consumer, be so adjusted that the latter, while paying for his illuminating gas an increased price, proportionate to the increase of illuminating power, would be furnished with a heating gas at greatly reduced cost; for the heating gas could be reduced in price in a much larger proportion than the illuminating gas would have to be raised, because it would not require the same purification from sulphur, which renders illuminating gas comparatively costly. The enormous increase of consumption would, moreover, enable the gas companies to reduce prices all round very considerably, without interfering with their comfortable revenues.

For large applications of heating gas to the working of furnaces and boilers, simpler means than the retort can be found for its production. I need not now describe in detail the gas producer which I constructed many years ago in connection with my regenerative gas furnace. In it all the carbonaceous matter of the coal is converted into combustible gas, the solid carbon yielding a supply of carbonic oxide. The resultant mixture of combustible gas contains a very large proportion—averaging 61·5 per cent.—of nitrogen, which swells its volume without in any way contributing to its heating power.

It has been my endeavour for some time to construct a gas producer which, without losing the simplicity of the first, should be capable of yielding a heating gas of superior calorific power. This producer consists of a wrought-iron cylindrical chamber, truncated downwards, and lined with brickwork. The fuel to be converted into gas is introduced through a hopper, and the cinder and ashes work out through the open orifice at the bottom. Instead of a grating for the introduction of atmospheric air, a current of heated air is brought in, either through the hopper or through the orifice at the bottom, and is discharged into the centre of the mass of fuel. The effect is the generation of a very intense heat at that point. The fuel, after its descent through the hopper, arrives gradually at this region of intense heat, and when subjected to it, parts with its gaseous constituents. At the point of maximum heat coke is consumed, producing carbonic anhydride, which, in passing through the considerable thickness of fuel surrounding this portion, takes up a second equivalent of carbon, and becomes changed into carbonic oxide. Here also the earthy constituents are for the most part separated in a fused or semi-fused condition, and in descending gradually reach the orifice at the bottom, whence they are removed from time to time. Air enters through the bottom orifice to some extent, causing the entire consumption of the carbonaceous matter which may have got past the zone of greatest heat. Water is also here introduced in a hollow tray; and, after evaporation by the heat of the hot clinkers, passes upwards through the incandescent mass, and is converted by decomposition into carbonic oxide and hydrogen gas. The exit orifices for the gases are placed all round, near the circumference of the chamber, ascending upwards into an annular space, whence they are taken through pipes to the furnace or other destination.

The advantages connected with this *modus operandi* consist in the intensity of the heat produced within the centre of the mass, whereby the whole of the fuel is converted into combustible gases, with the least amount of nitrogen. The hydrocarbons formed in the upper portion of the apparatus have to descend through the hotter fuel below, and in so doing the tar and other vapours mixed up with them are decomposed, and furnish combustible gases of a permanent character.

The orifice at the bottom of the apparatus may be enlarged, and so arranged that, instead of ashes only being produced, coke may be withdrawn, and in this way a continuous coke oven may be constructed, which is at the same time a gas producer; or, in other words, an apparatus in which both the solid and gaseous constituents of the coal are fully utilized. The intense heat in the very centre of a large mass of fuel has for its result a very rapid distillation, and thus one gas producer does the work of two or three gas producers of the type hitherto employed. This more concentrated action will, moreover, allow of the introduction of gaseous fuel, where want of space and considerations of economy have militated hitherto against it, and in favour of the ordinary coal furnace.

It has been already proved that steam-boilers can be worked economically on land with gaseous fuel, and there is no reason that I know of why the same mode of working should not also be applied to marine boilers. The marine engine has within the last 15 years been improved to an extent which is truly surprising. The consumption of coal, which at the commencement of that period was never less than 8 lbs. per horse power, has been reduced by expansive working in compound cylinders to 2 lbs., or even less, per actual horse power. The mode of firing marine boilers has, however, remained the same as it was in the days of Watt and Fulton. In crossing the Atlantic one may see a considerable number of men incessantly employed in the close stoke-hole of the vessel, opening the fire-doors and throwing in fuel. Each charge gives rise to the development of great clouds of black smoke issuing from the chimney, to the great annoyance and discomfort of the passengers on deck. If, instead of this, the fuel could be discharged mechanically into one or more gas producers, the gaseous fuel produced would maintain the boilers at a very uniform heat, without necessitating the almost superhuman toil of the fireman; no smoke or dust would be emitted from the chimney, and a large saving of fuel would be effected. This change would be spe-

cially appreciated by the numerous tourists visiting the Western Highlands. Speaking from my own experience on one occasion, I may say that the pleasure of a trip on the beautiful Loch Lomond was very seriously marred in consequence of the fumigation which my fellow-passengers and myself had to endure.

The change from the use of solid to gaseous fuel would be the prelude probably to another, and still more important change—namely, the entire suppression of the steam-boiler. We are already in possession of gas-engines working at moderate expense as compared with small steam-engines, even when supplied with the comparatively expensive gas from our town gas-mains, and all that will be required is an extension of the principle of operation already established. The realization of such a plan would, of course, involve many important considerations, and may be looked upon as one of those subjects the accomplishment of which may be left for the energy and inventive power of the rising generation of engineers.

Before leaving this branch of the subject, I wish to call attention to a favourable suggestion which I had occasion to make some years ago. It consists in placing gas producers at the bottoms of the coal mines themselves, so that instead of having to raise the coal by mechanical power, the combustible gases ascending from the depth of the mine to the surface would acquire, by virtue of their low specific gravity, such an onward pressure that they could be conducted in tubes to distances of many miles, thus saving the cost of raising and transporting the solid fuel. Glasgow, with its adjoining coal-fields, appears to me a particularly favourable locality for putting such a plan to a practical trial, and the well-known enterprise of its inhabitants makes me sanguine of its accomplishment. When thus supplied with gaseous fuel, the town would not only be able to boast of a clear atmosphere, but the streets would be relieved of the most objectionable portion of the daily traffic.

I now approach another and the last portion of my address—the attainment of very intense degrees of heat either for effecting fusion or chemical decomposition. Although, by means of the combustion of either solid or gaseous fuel, heats are produced which suffice for all ordinary purposes, there is a limit imposed upon the degree of temperature attainable by any furnace depending upon combustion. It has been shown by Bunsen and by St. Claire Deville, that at certain temperatures the chemical affinity between oxygen on the one hand and carbon and hydrogen on the other absolutely ceases, and that if the products of combustion—carbonic acid and water—be exposed to such a degree of temperature, they would fall to pieces into their constituent elements. This point of dissociation, as it is called, is influenced by pressure, but has been found for carbonic acid under atmospheric pressure to be 2600° C. (4700° Fahr.). But long before this extreme point has been arrived at, combustion is greatly retarded, and the limit is reached when the losses of heat by radiation from the furnace balance its production by combustion.

To electricity we must look, then, for the attainment of a temperature above that of dissociation, and we have evidence of the early application of the electric arc to such a purpose. In 1807 Sir Humphry Davy succeeded in decomposing potash by means of an electric current from a Wollaston battery of 400 elements, and in 1810 he surprised the members of the Royal Institution by the brilliant electric arc produced between carbon points through the same agency.

Magneto-electric and dynamo-electric currents allow of the production of the electric arc much more readily and economically than by the use of Sir Humphry Davy's gigantic battery, and Messrs. Huggins, Lockyer, and Living, and other physicists have taken advantage of the comparatively new method to advance astronomical and chemical research with the aid of spectrum analysis.

My object is now to show that the heat of the electric arc is not only available within a focus or extremely contracted space, but that it is capable of producing such larger effects as will render it useful in the arts for fusing platinum, iridium, steel, or iron, or for effecting such reactions or decompositions as require for their accomplishment an intense degree of heat, coupled with freedom from such disturbing influences as are inseparable from a furnace worked by the combustion of carbonaceous material.

The apparatus which I employ to effect the electro-fusion of such material as iron or platinum consists of an ordinary crucible of plumbago or other highly refractory material, placed in a metallic jacket or outer casing, the intervening space being filled up with pounded charcoal or other bad conductor of heat. A hole is pierced through the bottom of the crucible for the admission of a rod of iron, platinum, or dense carbon, such as is used in electric illumination. The cover of the crucible is also pierced for the reception of the negative electrode, by preference a cylinder of compressed carbon of comparatively large dimensions. At one end of a beam, supported at its centre, is suspended the negative electrode by means of a strip of copper or other good conductor of electricity, the other end of the beam being attached to a hollow cylinder of soft iron, free to move vertically within a solenoid coil of wire, presenting a total resistance of about 50 units or ohms. By means of a sliding weight the preponderance of the beam in the direction of the solenoid can be varied so as to balance the magnetic force with which the hollow iron cylinder is drawn into the coil. One end of the solenoid coil is connected with the positive, and the other with the negative pole of the electric arc, and, being a coil of high resistance, its attractive force on the iron cylinder is proportional to the electro-motive force between the two electrodes, or, in other words, to the electrical resistance of the arc itself.

The resistance of the arc was determined and fixed at will within the limits of the source of power, by sliding the weight upon the beam. If the resistance of the arc should increase from any cause, the current passing through the solenoid would gain in strength, and the magnetic force overcoming the counteracting weight would cause the negative electrode to descend deeper into the crucible; whereas, if the resistance of the arc should fall below the desired limit, the weight would drive the iron cylinder within the coils, and the length of the arc would increase until the balance between the forces engaged is re-established.

Experiments with long solenoid coils have shown that the attractive force exerted upon the iron cylinder is subject only to slight variation within a range of several inches, which circumstance allows of a working range, to that extent, of nearly uniform action on the electric arc.

This automatic adjustment of the arc is of great importance to the attainment of advantageous results in the process of electric fusion. Without it the resistance of the arc would rapidly diminish with increase of temperature of the heated atmosphere within the crucible, and heat would be developed in the dynamo-electric machine to the prejudice of the electric furnace. The sudden sinking or change in electrical resistance of the material undergoing fusion would, on the other hand, cause sudden increase in the resistance of the arc, with a likelihood of its extinction, if such self-adjusting action did not take place.

Another important element of success in electric fusion consists in constituting the material to be fused the positive pole of the electric arc. It is well known that it is at the positive pole that the heat is principally developed, and fusion of the material constituting the positive pole takes place even before the crucible itself is heated up to the same degree. This principle of action is, of course, applicable only to the melting of metals

and other electrical conductors, such as metallic oxides, which constitute the materials generally operated upon in all metallurgical processes. In operating upon non-conductive earth or upon streams of gases, it becomes necessary to provide a non-destructible positive pole, such as is supplied by the use of a pool of fused platinum, or iridium, or by a plumbago crucible. In working the electric furnace, some time is taken up in the first instance in raising the temperature of the crucible to a considerable degree, but it is surprising how rapidly an accumulation of heat takes place. In using a pair of dynamo machines capable of producing 70 webbers of current with an expenditure of 7-horse power, and which, when used for purposes of illumination, produce a light of 12,000 candles, a crucible of about 8 inches in depth, immersed in a non-conductive material, has its temperature raised to a white heat in 15 minutes, and 4 lbs. of steel are fused within another 15 minutes, successive fusions being effected in somewhat diminishing intervals of time. The process can be carried on upon a still larger scale by increasing the power of the dynamo machines and the size of the crucibles.

The purely chemical reaction intended to be carried into effect within the crucible, might be interfered with through the detachment of particles from the dense carbon used for the negative pole, although its consumption within a neutral atmosphere is exceedingly slow. To prevent this I have used, both in this connection and also in the construction of electric lamps, a water pole, or tube of copper through which a current of water circulates, so that it yields no substance to the arc. It consists simply of a stout copper cylinder closed at the lower end, having an inner tube penetrating to near the bottom, for the passage of a current of water into the cylinder, which water enters and is discharged by means of flexible india-rubber tubing. This tubing being of non-conductive material, and its sectional area small, the escape of current from the pole to the reservoir is so slight that it may be neglected. On the other hand, some loss of heat is incurred through conduction, with the use of the water pole, but this loss diminishes with the increasing heat of the furnace, inasmuch as the arc becomes longer, and the pole is retired more and more into the crucible cover.

In the experiments which I shall now place before you, the current which has supplied the one electric lamp in the centre of the hall will be diverted by means of a commutator through the electric furnace. After it has been active for five minutes to warm the crucible, I shall charge it with 8 lbs. of broken steel files, which I shall endeavour to melt and pour out into an ingot mould before your eyes.

By some obvious modifications of this electric furnace it can be made available for a variety of other purposes where intense heat is required combined with immunity from disturbing chemical actions. By piercing a number of radial holes through the sides of the chamber, and introducing the ends of wires through the same, an excellent means is provided of heating those wire ends very rapidly, without burning them, for the purpose of welding them together. The electrical furnace will also be found useful, I believe, in the hands of the chemist, to effect those high temperature reactions between gaseous bodies which require the employment of temperatures far exceeding the hitherto available limits, and will thus increase the area of available reactions at his disposal for the attainment of either scientific or practical ends.

I have endeavoured to compress within the limited space of a single lecture, subject-matter that might occupy the close attention of the student for weeks or months, and I may, therefore, be pardoned if I have failed to convey to you more than a very rough outline of what may be accomplished by the judicious use of gaseous fuel and of the electric current as heating agents. The one purpose that has been foremost in my mind, in preparing this lecture, has been to make war upon the smoky chimney, which, so far from being a necessity under any circumstances whatever, should be regarded only as a remnant of that stage of our industrial and social progress which, satisfied with the attainment of certain ends, could afford to neglect the economical and sanitary conditions under which those ends were accomplished.

The exhibition which has lately been held in this city, of appliances for heating and illuminating by means of gas and electricity—in which your President, my esteemed friend, Sir William Thomson, took so prominent a part, as he does in everything tending towards the advancement of human knowledge and well-being—proves how deep is the interest felt amongst you in the very questions with which I have had to deal this evening. And so I thought you might not be disinclined to give attention once more to a particular view of the question, which happens to be the result of the independent labour of one who may claim at any rate to have given a life-long attention to the subject.

THE PURCHASE OF THE NEWCASTLE-UNDER-LYME GAS-WORKS BY THE CORPORATION.*

ARBITRATION PROCEEDINGS.

SURVEYORS' INSTITUTE, WESTMINSTER.—WEDNESDAY, JAN. 19.

(Before G. W. STEVENSON, Esq., and R. P. SPICE, Esq., Arbitrators; Sir HENRY HUNT, C.B., Umpire.)

(Continued from p. 183.)

Mr. W. Winstanley, examined by Mr. MICHAEL.

I have been Manager of the Newcastle-under-Lyme Gas-Works for nearly six years, and hope to remain in the same position under the Corporation. The number of retorts we have is 83. Last year was a very exceptional one, so far as gas lighting was concerned. We made a larger quantity of gas than in any previous year, although on one particular day in 1879 we made more than on any one day in 1880. The largest number of retorts we used in 1880 was 53. The works are in a very fair condition; there has been a considerable amount of pipe-laying done since I have been Manager. The trunk mains from the works have all been renewed within the last two years. The largest main runs to about 300 yards from the works. The subsidiary mains are in a very good condition. The Silverdale district has been considerably undermined up to the present time, but it is not worked out. There is a railway siding into the works, and this will eventuate to the benefit of gas making when it is worked by the North Staffordshire Railway. It will make a difference of 9d. per ton of coal. The retort-house is very well suited for the manufacture of gas. I have never had it flooded.

Cross-examined by Mr. LITTLER: The Silverdale mines have been going on for some years, I believe, and render the mains liable to leakage. In 1880 our make of gas was 53,905,000 cubic feet, and the year before it was 51,529,000 cubic feet.

Mr. MICHAEL: That is an increase of about 2½ million cubic feet.

Mr. LITTLER: Can you tell the rate of increase between June and December?

* Mr. Penny asks us to make the following corrections in his evidence on this case, as given last week:—Page 180, line 14 of examination-in-chief, for "two-fifths" read "four-fifths, or 80 per cent.," as the relation between the storage and the daily make. In the last line of the same paragraph, for £62,500, read £32,500.

Mr. MICHAEL: That is no criterion. You must take it year by year.

Mr. LITTLER: I can have it for what it is worth.

Mr. MICHAEL: If you compare one half year with the corresponding half of the previous year, it is a fair criterion.

Mr. LITTLER: I want it in half years. What is the difference between the December half year of 1880 as compared with the December half year of 1879?

Witness: The increase is only about 340,000 feet in the half year.

Mr. STEVENSON: Were the meters taken at the same period exactly?

Witness: We are now speaking of the make. Our books are not made up for the past half year.

Mr. LITTLER: Mr. Penny said these works would require what he called "reconstructing" within three years—what do you say?

Witness: I have taken it at three years, taking it at the average increase; but it all depends upon the increase of consumption.

Mr. MICHAEL: Mr. Penny did not say so. He merely said it would be desirable, if the increase continued, to reconstruct the retort-house.

Mr. LITTLER: In order to avoid any doubt, I used the word in the same sense as Mr. Penny did; and the witness fairly takes it at about the same.

Re-examined by Mr. MICHAEL: There was a much larger amount of gas consumed in December, 1879, than was to be expected, looking at the ordinary rate of progress.

Mr. Corbet Woodall, examined by Mr. UDALL.

I am well acquainted with the principles which govern the transfer of gas undertakings to municipal bodies. I know the town and neighbourhood of Newcastle-under-Lyme, having lived in the vicinity for many years. I have recently visited the district in connection with this arbitration, and have made myself acquainted with the various Acts of Parliament under which the Company have conducted their business, and also the Act of the Corporation by which the undertaking is to be purchased. I know generally the terms upon which the gas undertakings in the Staffordshire Potteries were transferred, and somewhat intimately the circumstances of the Companies before the transfers. Newcastle-under-Lyme is a market town, and not such a large manufacturing district as the Potteries towns generally; but I think this is an advantage, because it is not liable to great fluctuations, either in its prosperity or in the consumption of gas. I notice, for instance, that in the Silverdale district, which is a manufacturing district pure and simple—a village attached to the iron-works—the fluctuations are very considerable indeed. At present the consumption there is not so large as it was a few years ago—at any rate, that was the case in 1880—while the general consumption of gas, in which there is observable a steady rate of progress, is due to the more stable way in which Newcastle-under-Lyme has prospered. When I recently inspected the works of the Gas Company I was very well pleased with them. I thought their arrangement was fairly satisfactory, and also the condition of the entire apparatus was good. Their position for the supply of the town could not, I think, be improved; and the order in which the whole place was kept was eminently to the credit of the Manager. I found the capacity of the works vastly larger than the average. There was a margin of producing power equal to 30 per cent. over the greatest make of the year; and the whole works throughout, with the exception of the ammonia apparatus, were quite capable of providing for this increased amount. The expenditure of a few hundred pounds on the plant, which would be largely reproductive at once, would provide for an increase of 30 per cent. over the present make.

Mr. STEVENSON: The ammonia plant is not requisite for supplying the town with gas, is it?

Witness: Certainly it is not requisite.

Ammonia works are incidental, which the Company have erected for increasing their profit?—That is so. It must always appear that a gas plant at one time or another is in excess of what can be profitably used. A margin of 30 per cent. is not the most profitable condition for a company to be in—the closer the apparatus is worked up the better for the profits of the undertaking—but when extensions are made they must be made with a view not simply to the business of to-day, but also of the following and subsequent years.

Examination resumed: Mr. Lass's accounts show that the Company have not only maintained their works in good order, but have also paid maximum dividends for a considerable period, and still have a surplus. The margin last year was over £1000, which was equal to the payment of more than 4 per cent. over the whole capital, in addition to what they have divided. I have no doubt at all of the capacity of the business to maintain the rate of profit at present allowed to be divided amongst the Shareholders; in fact, the increased business must necessarily be more profitable than the present business. I may explain this by instancing the rate at which the Corporation of Newcastle-under-Lyme will raise money; and the same thing would apply to any further money raised (as the last £6000 was by the Gas Company) under the auction clauses—the money would be raised at a lower rate than the average charge for the present capital of the Company. Then, again, any capital now spent is expended more economically in relation to the amount of business to be derived from it. I may put it broadly in this way, that the present profit charged for dividends and interest on capital amounts to a little under 12d. per 1000 cubic feet, but I think there is no doubt that the future business could be obtained on an expenditure that would not require a greater charge than 5d. or 6d. per 1000 cubic feet, and therefore there would be a clear advantage on that item of 6d. per 1000 cubic feet.

Mr. STEVENSON: It would gradually go down to that; it would not jump down all at once?

Witness: The further business obtained by such extension of works has appeared to create the real necessity; the extended business that would be obtained in this way would be more profitable for the reason I have given. Of course, that must be after the present expenditure has been utilized to the full.

You have, I think, made a valuation?—I have; the total amount being £77,365. The details are identical with those given by Mr. Penny, with the exception that there is some slight difference in the amount of the estimated advantage from the conversion of borrowed money into share capital; and I have also put down two years' purchase of the income of the Directors and officers, amounting to £1410.

Mr. LITTLER: Mr. Michael agreed that this ought to be deducted, and could not be claimed.

Witness: I very much regret that it is so.

Mr. MICHAEL said perhaps he might interpose, and say the only difference was that, whereas Mr. Penny took the borrowed money at 4½ per cent., Mr. Woodall, who happened to have better information, had taken it at the proper rate of 4 per cent. There was a difference, therefore, of £100 or £200 on this account.

The UMPIRE: They are practically agreed.

Mr. MICHAEL said this was the case, and the £1400 might be struck out. Of course, he could not control the witnesses. He could only say he gave up what they claimed, and what he knew could not be claimed.

Mr. Woodall's valuation, as corrected, was handed in, as follows:—

Present statutory dividends on capital called up—viz. £26,000 . . .	£2,315
27 years' purchase of the above—£2315 × 27 =	£62,505
Back dividends not paid to Shareholders, as per Accountant's statement	3,377
Stock-in-trade, June 30, 1880, also taken from Accountant's figures	1,216
The right to convert borrowed money into share capital—£4000 at 6 per cent.	£240 0 0
Do. £1000 at 3½ per cent.	32 10 0
	£272 10 0
272 10 0 27 × =	7,357
Allowance to Directors and officers—two years' purchase of income . . .	1,410
Estimated expenses of winding up Company.	1,500
	£77,365

Mr. LITTLER (in cross-examination): I suppose, like Mr. Penny, you agree that this is the first case in which, so far as you know, 27 years' purchase has been claimed?

Witness: It is not by any means the first case in which 27 years, or upwards, have been paid.

That is by arrangement, but I mean where it has been claimed in arbitration?—I believe that is so.

I suppose you are aware that the Corporation offered to give 25 years?—Really I was not aware that such an offer had been made. I may, however, say that I regard the present value of gas undertakings as greater than it was three years ago.

That was just at the beginning of the electric light scare, was it not?—Yes, or a little before it; but that notwithstanding.

I suppose you would admit that, whether or not the electric light scare has done any real damage to gas property, it has not improved the value of gas shares?—No; it has depreciated the value of gas shares, although it has not diminished the value of gas undertakings.

Re-examined by Mr. MICHAEL: I think I may fairly state that the quotations of the value of gas shares are based upon very small transactions indeed, and therefore I make the distinction between gas undertakings and gas shares.

Mr. MICHAEL: It is better to take one individual thing, and as London has been mentioned I will take the "H" stock of The Gaslight and Coke Company.

Witness: I know more of the "A" stock. I am aware that the "H" stock at 7 per cent. is quoted, but I do not know the incidents of it. I am aware, however, that it is limited to 7 per cent., and can never get higher. The present price is 138, and I am not aware that it was ever so high before.

Mr. LITTLER: It pays a little under 5 per cent.

Mr. MICHAEL: It pays 5 per cent.

Mr. PRICE: How many years' purchase is this total claim of £77,365?

Witness: 32·77. The item of £1216 was explained yesterday, and is taken simply to square accounts. It ought to be a little more.

Mr. Harry E. Jones, examined by Mr. MICHAEL.

I have examined the accounts of the Newcastle-under-Lyme Gas Company, as taken from their books by Mr. Lass, and have also visited and inspected the works of the Company, which I found complete in every particular and with proper plant, most of it being in excess of the maximum use by about 20 per cent. It is represented by a capital expenditure as low as £625 per million cubic feet of annual production. This is an important factor in determining the value of gas-works, because the productive capability of the works is to earn a dividend upon the amount of capital; and if the amount of capital be £1200 per million cubic feet—or, as in the case of some country gas-works, like Gorleston, near Yarmouth, £2500 per million cubic feet, it follows that the works are much more valuable to the man who can discern this fact than to the stockbroker who rates them all at the same price. Looking at gas property generally, £625 per million cubic feet is very near the minimum; the lowest, I know, is £500 per million cubic feet. The average over the kingdom would probably be something like £1000 or £1100. With respect to the general condition of the works, they are in fair working order, and in a good state of repair. They are not fancy works, but there is not the slightest defect in the construction of any part of the buildings or plant. The Manager's residence is the most palatial thing about the works, although, the road having been raised, it looks a little down-hill. The retort-house is quite high enough for its purpose. It allows perfect clearance for all the plant, and also for all operations connected with it. There is a siding from the railway, which determines the level of it, and it could not be altered without an objection from the Railway Company. There is a considerable amount of surplus power in the retort-house, capable of lasting, with the probable increase, for three or four years. The works are also capable of being extended very easily and cheaply. Owing to the railway arrangements, the saving in carriage will be an important item in diminishing the price of coal in the future, but that is only prospective, and I have not taken it into account. I agree with Mr. Penny that 6d. per 1000 cubic feet is the maximum that should be spent on repairs, renewals, and maintenance, the works being situated in the midst of the coal, iron, and fire-clay district. In my estimate I have not put down anything for probable increase of profits.

Mr. MICHAEL: Therefore the Company could not divide, except as back dividends, any money they have earned since 1863?

Witness: Certainly.

Have they paid maximum dividends?—Certainly.

The surplus cannot be accounted for in any shape in the valuation; it goes over to the purchaser without any compensation?—Quite so.

You have not put down any figure whatever to represent, first, the prospective profit; and, secondly, the maximum profit already earned, but not divisible among the Shareholders?—No; except I allow for the back dividends being paid.

Taking a Company in the position of this, and looking at it from the point of view of the purchaser of gas property, how many years' purchase do you think should be the number in order to multiply the estimated amount of profit?—Certainly not less than 27.

Why 27?—Because I am myself in precisely the same position at the present moment that these Shareholders will be in when this arbitration is over. I recently sold some small gas-works which were too far from London for me to look after properly. I have that money lying at the bank; I do not wish to put all my eggs, as hitherto, into one basket, and wish to find a security outside gas, if I can; but I cannot find one to pay me more than 3 or 3½ per cent., and I feel sure I shall drift into that of which I have too much already. I shall buy gas stock at the low price that the Stock Exchange places upon it, because this is by far the most advantageous thing any man in London can do, looking to the security.

Examination resumed: I have made an independent estimate of the value of the works, but I may say I agree with every detail given by Mr. Penny, excepting the amount due to the conversion of the stock, which he took at £7087, and I take at £7371. This, however, was owing to the ½ per cent. I had the Company gone on, I have no doubt they would have been enabled to pay their back dividends, and they ought to have done so long ago.

Mr. LITTLE said he should not cross-examine the witness.

Mr. Jones's valuation was then handed in, as follows:—

Maximum dividends on £26,000	£2,315
Extra dividends accruing by conversion of loans as above—	
Difference on £4000 between 4 and 10 per cent.	273
" " 1000 " 4½ " 7½ "	
" " 1500 " 4½ " 7 "	
	£2,588
£2588 at 27 years' purchase	£69,876
Deficiency of dividends (which the Company can pay, having earned them)	3,377
Stock-in-trade, including utensils in trade, like meters, not included in capital account	1,216
Expenses of winding up the undertaking, say	1,500
	£75,969

Mr. MICHAEL said this was the case for the Company.

Mr. LITTLE stated that he did not propose to call any witnesses.

Mr. MICHAEL, after expressing his surprise that no witnesses were to be called on behalf of the Corporation, said he could only remark on the very few points that had been raised in cross-examination of the witnesses it had been his honour to bring before the Arbitrators. He might just recall the facts of the case as proved by the witnesses, and also by the accounts furnished by Mr. Lass. There was, first, the undertaking in perfect repair—a large and most important portion of it so lately renewed as to be new—with an amount of surplus power, estimated by the witnesses, above what was required to supply the quantity of gas, which was continuously increasing, and at the end of three years furnishing the means to the Corporation of setting up additional works at so small a cost as to reduce, according to the evidence of Mr. Woodall, an amount of profit required to pay a certain dividend, calculated at the same rate, from 1s. to 6d. They had, therefore, something that was permanently and progressively earning the maximum rate of dividend upon which the compensation was asked to be based; they had 30 per cent. of the whole supply—or say 25 per cent.—as an increase continuously every year, for which no compensation could be afforded; and, above all, there was at the present time a sum of £1000 a year to pass over into the hands of the Corporation, subject only to the payment of the two small amounts claimed, and increasing year by year at the rate of somewhere about 7 or 8 per cent., for which no compensation could be made. Was he not right, therefore, in asking that 27 years' purchase should be awarded? He based his claim upon the fact that there was an amount which was thoroughly secured. He could not ask, except incidentally, that it might be considered as continuously increasing, nor that it had very far exceeded in amount the dividend, nor that there was a surplus of £1000 a year upon which the Arbitrators would make no calculation whatever; but he turned to the fact that there were persons conducting an enterprise in their own hands,—of which they knew the value, and of which they could estimate the security—which brought them in not only a profit at the present time, but, in the view of future legislation, a very much larger profit, which they were simply called upon to part with. If then the Shareholders looked for an equal security in their own neighbourhood, they could not purchase except under circumstances of great difficulty, and by the payment of at least 27 years' purchase. With regard to the question of an application to Parliament, no one knew better than his learned friend that an application for further capital was granted as a matter of course, seeing that no *locus standi* was allowed to any one to oppose a gas company in asking for further extensions of capital; but it would be unfair if he (Mr. Michael) did not state that it would not be of any advantage whatever to this Company if the auction clauses were superadded, seeing that the premiums obtained under them would only go, as the £976 had already gone, into capital, but bearing no interest, therefore only furnishing further security for the payment in the future of the dividends which had accrued in the past. There was also another very important element: If there was an excess of profit, and the Company divided it equally between the consumers and themselves, they would, by the operation of the sliding scale, at once have £500 a year granted to them by Parliament; and therefore, instead of £2315 as formerly, during the year 1880, they would have had the sliding scale running over the whole of their capital, which would have raised the £2315 to £2815 as the basis of the calculation. No one could contend for a single moment but that the whole of the Shareholders were entitled to their back dividends. It was a matter of law; and the Directors, if they so willed it, might hand over £3377—or whatever the amount came to—for back dividends, out of money due to the credit of their expenditure account remaining in their hands. It was frequently done, and was in accordance with the law, which said that if there was any deficit, such deficit should be made up out of the profits of any subsequent year. He would not trouble about abstruse calculations as between 4 and 4½ per cent., but would take the matter in a much simpler way. When the Shareholders wished to convert their borrowed money into capital, the only thing necessary was that they should furnish the sum required to pay off the borrowed money, and as soon as this was done the money became entitled to 10 or 7½ per cent. respectively, in accordance with the capital for which it was granted. He then took this amount of money, and multiplied it to find what the dividend was, and he took the same number of years' purchase—for the theory was that from it must be deducted the amount of money that would have to be furnished by the Shareholders in order to make it up as capital. The only distinction existing was that in the one case the capital had been already furnished, whereas in the other it had to be paid, and therefore must be deducted from the sum allocated. Taking it in this simple way, it came to an amount which might be represented by £7500. There only remained two other items. Since June 30, 1880, the Company had been agents of the Corporation, and had carried on the works at their own risk, although they should have been carried on at the risk of the Corporation. It would be found, by the terms of the Act of Parliament, that there were two modes provided, at the option of the Gas Company, for the payment of compensation money, and they really amounted to the same thing. It was either to be paid for in annuities, or in a gross sum as representing those annuities. Supposing an annuity of £2315 a year had been granted, out of what moneys would the natural expenses come of paying the debts of the Company, and all the expenses of the transfer to the Corporation? There was not any money in hand. This must all have been handed over to the Corporation, and the Shareholders would only have their accruing annuities or the gross sum, and not a single penny would be in their hands to pay outstanding debts or to pay the expenses of winding-up. So they had taken a sum, and had supported that step in the following way: They had treated the annuities as though they were annuities at the present money value; and they had added the payment of the back dividends, and also the payment for the conversion of the borrowed money into capital. Were the Arbitrators going to impose on the Company a burden estimated at £1500 for winding-up a concern that was no longer theirs? He (Mr. Michael) said they were not.

He asked them, therefore, carefully to consider the accounts, and he was sure they would say the Company were entitled to this £1216 for the stock-in-trade, and to £1500 for the natural expenses of winding-up the concern. He asked for a large and comprehensive view to be taken of all the circumstances, for whatever sum was awarded, even to the last penny, it would be very far below the value of the undertaking in the hands of the Corporation, because there would be from the very first moment a large sinking fund accumulating in their hands, without the expenditure of a single penny on the part of the ratepayers, which in a very few years would enable the Corporation, if they thought proper, to supply gas without charge to the whole of the ratepayers, or leave a very handsome surplus which would go in diminution, to a considerable extent, of the rates of the borough. He had never known a case in which so large and admirable an amount of property was to be transferred from one body to another for so small a consideration. He might quote several instances, and say that the number of years' purchase was no criterion, because he could show that 53 years' purchase had been given for a gas undertaking. Every single case must stand upon its own merits. Here the Company were precluded, by the operation of the law, from asking what was really the value. He put before the Arbitrators the value to the seller, and asked them to give full consideration to the arguments adduced, and also to the elements of value, which were essential to the concern itself.

Mr. LITTLE, in replying on behalf of the Corporation, described the case as being one of the most ordinary gas transfers. He would not waste time by calling witnesses, for he was going to ask the Arbitrators to go and look at the place before making their award, and also to go and look at Stafford, as this place had been cited. They would then be able to see what was the present condition of the works, and judge for themselves. Let them look at the evidence as it stood. Mr. Penny frankly said that the Corporation of Newcastle-under-Lyme was the *corpus vile* on which he was going to make his next experiment of extending the number of years' purchase. He (Mr. Little), however, objected to even the skilled hand of Mr. Penny as the surgeon, making use of this body to be dissected and experimented upon, and would rather he adopted the old method of medicine, and applied the same doses to them as had been applied to other people before. Why should the alteration be made? Surely not at present, when gas property was not worth so much as it used to be. The reason why the increase of the value had taken place from the 16½ years up to the 25 years' purchase had been that people found out that gas property really was worth, at the lowest, about 6 per cent., and thus when it was being sold with all its prospective advantages it was thought fair to give something over the market price, and that something had been fixed by universal consent at 25 years. Not that it is worth the 25 years, because one could not sell it for more than 20 years in the open market; and surely giving five years' more purchase when it was sold to a local authority was as much as any human being could possibly ask. Then they said, "Oh, but there will be a great difficulty in investing our money in other securities." This was not what the Arbitrators had to deal with. They had to look at the fact that these people had, for the purpose of making their 6 per cent., invested in gas property. Mr. Jones had said he did not want to put all his eggs in one basket; but why was it to be assumed that all the people who owned the shares in this Company were gas men? He (Mr. Little) submitted that they were merely ordinary investors who would venture to invest their money in gas property for the purpose of getting 5 per cent. Why were they to receive Consols price? The Arbitrators were asked to give 3277 years' purchase—for this was what it came to—instead of 25 years; and this was so absolutely unreasonable that it did not require any evidence to expose such a fallacy. In this particular case it was perfectly ridiculous, because the conditions must be remembered on which the last capital was issued, which must have been somewhere between 1877 and the present time. The Company were required, under their Provisional Order, to give, in the usual manner, 28 days' notice of the sale, and therefore the auction took place under the most favourable circumstances, with notice to the stock brokers and jobbers in London, to the Local Authority, and also to the whole district. If the Shareholders had chosen, they might have bought the whole of the property, but they had not so chosen. They allowed it to go to the outside public at 6 per cent., or 16½ years' purchase, and why were they now to ask double? The idea was monstrous. They thought the price ought to go up because the rate of money for the time being appeared to be exceptionally low; but, after all, what had the price of money to do with it? In the case of land, 33 and 35 years' purchase was asked, because there the man who was obliged to sell had to make a similar investment. There the argument was the other way—it was used against a railway company that a man could not obtain a similar investment for less than 30, 35, or 40 years' purchase; and in some parts of Cumberland even 45 years' purchase. In the present case, if 25 years' purchase were given, the purchaser could invest every £100 he received for £133, because he received one-third more than the actual purchaser. The man who bought at 16½ years' purchase was going to get 25 years' purchase, according to the calculation of the Corporation; but according to that of the other side, his investment at 6 per cent. would be equal to 12 per cent. by the time he had the money in his pocket if anything like the 32½ years' purchase was given. He (Mr. Little) would next deal with the way in which the 32½ years were made up. He ventured to think that the arguments that had been supplied by the claimants were absolutely conclusive against the 27 years' purchase. He also wished to know what new facts had arisen in this case to justify a new doctrine being applied which had never been applied before, at a time when gas property was still, to a certain extent, the subject of that which might or might not, after all, turn out a good scare—viz., the electric light. He did not say that gas might be superseded; but instead of the steady increase which the Company wished to calculate upon, there might be improvements in the electric light, so that in a few years the state of things as regarded gas might not be what had been predicted for it. The effect of the electric light scare was such that gas shares were not so valuable as they were three years ago, and therefore the property was not one on which an increasing value should be placed, but rather a decreasing value. The Arbitrators, thus, ought not to give anything at all above the 25 years' purchase, unless they saw the strongest reasons for so doing; and he (Mr. Little) contended that this was a reason why everything should be included—even the £1216—in the 25 years' purchase. With regard to the other items, he would first take the back dividends as per the Accountant's statement. Before dealing with the question as a legal one, he might mention that it was 17 years since the Company began to pay their full dividends, and did any human being believe that if the Directors had been left alone they would ever have paid any back dividends? The mere potentiality of it was not to be turned into an argument against the Corporation, unless it were a thing likely to happen. They dared not have done it. It appeared that, notwithstanding their exceptionally low rate of capital, they had only paid their maximum dividends, and but for this exceptional circumstance they could not have earned their maximum dividends at the same rate as other places. This had two effects—first, it showed it was not such a grand property as was suggested, for they had only just managed to scrape along, borrowing money from their banker from time to time, not having any money in hand, and

resorting to all kinds of shifts which companies did when they were not very strong. The Company had only just paid their maximum dividend out of their price of 3s. 6d. per 1000 cubic feet. They dared not have increased the price, and Mr. Penny practically admitted the fact. Then, said Mr. Penny, they would have had the money to add to it, and also £2000 or £3000 in hand, out of which they might have done it. All he (Mr. Littler) could say was that he thought Mr. Penny was quite right in agreeing that if the Company had wanted to go before Parliament for, say, more land, they would not have dared to confess having paid maximum dividends for 17 years, and had also taken £3000 a year for back dividends. Mr. Hawksley's old formula was that companies ought to go to Parliament every 10 years; but this Company had not been to Parliament—except for what, as his learned friend said, could not be opposed—for 25 years, and they could not have gone for the reasons he had given. He (Mr. Littler) thought, however, they were rather wiser in their generation than those who had advised them, in not paying any back dividends, because the Gas-Works Clauses Act prescribed the formation of a reserve fund [sections read], but this Company had not such a fund, and had not attempted to form one. Let them look at the source from which the profits had been made up. The 83rd section said: "When such fund shall, by accumulation or otherwise, amount to the prescribed sum, or one-tenth of the nominal capital of the company, as the case may be, the interest and dividends thereon shall no longer be invested, but shall be applied to any of the general purposes of the undertaking to which the profits thereof are applicable." There was, however, no reserve fund to take it from. The Gas-Works Clauses Act did not apply, and the Company had no more right to do what they proposed than they had to appropriate the property of the Corporation of Newcastle without paying for it, and it would be seen that the object of the clause was to meet any accidental circumstance, and not to meet the circumstance of the Company having years and years back been in this position. Of course, an engineer advising people in a compensation case was wise to make any claim he thought was not unjust, and therefore this thing had been done. Again, with regard to the back dividends, there must be a limit somewhere. Were they to be given from so far back as 1855? Surely they could not have more than six years. Supposing that the Arbitrators were not satisfied on the argument that they were not entitled to back dividends at all, he would venture to submit that as a question of law they were not entitled to one halfpenny under such circumstances as the Company were in. With regard to the bond debt, the arbitration was provided for in the Newcastle Corporation Act, 1877, and what was to be valued was the value of the undertaking at the time appointed, which was the end of June, 1880, at which date they had not converted their debt. It was simply a bond debt, and nothing else, and from that date to the present they had not converted it; and he (Mr. Littler) respectfully demurred to their making use of a potentiality which again they transparently were not intending to exercise, for it had not been done from 1855 to the present time.

The UMPIRE: The bonds were not due.

Mr. LITTLER said he did not think any were due in June, 1880, which was the date agreed upon for the transfer to take place; and therefore the Company could not, as a matter of fact, convert their bonds into stock at all. The time had not arrived when they could do it, and in 1877 they had allowed themselves to be placed in the position of the Corporation having the option, at any time during three years, of giving them notice for the purchase of their undertaking. They stood by, and allowed themselves to be placed in this position, showing that they never intended to do it; but there was something stronger than this. The 26th section of the Newcastle Corporation Act enacted that all debts, including the bonds or mortgage debt of the Company, should be paid, discharged, and settled by the Corporation. Having allowed this section to be inserted in the Act, they had incapacitated themselves from doing anything at all, and he submitted that the Arbitrators had no power or jurisdiction to award anything in respect of this matter. He also contended that the award would be bad if anything were allowed. As to the right to convert borrowed money into share capital, this was a matter of arithmetic, and would have to be calculated; he, however, said it should be on a less number of years' purchase, and must be reduced. The next item was the stock-in-trade. Mr. Penny said it was common to value this; but why? Where did the money to purchase the stock come from? Out of the capital of the Company. They must go on renewing from time to time; and if there were an unset retort, as he understood—

Mr. MICHAEL: I think not.

Mr. LITTLER said he thought there was one; but he would put it hypothetically, and say suppose there was an unset retort.

Mr. MICHAEL said this came into a different category.

Mr. LITTLER inquired why it should be in a different category. If the Company chose to go into the trade of chandelier dealing, which was wholly *ultra vires*, why should the stock not be capital stock of the Company? The letting out of meters was part of the regular business of a gas company, but was not the stock of meters as much part of the capital stock of the company as the stock of gas-pipes, or the mains laid in the streets?

Mr. MICHAEL: This has been expressly held not to be the case.

Mr. LITTLER said that was for the purposes of rating, which was very different from the question of selling a business. He should be much surprised if any Court held that what had been bought with the capital did not represent the capital. Therefore when the Corporation were giving for the works, which were fairly good works, a sum which would be given for the best works in the world, it certainly ought to include every possible thing in the whole concern, and it should be all included in one sum. The claim for allowance to Directors had been abandoned, and the only observation that need be made on this point was that it showed the wonderful pains which had been taken to make a big claim, so that the Arbitrators might have something to cut at; and it had been seen with what reluctance every witness abandoned it. His friend Mr. Michael had, however, effectually buried it out of sight, and it was not likely it would ever be heard of again in a gas arbitration. The only other item was the estimate of £1500 for winding-up, which turned out to mean extra allowances to witnesses, and the various costs of the present arbitration beyond those allowed on taxation—if the Corporation took the matter to taxation—but if ever there was a claim which could not legally be preferred, it was a claim for those extra costs; and he (Mr. Littler) again submitted that it would be illegal for any allowance for such an item to be made in the award. It had been suggested to him that perhaps the Company might not get any costs at all, because they were in the discretion of the Umpire, and they had had 25 years' purchase offered them—

Mr. MICHAEL said Mr. Littler must not refer to this, as whatever offer had been made was without prejudice.

After some conversation, it was arranged that the amount should be mentioned.

Mr. LITTLER said £57,875 was, he believed, 25 years' purchase of the sum of £2315, and then there was the bonded debt, which his clients would have to pay, making a total of £63,125.

Mr. MICHAEL: You offered less than 24 years' purchase.

Mr. UNDERHILL: Some of the bonded debt has been incurred since.

Mr. LITTLER said £1250 had been issued since the offer was made. Under these circumstances, this being the sum proposed to be given, the question was, what was the value of the undertaking that was to be paid by the Corporation? This sum was more than the real value of the property, and more than the Company could obtain in the market, and if they were awarded £57,875 it would be far more than the works were worth, and they ought to think themselves exceedingly fortunate to get it. His learned friend said it was difficult to obtain one particular stock—the Chartered Company's stock, which was so well secured—but it was not difficult to obtain gas stock all over the country. The Company's own witnesses said that stock brokers and jobbers bought and sold any quantity to pay 6 per cent.; and therefore if the Shareholders obtained 25 years' purchase of their maximum dividend, they would be able to re-invest their money in a similar concern at 16 years' purchase—that was to say, they would earn 6 per cent. for every 4 per cent. they received in respect of the present concern, and therefore they would be in a remarkably good position. If one halfpenny more were given, he ventured to say it would be an evil precedent, and would, in effect, burden the public, whenever they desired to acquire a gas undertaking, with more than they had ever contemplated, and he certainly asked that in the present case no departure should be made from the usual course. He had shown why the £1216 should be included, and he contended that, including this sum, the undertaking ought to be transferred for £57,875. In conclusion, the learned Counsel said that a little arithmetical calculation had just been placed in his hands, which he should like to have checked. The Company talked about the works having cost about £682 per million cubic feet of gas. If, however, the Arbitrators looked at the price proposed to be charged, it would be found that it worked out to something like £1700 per million cubic feet, and this was a striking illustration of the difference between the actual cost and that which the Company desired to be paid for. This was an additional argument in favour of not departing from the usual course; and inasmuch as his clients were willing to give the sum he had named before the arbitration commenced, the Company ought to be left, at all events, to pay their own costs, even if they were not ordered to pay those of the Corporation.

The UMPIRE inquired whether, it having been agreed that the vesting of the undertaking should be considered as from June 30, 1880, the parties wished this to be mentioned in the award.

Mr. MICHAEL said he did not think it necessary, as Mr. Underhill and Mr. Udall would draw up the agreement.

Mr. LITTLER thought it would be better, because the Act stated it might be done by agreement or in the arbitration.

Mr. MICHAEL said it had been settled by agreement.

Mr. LITTLER thought it would be as well to set out the agreement, and to recite, "Whereas it has been settled by agreement that the time shall be" so and so.

The UMPIRE agreed to the suggestion.

Mr. SPICE said he had been asked to mention the necessity for some reference to the finding of the capital which might be required.

Mr. MICHAEL said this would be settled in the agreement. It was one of the essential points.

Mr. LITTLER: Yes.

Mr. MICHAEL said that if capital was required it would, of course, be found by the Corporation.

Mr. LITTLER said this would have to be provided for.

The UMPIRE: The agreement will also determine the rate of interest to be paid.

Mr. LITTLER: Certainly; we shall not trouble you with any of these things.

Mr. MICHAEL: Yes. Your award will be a clear one, without reference to any of those matters. It now only remains, Sir, for me to thank you for the courtesy you have shown towards us in this case. I am sure Mr. Littler will join me in this.

Mr. LITTLER: Certainly.

The proceedings then terminated.

METROPOLIS WATER SUPPLY.

THE METROPOLITAN BOARD OF WORKS AND THE EAST LONDON WATER COMPANY'S BILL.

At last Friday's meeting of the Board, the Parliamentary Committee, *inter alia*, reported as follows:—"The Board, on the 21st ult., resolved to petition against the East London Water Bill, and it will be necessary soon to consider what steps shall be taken to support the petition. Before making any recommendation upon this point, however, it appears to your Committee desirable, in order to avoid any question which may hereafter be raised as to the Board's power to incur expense in supporting the interests of the consumers, that the Home Secretary should be asked whether the Government will undertake to introduce and secure the passing of a Bill to protect the members of the Board against any personal liability."

The Committee recommend that a letter be accordingly addressed to the Home Secretary; and a motion to this effect was proposed and carried.

SINKING OF AN ARTESIAN TUBE-WELL.—There has recently been sunk upon the premises of Messrs. Le Grand and Sutcliffe, Engineers, No. 100, Bunhill Row, E.C., an artesian tube-well, some particulars in reference to which are given in the *City Press*. After passing through 28 feet of ballast the London clay was reached. This, together with the underlying beds of Woolwich and Thanet sands, extended to the depth of 163 feet, when the chalk was struck. The boring was then continued for a further 54 feet, making the total depth of the tube-well to be 217 feet. About 30 years back the water level of the chalk springs in the vicinity, when struck, rose to within 40 feet of the surface, whereas the water from the chalk springs now stands 123 feet below the surface, and is the same level as the sand springs, showing that the numerous artesian wells sunk in the London basin have considerably lowered the water level. However, it is satisfactory to know that no lowering has taken place within the last four years, at least so far as the immediate vicinity is concerned. Although the water stands, as above stated, 123 feet from the surface, no shaft whatever has been sunk, as the firm fitted a novel form of pump down the tube-well, employing a hollow pump-rod reaching to the surface, which serves the double purpose of rising main and pump-rod, and this arrangement is found to work so well that one man can raise the water to the surface with comparative ease at the rate of 180 gallons per hour. The water from the well has been analyzed by Mr. E. Riley, F.C.S., and it proves to be a remarkably soft water, possessing characteristics very unusual for water drawn from the chalk. Besides being a pure and wholesome drinking water, not containing the least trace of organic matter, its alkaline qualities render it very suitable for boiler purposes; and a medical authority, to whom the analysis has been submitted, pronounces it to possess most of the properties of the Carlsbad waters, only in a weaker degree.

The Corporation of Tewkesbury have, it is reported, passed a resolution to purchase the undertaking of the local Gas Company for £15,000.

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held at the London Offices, Union Court, Old Broad Street, on Thursday, the 27th ult.—Mr. J. BRICKWELL in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice convening the meeting, and the following report and statements of account were taken as read:—

The Directors are happy to have it in their power to present to the Shareholders a favourable report of the Company's affairs in the annexed statement of accounts, duly audited, for the half year ending Sept. 30, 1880.

The net profits on the six months' working amount to £5973 18s. 8d., being a very satisfactory increase as compared with the corresponding half of last year. This fact is not only eminently hopeful in itself, but being the result of continued steady improvement in revenue from private lighting, sales of coke, &c., points to an increasing local commercial prosperity, on the existence of which the well-being of the Company so much depends.

The carbonizing accounts for the period now under review show that the average production of gas per ton of material carbonized is 10,850 cubic feet, and the total expenditure under all heads has amounted to £4 1s. 0½d. per ton carbonized. This satisfactory production reflects credit on the Engineer, and has, in a great measure, been the cause of the present improvement. While the existing price of coals and the rates of freight continue, there is every reason to hope that similar results will be secured.

The loss by leakage has been unusually small. Attention continues to be directed to economical working so far as is consistent with thorough efficiency.

The question of exchange has, during the whole of the past twelve months, caused the Directors much anxiety. By referring to the interim report, it will be noticed that the loss for the half year ending the 31st of March was £1368 0s. 8d.; the loss for the half year now under review is £352 4s. 7d.; thus making a total for the year of £1720 5s. 3d. The whole of this amount has been written off out of the profits of the year's working.

Lighter Capital Account.—A further amount of 10 per cent. has been written off this account, thus reducing the nominal value of the lighters to £1379 9s. 5d.

Maud's Balance.—A further 50 per cent. of this debt has been written off; the original amount of £225 9s. 6d. now standing at £56 7s. 4d.

With the balance brought forward from the previous half year (after paying the August dividend) the available amount for division is £7122 6s. 3d., and from this the Directors recommend a dividend at the rate of 7 per cent. per annum for the half year just closed, payable on and after Feb. 16, 1881. This, together with the interim dividend paid in August last (in accordance with the powers vested in the Directors) at the rate of 4 per cent. per annum, will make a total dividend of 5½ per cent. for the twelve months ending Sept. 30, 1880, leaving £1581 17s. 3d. still available. Of this amount it is proposed to pass £1276 12s. 5d. to the reserve fund, thereby increasing this amount to £2500, carrying forward the balance, £305 4s. 10d.

The Engineer and Manager, Mr. George Harlowe Sumner, reports that the works of the Company are in an efficient and satisfactory state.

Two of your Directors—viz., Mr. James Brickwell and Mr. Edward Tiley Lambert—retire by rotation, but are eligible for re-election, and offer themselves accordingly.

Mr. Philip Crellin, the Auditor of the Company, likewise retires from office, but, being eligible, offers himself for re-election.

Dr.	General Balance-Sheet, Sept. 30, 1880.				Cr.		
Authorized capital	£175,000	0	0	Works, including extensions, furniture, &c. . .	£143,011	13	9
Less amount not taken up . . .	8,130	0	0	Gas-fitting capital on March 31, 1880	10,696	12	3
	£166,870	0	0	Extensions to date	193	4	9
Reserve fund	1,223	7	7	Stock in Pará	2,777	3	4
Bills payable	282	3	1	Lighter capital £1532 14 11			
Sundry creditors in London . .	303	14	3	Less written off	153	5	6
Ditto in Pará	667	3	1				
Gas-fitting rental reserve fund to March 31, 1880 £156 15 11				Stores	1,379	9	5
Add reserve for the current half year less amount expended in repairs	74	11	10	Coals.	2,399	0	9
	231	7	9	Wood	1,930	14	6
Profit and loss	7,122	6	3	Maud and Co. (in suspense). .	56	7	4
	£177,000	2	0	Sundry debtors in Pará . . .	3,761	0	9
				Cash at Pará bankers.	1,239	0	3
				Do. at Glyn and Co's	3,449	15	1
				Petty cash (London)	10	13	5
				Bills of exchange, in hand . .	6,000	0	0
	£177,000	2	0		£177,000	2	0

Revenue Account, for the Half Year ending Sept. 30, 1880.

Coal and wood for carbonizing £3,103 4 5	Public lamps . . .	£5,813 17 8
Wages, includ. lamplighting, purification, & carbonizing . . .	Private lights . . .	1,253 0 11
Salaries . . .	Public establishments . . .	411 4 7
Charges . . .	Illuminations . . .	406 8 8
Retorts . . .	Gas-fitting rental . . .	113 13 10
Repairs . . .	Meter-rental . . .	210 1 6
Office expenses, stationery, &c. . .	Lighter revenue . . .	221 15 2
Law charges . . .	Coke . . .	1,562 4 6
Gas-fitting revenue and expenditure . . .	Tar . . .	207 9 4
Interest and discount . . .	Transfer fees . . .	4 7 6
Directors' fees . . .	Rent and taxes . . .	77 4 8
Travelling expenses . . .		
Exchange . . .		
Profit and loss . . .		
£13,311 8 4		£13,311 8 4

The CHAIRMAN, in moving the adoption of the report, said many of the Shareholders would recollect that at their last meeting the Directors somewhat foreshadowed the present improved state of the Company's affairs. There was no question that they were on the road to improvement, and that they had been so from the period he had first mentioned twelve months ago; and he thought that unless something at present quite unforeseen should take place, their business would still further improve. Perhaps he could not better explain his meaning than by stating that the Directors had made arrangements for obtaining an ample supply of coal for two years from the present time, at very satisfactory prices; and if freights continued at the present rate, he thought the Shareholders might consider that their dividend was as nearly certain as it could possibly be, independent of any increase in the Company's earnings which it was hoped would take place. As the report stated, much of the prosperity they were now experiencing might be attributed to the very judicious superintendence of their Manager, Mr. Sumner. There was reason for great satisfaction with the condition in which the Company were placed at the present time, not only in reference to coal and freights, but in the fact that the liabilities had been considerably reduced. The Shareholders were told at the last meeting that this would be the case, and he was glad to say that they had now entirely got rid of the loan of £10,000, originally borrowed at 10 per cent. Respecting the manufacturing account, it was a great satisfaction to the Directors to be able to report that the amount of unaccounted-for gas was at present, by judicious management, being reduced to a minimum. It was now not more than 4 per cent., which was really a very low figure. This matter of unaccounted-for gas was one of considerable importance. The improvement in the Company's business had been brought about by the better state of trade generally, and from the fact that a large amount of building was going on in their neighbourhood. There had scarcely been a house built during the past year that had not apparently been fitted for the consumption of gas. The promptitude with which the Company's accounts were being met was a matter of great satisfaction to the Directors. It used to be a considerable drawback to the Company that their accounts with the Government were allowed to remain so long in arrear. They

were frequently unpaid for nine months after delivery; but now there was far greater regularity, and the payments for private lighting were also more satisfactory. During the past twelve months the Company had received an increased profit for private lighting alone of £1631. The Directors had great confidence in the officers of the Company, and they were sure that the gentleman who at present had the local management of the Company's affairs in Para had quite come up to the Directors' anticipations, and he (the Chairman) only trusted that Mr. Sumner's life and health might long be spared to fill the important position he now so ably occupied.

Mr. HENRY, in seconding the motion, congratulated the Shareholders on the formation of a reserve-fund, and also upon the increased dividend recommended in the report.

The CHAIRMAN remarked that the reserve fund was formerly a fire insurance fund; and, at the close of the year, stood at £1223. It was now intended to supplement this, and make the reserve up (out of funds in hand) to £2500, which would be at once invested in proper securities.

The motion was carried unanimously.

The CHAIRMAN then proposed—"That the interim dividend paid to the Shareholders at the rate of 4 per cent. per annum for the half year ending the 31st of March last be and is hereby confirmed, and that a half year's dividend up to the 30th of September last, at the rate of 7 per cent. per annum, and free of income-tax, be payable to the Shareholders on and after the 16th of February next."

Mr. ALLEN seconded the motion, and it was carried.

The retiring Directors and Auditor having been re-elected,

Mr. DODSON gave notice of his intention to propose at the next meeting to alter in the Articles of Association the clause having reference to the necessary quorum of Shareholders at meetings, and to provide that 7 instead of 20 should be a quorum.

A vote of thanks was then accorded to the Chairman, Directors, Secretary, and other Officers of the Company, and the proceedings terminated.

YORK UNITED GASLIGHT COMPANY.

The Seventy-third Half-Yearly Meeting of this Company was held on Thursday last—Mr. J. F. TAYLOR in the chair.

The SECRETARY (Mr. C. Sellers) read the notice convening the meeting, and the report of the Directors, which stated that the continued growth of the Company's business was satisfactory, the profit resulting from the half year's operations being £7868 7s. 8d. Out of this sum the Directors had paid the interest on the money borrowed on mortgage, and carried £800 to the reserve fund account. They recommended the usual rate of dividend of 5s. per share (10 per cent.) upon the old shares, and 1s. 6d. per share, or 5 per cent. per annum, upon the new shares, to be paid free of income-tax. The half year's profits had been considerably helped by freedom from many exceptional expenses incidental to the Company's business. The construction of the new works had made fair progress. The viaduct and railway were in an advanced state, and it was hoped the railway connection with the works would be completed during the present half year. The interest upon the capital cost of the principal portion of these extensions must necessarily, the Directors stated, for some time to come be a charge upon the Company's current business; but when the railway was opened this would immediately be remunerative. The excavation for the new gasholder-tank had been interrupted by floods, and the progress of its construction had, in consequence, been slow. During the next six months the Directors anticipate large payments on account of their several contracts, and to provide for these they propose to make a call on the new shares, payable in April.

The CHAIRMAN, in moving the adoption of the report, said the Shareholders would agree with him that it was one of the most satisfactory reports that had ever been presented to them. In past times their half-yearly meetings had been somewhat monotonous—they had just the ordinary routine of business to go through; but they had now a different state of things. The carrying out of the provisions of the Act of Parliament they had recently obtained, and the new works they had in hand, made their meetings much more significant than they had been at any time since he had had the honour of being connected with the Company. They had already entered upon their new works, and were making a tank for the new gasholder, as well as putting in foundations for the meter-house, the tar and liquor wells, and the boiler-house. But perhaps the most important, and that which would be brought soonest into use, was the railway. The siding from the Cattle Market was, as the Directors reported at the last half-yearly meeting, completed; but they were now making a railway connecting the new works with the old, and the whole with the Cattle Market new railway. They trusted this would be remunerative. It would take out of the streets those much-observed and often talked-about coal-carts. This had been done already, to some extent, by the coal being taken from the depôts to the Cattle Market station; but now the Company would bring in by railway to their own works not only coals, but lime and the other materials they required. They would be able to send out also by railway any products, such as spent lime, tar, and other things they had for sale. This was very satisfactory, and the Directors were quite sure it would tend to the prosperity of the Company. The proposed new show-rooms and offices in Daygate, had not yet been commenced. The plans were in an advanced state, and the Directors hoped soon to begin the work. They did not intend to carry out the whole scheme at present, but were going to construct show-rooms and workshops, and make other provisions which they hoped would tend to the convenience of the general public. As to the old plant, the Directors might congratulate themselves, and the Shareholders also, that they had one of the best plants in the kingdom. He did not know that any improvement could be suggested if the whole had to be erected again to-day. Everything was compact, but not crowded. The new plant they intended to make equally convenient as the old, but they did not mean to be extravagant. In consequence of the mildness of the weather during the latter part of the past half year, the consumption of gas was not so great as in the corresponding part of the year 1879; but the consumption as it increased was overtaking the Company's powers of manufacture. They would be able to make all the gas that would be required, but when they had the new works they would very soon have to put them into requisition. In consequence of the bad weather and the late storm, the Directors had not made so much progress with the new works as they could have wished; but they trusted that there would now be little hindrance, and that they should soon complete that much-desired improvement, the new railway. Alluding to the state of the revenue, he said the Shareholders would observe that the Company had had a very satisfactory half year. They did not, and they had no right to expect that the net revenue would be so great in the next half year as it had been. They had had an exceptionally light half year so far as the general expenses had gone. There had been very little street work, and there were other matters inside the works which had tended to this result. They were, therefore, tolerably certain that the expenditure would be greater next half year, and though they hoped the price of coals would not rise, they could not say it would not; but the Shareholders might depend upon it that as the constant vigilance of the Directors had been given to the interests of the Company in the past, so it would be continued. As

to the call, the Directors proposed that it should be made on the 1st of April. The call would be £2 per share, which would realize about £16,000. By the time named some of the payments on the works now in progress would be due, and they would require this money to meet the expenditure. Coke continued in great favour. Many people from other places had been to see their coke breakers, and he dared say there were more coke breakers in the gas-works of the kingdom now than there ever were. As to the electric light, he might venture to say there was no practical advance in its development. Those electricians who were supposed to know all about it were of opinion that it could not compete with gas for household and ordinary purposes. It was a very easy thing for people to suggest it to be the light of the future, but such predictions partook more of talk than practical knowledge of the subject. In conclusion, the Chairman said the affairs of the Company were never in a more prosperous condition, and the Directors hoped, and had every reason to believe, that this prosperity would continue.

Alderman WILBERFORCE seconded the motion, and it was unanimously adopted.

On the motion of the CHAIRMAN, seconded by Alderman WILBERFORCE, it was resolved—"That the usual rate of dividend of 5s. per share upon the old shares, and 1s. 6d. per share, or 5 per cent. per annum, upon the new shares, be paid on and after the 8th inst., free from income-tax."

Mr. J. R. HILL moved a vote of thanks to the Chairman and Directors, who, he said, had given strict attention to the interests of the Company. The Chairman had referred to the price of coal, but if that should increase, the Shareholders had the satisfactory assurance of a continued increase in the consumption of gas, and a large increase in the value of the residual products.

Alderman AGAR seconded the motion, and it was carried unanimously.

The CHAIRMAN having briefly replied, the meeting terminated.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Thursday, the 27th ult.—the Rev. Dr. PHELPS in the chair.

The minutes of the previous meeting having been read and confirmed, the following report of the Directors was taken as read:—

The Directors recommend that a dividend for the half year, after the rate of 10 per cent. per annum on the consolidated stock, representing the original share capital, and after the rate of 7 per cent. per annum on the consolidated stock and on the amount called up on the new shares, representing the new share capital, be paid, free of income-tax. To pay this dividend, it will be necessary, in consequence of the large sum expended on renewals during the past half year, to appropriate from the floating assets the sum of £1663 17s. 1d.

The Directors, after full consideration of all the circumstances, and wishing to avoid litigation, have decided not to appeal against the new poor rate assessment, although they cannot but consider the assessment excessive.

The Directors, acting on the advice of Mr. T. Hawksley, purchased in July last 4a. 1r. 16p. of land adjoining the works, upon very advantageous terms; and as, under the Company's Special Act, this land cannot be used for the manufacture and storage of gas without the authority of Parliament, the Directors have deposited a Bill for the purpose of obtaining that authority, which Bill will be submitted to the Shareholders at a special meeting to be held immediately after the ordinary general meeting.

The report of the Manager (Mr. J. Weeks), which was presented with the Directors' report, stated that the increase in the consumption of gas for the half year ending Christmas last had been above the average, and had brought into full operation the whole of the Company's new works. The illuminating power, pressure, and purity of the gas had been kept to the required standard.

The CHAIRMAN moved that the above reports be entered on the minutes. The reports were, he said, in the Shareholders' hands, and he hoped they would think them as satisfactory as he did. He did not think that any company could be better circumstanced than they were.

Mr. S. PEED seconded the motion, which was unanimously agreed to.

The CHAIRMAN proposed that the dividends recommended in the report be declared.

Mr. F. C. WACE seconded the motion, and it was agreed to.

Dr. FAWCETT proposed, and Mr. G. W. FITCH seconded, a vote of thanks to the Chairman, and the motion was carried unanimously.

The CHAIRMAN, in acknowledging the vote, said he believed the Company were in a highly efficient and promising condition. The rate of increase in the consumption of gas had recently gone forward with a bound.

This closed the business of the ordinary meeting.

A Special Meeting was then held for the purpose of submitting to the Shareholders the Bill promoted by the Directors for the purpose of obtaining authority for the manufacture and storage of gas on the piece of land referred to in the report.

The SECRETARY read the preamble of the Bill and the marginal notes appended to the clauses. [The 6th clause provides for the raising of additional capital, the 8th for the limitation of the dividend to 7 per cent., and the auction clauses as usual provide that the whole of the shares in the new capital shall be offered by public auction.] He said the Bill had complied with the Standing Orders of the House of Commons, and at present there was no opposition to it.

The CHAIRMAN, in proposing that the Bill be approved, referred to the absolute necessity for making this application to Parliament, and the advantageous terms on which the land had been acquired. He did not fear that there would be any difficulty in obtaining an Act.

Mr. BALLS seconded the motion, which was agreed to unanimously.

Mr. T. HAWKLEY, C.E. (the Company's Consulting Engineer), remarked, in reference to a question put by Dr. Fawcett, that there was a clause in the Bill providing that not more than £5000 worth of new stock should be offered at any one sale.

The proceedings then terminated.

SHEFFIELD WATER-WORKS COMPANY.

A Special Meeting of this Company was held on Friday, the 28th ult., for the purpose of considering the Bill the Company are now promoting in Parliament. Mr. P. SMITH presided.

The LAW CLERK (Mr. B. P. Broomhead) having read the notice convening the meeting,

The CHAIRMAN said the Shareholders had been called together to consider and, if they thought well, to approve of the Bill promoted by the Company in the present session of Parliament. He might call to their recollection that the objects of the Bill were really only two—first, to obtain an extension of the period during which the Company could exercise their powers of making certain additional reservoirs, which, however, were not likely to be required for the service of the district for some years to come; secondly, to enable the Company to raise additional capital to pay for these reservoirs when the time arrived for them to be made, and in the meantime to extend the mains and other service works connected with their present systems of reservoirs as often and as soon as the increasing population required such extension. Now these were really the two objects, and the only objects, of the Bill; and their desirability in the interests of the Company seemed to him to be so very obvious that he could hardly imagine there could be any difference of opinion amongst

the Shareholders. He would, however, ask the Law Clerk to read the preamble and marginal notes of the Bill, and then he should be ready to hear any observations the Shareholders had to make upon it. He might remind them that they met that day as a parliamentary trading company, to consider a measure intended to benefit their own undertaking; and he was sure they would agree with him in regarding as mistimed and irrelevant any discussion which did not relate to the bearing of the Bill on their trade profits and the position of the Shareholders, or upon such obligations as Parliament had laid upon them, as, virtually, the water monopolists of the district.

The LAW CLERK having read the preamble and marginal notes of the Bill,

Mr. J. E. CUTLER asked what extension of time the Directors were going to ask for, and upon what basis they had calculated that the present water supply would be sufficient after 1884.

The CHAIRMAN replied that it was rather difficult to say when the new reservoirs would be required. They would be wanted some time when Sheffield had extended. If the Shareholders looked in the Directors' report of the last year but one, or the year before, they would find that Mr. T. Hawksley, the Company's Engineer, certified that their present system of reservoirs would give 20 gallons per head per day to half a million of people. The population of Sheffield at the present time did not reach quite 300,000; so that at all events they were a good many years beforehand. These calculations had been made after considerable consideration by the Engineers, and the term which they had suggested had been put into the Bill. It was on their calculation as to the quantity of water already in hand, which would supply the population for many years to come, that the Company had asked for this postponement.

Mr. CUTLER: You do not say what extension of time you ask for.

The CHAIRMAN said 16 years. The Shareholders must understand that the 16 years was not the period during which the Company could make the additional reservoirs, but merely the period during which they had time to exercise the right to make them. If they did not exercise the right within this time, then their powers would lapse. They were under compulsion to give a day and night supply, and whenever the population so increased as to require it, they would have to make new reservoirs. He then moved the following resolution:—"Resolved, by the Proprietors present in person or by proxy, holding at least three-fourths of the paid-up capital of the Company represented at this meeting (such Proprietors being qualified to vote at all ordinary meetings of the Company in right of such capital), that the Bill intitled 'A Bill to extend and amend enactments relating to the Company of Proprietors of the Sheffield Water-Works Company, and for other purposes,' and now submitted to the Proprietors of the Company, be and is hereby approved by them, subject to such alterations as the Directors may make therein, or as Parliament, with their consent, may prescribe."

Mr. J. W. HAWKLEY seconded the motion, which was carried, and the proceedings then terminated.

MR. SCOTT-MONCRIEFF'S SYSTEM OF CARBONIZATION.

In reference to the paper read the week before last by Mr. W. D. Scott-Moncrieff, and published in our issue of the 1st inst., Mr. R. H. Jones has addressed a letter to the Society of Arts to show that instead of £2,000,000 to be saved by the proposed system of supplying 24-candle gas by extracting only 3333 cubic feet from every ton of coals, Londoners would have to be content with 3 million tons of fuel instead of 5 millions, and the Gas Companies saddled with £2,350,000 extra for coals.

The letter, which is dated Jan. 31, is as follows:—

The paper read last Wednesday, by Mr. W. D. Scott-Moncrieff, on "Suggestions for Preventing London Smoke, and Making it Commercially Available," assumes that if the 4 million tons of coal used in London for heating purposes were all put into the retorts of the Gas Companies (in addition to the coal now used by those Companies), and manipulated as he suggests, London would be a "smokeless city," and an annual saving of some two millions sterling effected. Mr. Scott-Moncrieff asserts that if the Gas Companies extracted only one-third the quantity of gas they now get out of a ton of coal, the coke, or "smokeless fuel," would have a heating capacity fully 20 per cent. greater than common coal, and 10 per cent. greater than coke; but we are not favoured with any statistics to prove this. I will, however, take the lecturer's own figures, as the paper assumes a commercial aspect. How is it, then, that if coke has a heating capacity of 10 per cent. in excess of coal, its commercial value is 25 per cent. less—coke being valued at 12s. per ton, against 16s.? I venture to think this question should be treated in a practical manner, and taking Mr. Scott-Moncrieff's figures, I submit the following, from a gas maker's point of view:—

Present Net Cost of Coals for making London Gas.

2,000,000 tons of coal, at 16s.	£1,600,000
Labour thereon, at 2s.	200,000
	£1,800,000

Less tar and ammonia, at 3s. 9d. per ton of coal	£375,000
1,000,000 tons of coke, at 12s.	600,000
	975,000

Net cost of coal under present <i>modus operandi</i>	£825,000
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Mr. Scott-Moncrieff proposes that, instead of using 2 million tons of coal, the Gas Companies should use 6 millions.

6,000,000 tons of coal, at 16s.	£4,800,000
Labour thereon, at 2s.	600,000
	£5,400,000

Tar and ammonia are valued at double present sales, or 2s. 6d. per ton of coal	£750,000
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And if no more coke were used for carbonizing "in the retorts, on an extraction of less than three hours, instead of six hours, at present prevailing," there would be 3,000,000 tons of fuel for sale, which I cannot value at more than 10s. per ton	1,500,000
	2,250,000

Net cost of coal under proposed new system	£3,175,000
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I may add, in passing, that Mr. Scott-Moncrieff calculates 17 cwt. of coke made per ton of coal under the proposed system, against 13 cwt. as at present, with a percentage used for fuel of only 19½, against 23 at present. I submit that not more than, if so much as 10 cwt. of coke per ton of coal would be left for sale by the more frequent charging of the retorts.

Mr. Scott-Moncrieff assumes that, by making only one-third of the quantity of gas now made per ton of coal, the illuminating power would be raised from 16 to 24 candles—i.e., 50 per cent., and that the gas would be worth 50 per cent. more money, or 5s. 3d. per 1000 feet, instead of 3s. 6d., an increase of 1s. 9d. per 1000 feet, which the consumers would be called on to pay. I do not think this requires more than a passing notice. A gas consumer, with two burners in his room or shop, can use a third if

he chooses to increase his light. Why does he content himself with two? Simply because he does not want to pay for the third or extra light.

We have not been favoured with facts from actual workings, and I think the members of the Society of Arts would like to be informed: 1st, whether a 16s. per ton coal, producing 10,000 cubic feet of 16-candle gas, will produce at the consumer's burner 3333 cubic feet of 24-candle gas; 2nd, where and when has the test been made, proving that the coke of coal from which 3333 feet of gas has been extracted "has a heating capacity fully 20 per cent. greater" than coke of the coal from which the gas has all been extracted.

At the Beckton Gas-Works a year or two ago there were literally mountains of coke which was unsaleable in London, and had almost to be given away for shipment to the Continent. The severity of the last two winters has kept coke stocks pretty clear. Is it to be assumed that the "smokeless fuel" proposed to be made will command a better sale than the ordinary gas coke? I think it may be taken for granted that such fuel exposed for a few days during the recent weather would have become a heap of rubbish on removal from the gas-works.

According to my figures, London, instead of having 4 million tons of coal and 1 million tons of coke for fuel, would have to be content with 3 million tons of "smokeless fuel," and the Gas Companies saddled with an increase of £2,350,000 in the cost of producing their gas.

The following letter has also been addressed to the Society:—

In Mr. Moncrieff's paper he referred to the Royal Arsenal Gas-Works as having practically adopted his scheme of "using fuel from which a certain proportion of gas only has been extracted." As I was not present at the meeting, and unaware that Mr. Moncrieff intended referring to the works under my charge, I beg to be allowed to refute the statements in his paper, in so far as they relate to the Royal Arsenal, or any other of the Government Gas-Works.

Some years ago, during an exceptionally busy period, when the Government departments were working all night, I was unable to meet the greatly increased demand for gas, and was therefore compelled, at that time, and occasionally since, to work a few ovens with 4-hour charges, so as to obtain a larger quantity of gas in the 24 hours than could possibly be obtained by means of the ordinary 6-hour charges. But it is quite a mistake to suppose, as might be inferred, that I only obtained 3333 cubic feet per ton of coal carbonized; or that the short extraction was effected cheaply, owing to the coke from the short-time charges "being greatly superior to ordinary gas coke," and thereby assisting the operation—seeing that in the ovens worked with the 4-hour charges a volatile cannel coal was used, the coke from which contained very little heating properties, and consequently was not used as fuel under the retorts. So far from "superiority of the short-time charges being proved," as stated, the plan was found to be very expensive and uneconomical, and was only resorted to in order to meet a few exceptional emergencies; and it is not likely to be adopted again, seeing that the works have recently been enlarged to such an extent that I shall be able at all times in future, by working 6-hour charges, and taking all the gas I can get out of the coal, to keep a sufficient stock on hand to meet the requirements of the departments, under any conditions that are ever likely to arise.

I must, therefore, on behalf of all the Government Gas-Works under my superintendence, disclaim any right to the credit given of having adopted Mr. Moncrieff's scheme for producing coke containing a large quantity of gas, as I am sure the War Department would be far from satisfied if, instead of producing, as at present, between 9000 and 10,000 cubic feet of 16-candle gas per ton of coal carbonized, I were to give them about one-third of this quantity, and to offer a greatly increased yield of tar in lieu thereof, with coke from which only a small proportion of the gas had been extracted.

Royal Arsenal, Woolwich, Jan. 29, 1881.

J. A. C. HAY.

P.S.—Mr. Wallace, who manages the Royal Arsenal Gas-Works, under my superintendence, assures me that he did not furnish the statements contained in Mr. Moncrieff's paper in regard to these works, and that they have been made without his knowledge or consent.—J. A. C. H.

THE PRICE OF GAS AT BRADFORD.

Following up the report on this subject, which appeared in our issue of the 25th ult., and the remarks made last week in relation thereto, we give below the text of an article that was published in the *Bradford Observer Budget* of Jan. 29, and which confirms many of the arguments frequently advanced by us as to the injustice of relieving ratepayers at the expense of gas consumers in places where the supply of gas is under the control of the local body:—

"What are the principles which should regulate the price of gas in the cases, now very common, where the manufacture and distribution of this commodity are carried on by the public authorities? This is a question which, in one or other of its phases, has come up for discussion in most large towns during the last few years, but which seems to be almost as far as ever from a definite solution. It is nearly 10 years ago since the undertaking of the Bradford Gas Company was acquired by the Corporation. In spite of the continued depression of trade which has marked the greater half of the decade, the profits have increased yearly in amount, and at last have suggested an inquiry whether such large profits are either justifiable or expedient. Some people may be inclined to say that it is wise to let well alone, and our worthy Mayor has expressed himself as very much of that way of thinking upon the question. There are others who have had doubts as to whether 'well' could not be better, and in November last the Gas Committee of the Town Council appointed a Sub-Committee to look into the subject. Of course, if all ratepayers were consumers of gas, and all gas consumers were ratepayers, and the amount of gas consumed in each case were exactly proportionate to the rates paid, the question would be simply one as between direct and indirect taxation. Unfortunately, very wide disparities exist in this respect, and these tend greatly to complicate the question. However, the Sub-Committee referred to seem to have gone very thoroughly into their investigations, and their report, which we printed last week, is lucid and logical. The report begins by showing that the present price of gas in Bradford—3s. per 1000 cubic feet—is higher than the average price at which gas is sold in some 10 other large towns similar in many respects to Bradford. The Committee are further of opinion that a reduction in the price would stimulate the consumption. Having regard to these facts and circumstances, the Sub-Committee report in favour of a reduction of 6d. per 1000 feet, thus reducing the price to 2s. 6d. But they do not contemplate this reduction without reservations, for they insist that the reduction should be accompanied by an alteration in the scale of discounts allowed for prompt payment. The principle upon which the large consumer is allowed a higher rate of discount than the small consumer is a perfectly just and reasonable one within certain limits. The large consumer has the gas laid on to his works, say, in a 6-inch main, and it is all passed through one big meter. He is at all the expense of distribution, and has to bear all the waste inseparable therefrom. His half-yearly account

amounts to more than the total for a small colony of cottages, and is pretty certain to be paid when due. The saving in maintaining service-pipes, in book-keeping, in stationery, in collecting, and in bad debts, comparing the large consumer with the small, must be considerable; but it cannot be, or at least ought not to be, as much as 20 per cent. discount, which is now allowed to the former. The Committee have come to the conclusion that discounts at these rates cannot be justified, and they think that it is high time that they were modified—a conclusion which will be heartily endorsed by the general public. The new scale which it is proposed to adopt should begin with 2½ per cent. to those whose accounts amount to £1, and gradually increase to 12½ per cent. to those whose accounts amount to £60 or upwards. It is open to question whether the large consumer would not still have a considerable advantage under this arrangement, and it certainly appears desirable that the 2½ per cent. should be allowed to all small consumers, even though their accounts may not reach 20s., if for no other reason than that it would act as an incentive to prompt payment. Such a heavy reduction as 6d. on 3s. cannot be made without materially lessening the amount of gas profits, and, as these have uniformly been devoted in relief of the rates, it follows that the rates will have to be increased. It is this fear of adding to the burdens of the ratepayers which is the incentive to those who oppose any reduction. There is, however, we think, a very strong reason why the reduction should be made. The present profits are enormous. On any reasonable basis of calculation they are very much more than 10 per cent. upon what, if the concern were in the hands of a private company, would be the share capital. There are in the town many large ratepayers—as, for instance, the woolstaplers and merchants—who burn very little gas, and so contribute next to nothing to the profits, who yet get the full benefit of the apportionment in aid of the rates. Sir H. W. Ripley, for instance, does not consume a single foot of Corporation gas in all his extensive works and cottage property at Bowling, and yet the rates on that property have been about 6d. in the pound less on account of gas profits which have come out of the pockets of others. This surely is an anomaly which calls for modification."

The same paper, in giving a chronological account of the work of the Corporation since the year 1847—the date of incorporation—after speaking of the water-works undertaking, says: "The gas plant of the Corporation is more remunerative in its immediate returns upon capital. On this account the Corporation have borrowing powers amounting to £610,000, and they have borrowed £463,305, which remains as a mortgage debt. The annual receipts on revenue account were, in 1879, £149,450, and the payments £123,318, leaving a net profit to be appropriated in relief of rates amounting to £26,132. The following sums represent the net profits derived from the Corporation gas-works since they came into the possession of the ratepayers, viz:—

For* 1871	£9,690 16 8	Brought forward	£84,158 19 1
" 1872	13,127 12 1	For 1877	20,611 6 10 1/2
" 1873	4,808 0 4	" 1878	22,881 1 3 1/2
" 1874	10,848 12 4 1/2	" 1879	26,131 2 9
" 1875	25,530 4 2 1/2	" 1880	
" 1876	20,153 13 3	(first half)	14,014 4 4
Carried forward	£84,158 19 1	Total	£167,796 14 4

Of these profits £150,000 have been applied in relief of the rates of the borough. The works of the old Company, purchased in June, 1871, cost the Corporation £210,000."

THE FAILURE OF THE LINCOLN CORPORATION BILL.

A Special Meeting of the Lincoln Town Council was held on Saturday the 29th ult.—Alderman BEARD (in the absence of the Mayor) presiding—in regard to the Corporation Bill which had been rejected the previous Thursday, on the poll of the ratepayers.

Alderman MALBY moved—"That, the poll of the owners and ratepayers having resulted in a majority against the Bill, no further action be taken by the Corporation in the matter." In proposing this resolution, he said he did not wish to go back for one moment from the standpoint which he had taken from the first. When he introduced the subject of the purchase of the gas-works, and moved for the Council in committee to take the question into consideration, he was unanimously supported. The whole of the evidence in connection with the affair was placed before the Council; and time then seemed to be very pressing, as the Company had made application for power to borrow a certain sum of money at 7 per cent. He must admit that three or four gentlemen who took an opposite view of the case were particularly anxious that the subject should be deferred; but the majority of the members were desirous of coming to terms with the Company, in order to save the town from paying 7 per cent. on the money to be borrowed, as they could obtain the necessary amount at a lower rate. It was, however, then found to be too late, as two or three months passed before the report was presented to the Council. He must, however, say, that when the Engineer's report on the gas-works was presented, and the agreement was sealed, he believed not a single hand was held up against it. For his own part, he had acted according to the best of his judgment, and if he had been at fault it was owing to a fault of judgment and not of intention. He was not going to recede for a moment from the position he then took, nor yet from his opinion that the undertaking was a profitable one, and one which the citizens would not have regretted, if they had purchased by agreeing to the Bill. He knew it was said the Council hurried on the Bill, but he might state that the only reason why they did so was because the Company were applying for borrowing powers at 7 per cent., and it was to avoid the payment of such interest, as the Council could have borrowed money on better terms. So much for the course that he had taken. The town, however, had spoken against the measure, and he did not complain of the decision, but simply wished to lay the facts before the Council, and move the resolution he had done.

The motion having been seconded, a conversation ensued as to whether it would not be possible to retain certain parts of the Bill not connected with the gas-works purchase. It was, however, decided by the Town Clerk that this could not be done unless the members personally paid the costs which would be incurred.

The motion was then put and carried unanimously.

Mr. SMITH, in the course of a discussion as to the fund out of which the expenses that have been incurred should be paid, said he thought the expenses ought to come out of the borough fund pure and simple, and he should move a resolution to this effect; and he should also, at the next meeting of the Council, ask for a full and particular account of all the expenses that had been incurred.

The TOWN CLERK said he had referred to the Act of Parliament, and ascertained that the expenses of the poll would have to be paid out of the general district rate.

Alderman COTTINGHAM thought it was stated that the expenses of the poll would be defrayed out of the public funds.

The TOWN CLERK said it was the same thing.

Alderman COTTINGHAM did not think it was, as by making the payment come out of the district rate the ratepayers would be taxed.

Mr. STEPHENSON said he should like to ask how it was that the rate-payers were not called together earlier. If they had been, all trouble would have been saved, and he did not think it was right for the rate-payers not to be called together until after the work was done.

The CHAIRMAN: We had nothing to put before them.

Mr. STEPHENSON: I think it would only have been right and fair for them to have been called together before. It was not right to agree to spend the money without first calling them together.

Mr. SMITH said he should give notice at the next meeting that the expenses be paid out of the borough fund, and not out of the general district rate.

The TOWN CLERK said the whole matter would then be before the Council, and Mr. Smith could move such a resolution if he thought proper.

The proceedings then terminated.

ANALYSES OF THE PUBLIC WATER SUPPLIES OF ENGLAND.

In accordance with their promise, our contemporary, *The Analyst*, this month publishes what is intended to be the first of a series of analyses of English public water supplies. They preface their report with these remarks:—

“The purity of the water supply of the large towns of England has been for a long time a prominent matter in the consideration of the public, and a matter of almost daily discussion in the leading London and provincial newspapers, as well as a certain and somewhat lengthy source of argument year by year before Parliamentary Committees, and in the House of Commons itself.

“A certain section of the public have taken the matter up from the standpoint that a water supply for drinking purposes ought to be not only free from all injurious constituents; but that, in order to be perfectly satisfactory, it should practically possess the characters of distilled water as far as regards freedom from either organic or inorganic constituents. Following their opinion to its logical conclusion, these persons naturally conclude that no river supply could by any chance be fit for household use, and that no matter how much the proportion of drainage matter which may find its way into a stream is oxidized, even by flowing 20 miles down the stream, its injurious effects were liable to be as bad as when it was originally poured in. Others, again, hold that water from deep wells in the chalk strata, containing a large quantity of lime salts, although organically pure, is liable to produce, or any rate to increase, certain

diseases, by introducing too large a quantity of earthy salts into the system.

“It is not the business of the Society of Public Analysts to decide between these and the various other statements which have been made, but the proposals for legislation which occur from year to year in reference to water supplies, render it very desirable that authentic and reliable information as to the actual analyses of the various waters used, not only in London, but also in the leading towns of the kingdom, should be in the hands of those whose duty and interest it is to guide the national deliberations on the subject.

“In order to meet this public necessity, the Society of Public Analysts have discussed the matter and decided to publish a monthly series of analyses, which shall be made on a perfectly uniform system, somewhat more full than those which have been previously in use. This series will include not only monthly analyses of the London waters, and as far as practicable all the towns included in the Registrar-General's reports; but, in addition to these, periodical analyses, at longer or shorter intervals as the case may be, of the water of any other towns in which the supplies seem of a sufficiently public character, and the population is sufficiently large to justify such a step.

“At present neither the Society nor its members (by whose signature the returns are authenticated) express any opinion whatever as to the relative qualities of the waters, beyond those contained in the figures and facts of the analyses themselves, although it is possible that at a future time some such expression of opinion may be made. The details of the analyses are, however, so complete, that those who are in the habit of collating such results can form a fair judgment for themselves.

“There are in the scheme several special features which require notice. The analysts who are co-operating in it are working on uniform instructions, and according to absolutely uniform processes. The result is that, for the first time, a fair comparison can be made between the water supplies of London and of the provincial towns. The analyses are not only fuller than heretofore published, but some important modifications have been made, especially as regards the temperature at which the determination of oxygen absorbed is made, which, although altering these analyses slightly from those which have preceded them, yet do, in the opinion of the Society, greatly increase the delicacy of the analyses for the detection of pollution. The form in which the analyses are reported—namely, by giving the results in grains per gallon—has been adopted after mature deliberation, as that which, in the judgment of the majority, would render the analyses most valuable to those who have to consult the tabulated figures.”

A description of the sources of supply and methods of filtration (if any) of the London Companies is then given, the principal items of which are thus tabulated:—

	New River.	East London.	Southwark and Vauxhall.	West Middlesex.	Grand Junction.	Lambeth.	Chelsea.	Kent.
Capacity of reservoirs in gallons	170,000,000	605,000,000	66,000,000	92,000,000	64,500,000	125,000,000	140,000,000	None.
Unfiltered	170,000,000	605,000,000	66,000,000	92,000,000	64,500,000	125,000,000	140,000,000	None.
Filtered	30,000,000	12,000,000	18,000,000	11,000,000	24,000,000	30,000,000	11,000,000	”
Filter-beds	14½ acres.	27 acres.	14½ acres.	10 acres.	10·75 acres.	7 acres.	6·75 acres.	”
Fine sand	2 ft. 3 in.	2 ft. 6 in.	3 ft.	2 ft. 3 in.	2 ft. 6 in.	3 ft.	3 ft. 3 in.	”
Hoggin	—	—	1 ft.	—	6 in.	—	—	”
Coarse sand	—	—	—	1 ft.	—	—	—	”
Shells	—	—	—	—	—	—	3 in.	”
Fine gravel	3 ft.	—	9 in.	2 ft. 3 in.	9 in.	1 ft.	4 ft. 6 in.	”
Coarse gravel	—	1 ft.	9 in.	—	9 in.	3 ft.	—	”
Boulders	—	1 ft.	—	—	1 ft.	—	—	”
Average rate of filtration per square foot per hour	2 gallons.	1·3 gallons.	1·5 gallons.	1½ gallons.	1½ gallons.	3·5 gallons.	2 gallons.	”
Estimated population supplied.	1,000,000	960,000	684,000	430,000	390,000	463,000	225,000	303,300
Average quantity pumped daily.	29,000,000	26,000,000	24,000,000	10,500,000	11,700,000	16,000,000	9,000,000	8,500,000

Then follow certain particulars in regard to the supply of water to six of the towns reported upon, and a promise is held out that there will be published, from month to month, “particulars of the sources of any public supplies of which it may be possible to obtain authentic and reliable details.”

A table of analyses of the London and of 23 Provincial Water Supplies—including Birmingham, Bradford, Cambridge, Canterbury, Croydon, Derby, Exeter, Grantham, Huddersfield, Hull, King's Lynn, Leamington, Leeds, Manchester, Newcastle-on-Tyne, Norwich, Oldham, Salford, Sevenoaks, Sheffield, Shrewsbury, Sunderland, and Warwick—is given; but this our space will not admit of our reproducing. We must refer all those who are specially interested in the question to our contemporary for the figures showing amounts of (1) chlorine, (2) nitrogen as nitrates, (3) ammonia, (4) albumenoid ammonia, (5) oxygen absorbed in 2 minutes, at 80° Fahr., (6) do., in 4 hours, (7) hardness on Clark's scale, before boiling, (8) do., after boiling, (9) total solid matter, dried at 220° Fahr.; besides the appearance in a 2-foot tube, the smell when heated to 100° Fahr., whether or not there were traces of phosphoric acid, the result of a microscopical examination of deposit, and lastly the names of the analysts in all cases.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

Edinburgh, Saturday.

The difficulties which rear themselves against a corporation endeavouring to acquire the works of a private gas company, especially if there is an exhibition of any unwillingness to part with a business which, in the past, may have proved a lucrative investment, are sufficient to appal the heart of the most resolute town councillor. But when the seemingly simple task is undertaken, the impediments to progress do not always reveal themselves; and, in ignorance of their existence, corporations are found willing, nay, anxious, to join issue with private companies. I purpose this week, for the benefit of councillors who have set their hearts upon the acquisition of gas-works, to give a *résumé* of the tedious proceedings which have resulted in the town of Elgin becoming the owners of the gas-works. It is now more than two years since the feeling of the population was ascertained to be in favour of making their own gas, and as soon as the necessary preliminaries had been arranged, an arbitration was entered upon. To avoid this the Corporation offered £17 10s. per share; but the offer was refused. The Company were determined to have their “pound of flesh.” Looking back upon the whole proceedings, the Provost of Elgin, at a meeting of the Council last week, said they were “at every stage of the negotiations thwarted, and obstacles placed in their way.” From the very commencement the Council had to face difficulties. The Town Clerk, the statutory adviser and often the legal agent of a town, had some connection with the Directors of the Gas Company, and it was therefore expedient to have a substitute for him. Now, there resides in Elgin a lawyer named Mr. James Jameson. On Jan. 31, 1878, Mr. D. Forsyth, the Town Clerk, wrote to this gentleman as follows:—“The Town Council wish the benefit of your services in the matter of the transfer of the Elgin Gas-Works. . . . You will under-

stand, of course, that your charges will just be what my charges would be outside the town clerkship.” Mr. Jameson sent, in reply to this, a letter, in which he said, “I feel this a very distinguished honour indeed,” and he asked the Town Clerk to “convey to the Town Council how much I feel in being so highly honoured by their confidence in this way.” But this is nothing to what follows. Indeed, the sentence I am about to quote has quite a Pickensian flavour:—“You are good enough to mention as to charges. There can be no difficulty on that score. But what are charges to such honourable employment? Nothing! Assure the Town Council that in this matter no mercenary consideration shall prevent me doing my utmost on their behalf.” Here, for the moment, I will leave this very patriotic lawyer. Mr. Hislop, of Paisley, was appointed to act for the Gas Company, and Mr. Robertson, of Dundee, for the Town Council, and ultimately, after many delays, the price of the works was fixed, in round numbers, at £14,000, or, inclusive of arbitration, something like £21 5s. per share, exclusive of these expenses, £19 11s. 11d., or £2 1s. 11d. more than the compensation originally offered. Of course, in such circumstances, the Corporation had to pay the piper, and this week they have been sadly exercised as to the exact course which they ought to adopt. Mr. Jameson, in whose mind the honour of being employed by the town entirely superseded all “mercenary” considerations, presented an account for the tidy little sum of £280. This includes a claim for £132 3s. 1d. charged by Mr. Jameson in connection with a loan of £16,000 obtained for the town. But this loan business is worthy of remark in connection with the transference proceedings. The town wanted money wherewith to pay for the works they had acquired, and Mr. Jameson told the confiding Councillors that he could get a loan for them at 4½ per cent. interest. Armed with the necessary authority, he, through the firm of Messrs. H. Salter and Son, of Glasgow, obtained the sum in question, and the transaction having been completed, Mr. Jameson charges a commission of ⅓ per cent. on the total amount, and Messrs. Salter 1½ per cent., or £260. But these accounts are felt to press rather hardly upon the civic corn, and they are submitted to a firm of Edinburgh solicitors, who report upon Mr. Jameson's account thus:—“Mr. Jameson's account ‘consists of business account, £71 14s. 5d.; commission of ⅓ per cent., £60; outlays, 8s. 8d. The business account of £71 14s. 5d. is overcharged. It includes quite correctly a charge of £43 6s. 3d. for revising the mortgage, which charge is based on Sec. IV. of the Conveyancing Table. The note to that section, however, declares that this revising fee includes ‘trouble, if any, for procuring the loan,’ and the whole other charges of the account, with the exception of petty charges and £2 6s. 6d. for copies of the decree-arbitral, fall to be struck out. The same remark applies to the £60 for obtaining the loan.” This firm also dealt with Messrs. Salter's account, which they reduce to £109 5s. To make a long story short, the Council agreed to offer the latter firm £109 5s., and Mr. Jameson £200 in full of every claim. But whether or not they will accept these amounts remains to be seen. In addition to the accounts, it came out in the course of the proceedings that Mr. Hislop's charge for his assistance amounted to 1 per cent. on the value of the works, or £121 in all, and that the charge made by Mr. Robertson was

25 or 26 guineas. Since the transference has been effected, the Elgin Gas Company have made a claim upon the town for £688 13s. 8d., being the amount of the valuation for coals, tar, lime, pipes, &c., in stock at the time of taking over the works. These and all the other charges ought to have been dealt with by the Gas Committee; but the Provost thought it better to make the Council aware of the true state of matters. The story which the proceedings reveals may not be without its lesson to other corporations contemplating similar negotiations.

The all important question to a section of the natives of Dundee, as to what salary the Gas Manager of the town is to have, has at length been decided, at least so far as the Gas Commissioners are concerned; and decided in favour of retaining Mr. McCrae at a salary of £500. The minority who have cried so loudly for a reduction of the amount to £400 have been ignominiously defeated, the figures on a division being 11 as against 3. I have carefully gone over the remarks of the three gentlemen who argued in favour of the lesser sum of £400, to discover the grounds upon which they supported their views; and the only one to which, as it seems to me, any importance can be attached, is that Mr. McCrae is a young man. This is an objection which must, in the ordinary course, wear away with the succession of days; and as no one has challenged his ability to conduct the works on the same lines as his late father, I think the Commissioners ought to be complimented on the wisdom of their appointment. Mr. Robertson, the gentleman who seconded the motion for the reduction of the Manager's salary, in a moment of weakness allowed to escape him a statement which shows unmistakably his idea of what constitutes a gentleman. "It was," he said, "possible to spoil the best and most efficient servant by making him a gentleman all at once." In Dundee a gentleman is made "all at once" by giving him a salary of £500. I have hitherto been of the belief that a man might be a gentleman, though clothed in "hoddon grey," and that the term might be applicable to a person altogether apart from monetary considerations. Shakespeare makes one of his characters exclaim:

"I freely told you all the wealth I had
Ran in my veins; I was a gentleman."

But if Mr. Robertson's rule is to find favour, we must now adopt a different standard. In the course of the proceedings on Wednesday a large number of figures were quoted to show the salaries which were paid to managers both in England and in Scotland. Now, if a mind for abstraction framed, such as the Manager for Dunoon, for instance, were to set to work, a "gentlemanly table" might easily be evolved from this mass of figures. The manager having the highest salary would, of course, be the Beau Brummel, or the "First Gentleman" of the profession, and the others would be by percentages less gentlemanly. In this way, according to Mr. Robertson, a very amusing, if not instructive table might be prepared. I trust that we have heard the last of this ridiculous movement, and that the gentleman who has tabled a motion on the subject for the next meeting of the Council, will see his way to withdraw it.

There are still reports of accidents from explosions of gas, and one begins to wonder when the public may learn that gas and air in certain proportions make a highly dangerous mixture. During last week an explosion took place in Edinburgh, which did a considerable amount of damage to property. An attempt had been made to thaw the frozen water in a meter by pouring boiling liquid into it, and to relieve the pressure of gas one of the nozzles was opened. When a sufficient quantity of gas had been allowed to escape, a candle was in readiness to complete the work, and the result was a dangerous explosion. A number of explosions of gas have occurred recently in the town of Keith. On investigation, serious leaks in the main have been discovered. The Company are now about putting matters to rights by laying a new main.

I hear that the project, which was certainly about to be put into practical shape, of testing meters with a 3-inch water-seal, with the under tap open, has been abandoned. All I can add to the information is, R.I.P.

The Uphall Oil Company have not been without their troubles during the past two or three months. They had let a part of their estate to a certain farmer, whose Ayrshire cattle, after entering upon the farm, seemed to dwindle away. Had this occurred a century or two ago, the circumstance would have been ascribed to the supernatural power of witches, and not improbably an old woman or two would have been sacrificed at the altar of this belief; but in these scientific days people seek for a more reasonable explanation of such phenomena. In the case to which I am here referring, the farmer rushed to the conclusion that his cattle had drunk the waters—not of Lethe, but of a stream which had been polluted by paraffin products, and the consequence had been abortive births of calves and deaths amongst the grown-up cattle. He therefore asked one of the Judges of the Court of Session to give him £650 in name of damages, and a renunciation of his lease. The Land Ordinary, however, was not satisfied that the pursuer had established his case, and gave judgment for the defenders. In the second action, which was decided on Thursday, the Oil Company were not so successful. A landed proprietor named Mr. Hog, of Newliston, asked to interdict the Company from polluting the waters of a small stream which flows into the Almond. The defenders denied that polluting matter had been allowed to escape from their works, and the case went to proof. It came out in evidence that at the works a sluice existed which had communication with the burn, and the Land Ordinary, holding that the waters had been polluted, granted the interdict craved. As a breach of this order is a very serious matter, great care must in future be exercised by the Company.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

For the present the question of spending any portion of the gas surplus profits on public improvements in Glasgow has been settled. In accordance with notice formally given by one of the members, the Town Council sitting as Gas Commissioners on Thursday, had under consideration the following motion:—"That we reconsider the question of taking £5000 out of the profits of the manufacture of gas, seeing that so many of the Ward Committees have expressed disapproval of the principle." While submitting the motion, the proposer, Mr. John Neil, justified his desire to re-open the question, and a discussion ensued upon the subject. Mr. Gray seconded the motion, and in the course of his remarks said that when the Glasgow Corporation Gas Bill was in progress, it was the decided opinion of the general consumers that the gas profits should be used solely for gas purposes; and if any manipulation of the Bill had taken place during its progress with the view of allowing the profits to be otherwise disposed of, it had been done without the consent of the general public. It had been argued that as the gas consumers in the outside burghs were charged at the same rate as those within the city, they were thus made to contribute to the internal improvements. This might be an ingenious way of proceeding, but it was scarcely moral; and it had been urged that if the Gas Commissioners were to charge the suburban consumers a higher rate for the gas, the latter would proceed to set up opposition works. But he (Mr. Gray) thought that the proper thing was to do what was morally right in making their charges for gas, no matter what might be the result; and he questioned but that the Gas Trust might yet require all possible reserve funds in view of the electric light continuing to

make such decided progress. Ex-Bailie Walls, Convener of the Gas Committee, moved the previous question, remarking that as the £5000 previously voted had been paid over to the Town Council, he thought there was no use in bringing up the matter again. What had been done, however, was not to form a precedent. Bailie Mowat seconded the amendment. Ex-Lord Provost Collins made some remarks, and in supporting the amendment, ex-Bailie Lamberton, Convener of the Finance Committee, stated that it was only with considerable unwillingness that he agreed to the vote when it was previously taken, and that in future he would be no party to a repetition of such a vote in dealing with gas profits. Mr. Richmond said they should have kept their money for the improvement of the quality of the gas, and the lowering of the price to the consumers. Considering that they had gas coal in great abundance quite at hand, and at such low prices, he thought that the price of gas was too high in Glasgow; and in support of his contention he instanced the town of Dundee, which was not so well situated for obtaining a cheap supply of coal, and yet the gas supplied to the consumers there was cheaper than it was in Glasgow. He also referred to Manchester as being a town where a differential gas rate was charged—2s. 9d. per 1000 feet inside, and 3s. 4d. outside. Mr. W. R. W. Smith justified the former vote, and said that in Manchester as much as £50,000 had been paid over from the gas-supply undertaking for purely Corporation purposes. Mr. McLaren, as a member of the Gas Committee, stated that when the gas supply of Glasgow was taken over by the municipal authorities, it was distinctly understood that the community were to obtain their gas at cost price; and had he supposed, when the Committee were making their arrangements for the present year, that any such vote would have been proposed, he would have made an effort to have the price of gas reduced further. Mr. Neil, in view of the remarks that had been made in the course of the discussion, especially by Conveners Walls and Lamberton, expressed his willingness to withdraw his motion; but Bailie Mowat, apparently out of a little personal pique, insisted on pressing the question to a division, when 24 votes were recorded for the previous question, and 6 for the motion. There is now a general feeling that such a method of dealing with gas profits will not again be attempted in Glasgow, unless under very special circumstances. The Ward Committees are keenly alive to the question, as evidence, another of them (the 14th ward) resolved at a meeting held last night to support Councillor Richardson in his protest against £5000 being granted from the profits of the Gas Trust to improve George Square, maintaining that it ought to go to the reduction of the price of gas to the consumers. The motion, of which notice was formerly given by Mr. W. R. W. Smith, to vote a sum of £500 for experiments in connection with the most approved appliances for the economical use of gas, was withdrawn or temporarily delayed, so that some information might be obtained which was not yet available.

Formal approval of the appointment of Mr. David Terrace, of Arbroath, as successor to Mr. Mitchell at the Dawsholm Gas-Works, was given by the Glasgow Corporation Gas Commissioners at their meeting held last Thursday. Mr. Mitchell has already left Dawsholm to enter upon his duties in Edinburgh, and Mr. Terrace will take office with as little delay as possible. He will begin on a fixed salary of £300 per annum, which may be increased by an additional £100 a year in the shape of a bonus or payment on results. At this point I must make a slight correction upon a statement contained in my "Notes" last week. Mr. Terrace was never employed in Glasgow in any capacity, and therefore was not with Messrs. Laidlaw and Son. I should rather have stated that he had been with Messrs. Henry Balfour and Co., Leven, Fife. It is well to be correct in what may seem to be even small matters.

At a meeting of the Glasgow Police Board, held last Monday, it was reported that the Watching and Lighting Committee, at their meeting on the 28th ult., considered an offer by Messrs. Henry Bennett and Co., who represent the Crompton Lighting Company in Scotland, to light George Square by electricity; also an offer by Mr. R. Miller, on behalf of the Anglo-American Electric Light Company, Limited, of London, to fit up electric lights in any part of the city that may be decided on. The matter was remitted to the Inspector of Lighting for report. One or two of the members, however, thought that the desired result might be gained at less cost if the present system of lighting the square by gas were improved upon. There is certainly much room for improvement, whatever plan may ultimately be adopted.

The electric light was again under the consideration of the Greenock Harbour Trustees, at a meeting of that body held last Tuesday. On the suggestion of Mr. McCunn, it was remitted to the Committee formerly appointed to bring up a report as to how the electric light could best be applied to the lighting of the harbours and quays. They were instructed to bring up a systematic plan showing where the various lights might be placed.

As a result of 25 experiments made during the last month on the gas supplied to the town of Greenock, it was found that the minimum illuminating power was 25.40 candles; the average, 27.81 candles; and the maximum, 31.30 candles. Considering the great distance of the testing office from the works, as also the intensely cold weather prevailing during most of the month, the illuminating power was remarkably high, and of course very rich coal must have been used.

The important village of Kilmacolm, which is certainly a "populous place" in the eye of the Scotch Police Act of 1862, is now rejoicing in having its public thoroughfares abundantly lighted by gas, the expense of the lighting being defrayed by a voluntary assessment of 1½d. per pound of rental.

This day week the Glasgow Corporation 9 per Cent. Gas Annuities were advanced in price £1 12s. 6d., at £226 7s. 6d., and some business was done at the advance.

The week has been dull in the Glasgow pig iron warrant market, and prices have receded daily, and close at the lowest, 51s. 1½d. cash. Several brands of makers' iron have been reduced in price 1s. to 2s. per ton.

There has not been much alteration in the coal market. The demand for house descriptions is about an average for this season of the year. The shipping department is more regular in its requirements, yet there is no pressure. Prices remain firm, and it is thought on some hands that there will soon have to be a general advance of wages to the miners to the extent of 6d. per day.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, Feb. 5, 1881.

There is no material change of prices here.
Tar, worth 40s. per ton.
Ammonia liquor (sp. gr. 1.035), 22s. per ton.
" sulphate (white), £19 15s. to £20 per ton.
" " (good grey), £19 10s. per ton.
" muriate (white), £36 per ton.
" " (grey), £30 per ton.
" " (brown), £25 15s. to £25 10s. per ton.
Muriatic acid, £1 5s. to £1 10s. per ton.
Sulphuric acid (brown vitriol), £2 19s. per ton.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district has again been thrown into a state of dis-organization by the resumption of the strike at the pits in the neighbour-hood of Manchester. On Saturday the bulk of the colliers employed by the principal Manchester firms again came out on strike for an advance of wages, and in the surrounding districts, where work was being partially resumed, there is also a very unsettled feeling; whilst so far as West Lancashire is concerned, where the pits have been stopped since the commencement of the year, the probabilities of an early resump-tion of work have been rendered more doubtful. So far as the local supplies of coal are concerned, this renewed stoppage of work will place the market in a worse position than during the strike last month, as a very large proportion of the stocks which were then held by the local colliery proprietors have now been filled up, and circulars are being sent out from the collieries, informing customers that coalowners cannot undertake orders for any specified delivery, and that, in addition, orders can only be accepted subject to such prices as may be ruling when deliveries can be made. Consumers, however, will be in a better position than they were for obtaining supplies from outside districts, as not only have buyers been able to make more complete arrangements with colliery proprietors in other districts, but the transit of coal will now be carried on under more favourable conditions, the canals being again open for traffic, whilst the Railway Companies are in a better position for dealing with the increased quantity of coal which is being sent over their lines. Although there has been a good deal of gas coal which was held in stock in the Wigan district coming into the market, gas com-panies continue to a very large extent dependent upon outside districts for their supplies. Of course, for any supplies which have now to be bought, extra rates have to be paid. This forms a serious item to large consumers; but for it some compensation is found in the present en-hanced value of coke, for which advanced prices are now in many instances being charged. So far as the market generally is concerned, there are not at present really any fixed quotations, and the terms on which consumers will be able to obtain supplies will depend very much upon the certainty or otherwise of a prolonged stoppage of work. At present no definite opinion can be formed as to the probable duration of the strike, but the strong opposition to a renewed stoppage of work which has been expressed by a large number of the men furnishes some ground for hope that it will not be of a prolonged character.

In the iron trade business continues very quiet, and prices, so far as the raw material is concerned, show rather a tendency towards less firmness. Local makers of pig iron, however, although they show more anxiety to secure orders, are still quoting 46s. 6d. to 47s. 6d. per ton, less 2½ for delivery equal to Manchester. For finished iron there is a moderate in-quiry, and it is only for prompt specifications that makers are willing to take under current rates, which remain at £6 per ton for bars delivered into the Manchester district.

(BY TELEGRAPH.)

MANCHESTER, Monday Afternoon.

The number of men who went to work this morning at the Manchester collieries was considerably less than on Saturday, and circulars have been sent out this afternoon by the largest firm in the district, intimating that in consequence of the unsettled state of the men they cannot for the present deliver coal into the works. Engine classes of fuel are extremely scarce, and in the open market prices all round are practically withdrawn.

ANDOVER GAS SUPPLY.—Mr. Moorhouse, who yesterday left Andover for Guildford, in the course of his report to the Directors of the Andover Gas Company, dated the 29th ult., said: "In 1880 the make of gas at your works was 25 per cent. more than in the year 1877. This has been accom-plished by the same number of retorts and cost of wages; and half of the increase was during the past year." The make equalled 10,400 feet per ton of coal; 1¼ cwt. of coke resulting.

INSTITUTION OF CIVIL ENGINEERS.—At last Tuesday's meeting of the Institution, the monthly ballot resulted in the election, amongst others, of Mr. J. E. Cornish, Resident Engineer and Manager of the Alexandria Water-Works, as a Member; and of Mr. T. Blair, No. 10, St. Mary Axe, Mr. H. H. Manwaring, Assistant Engineer of the South Metropolitan Gas Company, Mr. R. Read, City Surveyor of Gloucester, and Mr. J. E. Worth, Borough Engineer of Burslem, as Associate Members.

LECTURE AT MAIDSTONE ON "COAL GAS."—A fortnight to-day, Mr. G. J. Cox, who is connected with the Maidstone Gas Company, and is one of the honorary officials of the St. Michael's Institute, took the oppor-tunity of delivering before the members a lecture on "Coal Gas;" endeavouring to create popular interest in the subject by simple expla-nations of what gas is, and of how it is made, by exhibiting skeleton meters to show how it is measured, by explaining how the large chemical industry of the country is bound up with its manufacture, and by other ways that would naturally suggest themselves to any one who has, as Mr. Cox evidently has, the advancement of gas supply at heart. It is need-less to follow Mr. Cox through his interesting lecture, a full abstract of

which is before us; but we may say that in the lecture-room he did away with a number of small burners, and fixed three large ones in their places—viz., a 120 and a 50-candle Argand, and a 120-candle triple flat-flame burner. He thus, without mentioning the matter, afforded those present a good opportunity of seeing the effect that is produced by a judicious use of gas.

ACCIDENT TO A GAS MANAGER.—A somewhat singular accident happened, on the 26th ult., to Mr. W. Bates, the Manager of the Workshop Gas-Works. It seems that Mr. Bates was returning from visiting the works late at night, when he was set upon by a ferocious retriever dog, which fixed itself on the bottom part of his waistcoat in front. In order to free himself from the animal's teeth, Mr. Bates backed across the road, and on to the surface of the frozen canal. The ice giving way, Mr. Bates and his unwelcome companion found themselves in mid stream—a circum-stance which led the latter to loose his hold, and leave Mr. Bates to struggle to the bank as best he could. This he succeeded, with some diffi-culty, in doing, and has since been suffering severely from the effects of exposure and fright. On complaint last week, the local magistrates ordered the destruction of the dog.

LOCAL GOVERNMENT BOARD INQUIRIES AT BANGOR (NEAR BELFAST) AND NEWTOWNARDS.—On Wednesday and Thursday, the 26th and 27th ult., Mr. Mr. R. Hamilton, Local Government Board Inspector, opened *pro forma*, and adjourned two inquiries fixed to be held on those days by Mr. C. P. Cotton; but which, through the indisposition of this gentleman, could not be entered upon. In the first case, the Bangor Town Commissioners, acting as the Urban Sanitary Authority of the district, applied to the Local Government Board, under the Public Health (Ireland) Act, 1878, for their sanction to a loan of £14,000—namely, £8000 for works for providing the town with water, £3000 for sewerage works, and £3000 for the purchase and extension of the gas-works. The Commissioners also presented a petition asking "that they may be allowed, with reference to the lands, water rights, easements, and premises therein set forth, to put in force the powers of the Lands Clauses Act with respect to the purchase and taking of land otherwise than by agreement, the said lands, water rights, eas-ements, and premises being required for the purpose of constructing works for supplying the town and district of Bangor with water for drinking, domestic, and other purposes." This inquiry was adjourned till Friday next. In the other case, the Newtownards Town Commissioners, acting as the Urban Sanitary Authority for the district, applied to the Local Government Board for their sanction to a loan of £11,500, of which £10,000 is to be applied to the purchase of the gas-works in the town, and £1500 to pay off a debt already incurred for market purposes; and as this sum with the balances of the outstanding loans contracted by the Town Com-missioners under the Sanitary Acts and the Public Health (Ireland) Act, 1878, would exceed the assessable value for one year of the premises within the district, the Local Government Board directed an inquiry to be held. Appearances were entered for the various parties interested in the matter; after which the inquiry was adjourned till Thursday in next week.

ANNUAL FESTIVAL OF THE PAISLEY GAS-WORKS EMPLOYÉES.—The fourth annual *soirée* of men employed in connection with the Paisley Corporation Gas-Works was held towards the close of last month. Bailie M'Gown, Chair-man of the Gas Committee, presided, and after eulogizing the skill and energy of the Engineer of the works (Mr. G. R. Hislop), gave some details regarding the early history of gas lighting, which were listened to with great attention, and subsequently said a few words as to the progress of gas lighting in their own good town. The Paisley Gas Company, he re-marked, was formed in 1823, and in 1824 gas was sold to the public at 11s. 4d. per 1000 feet; while the subsequent reductions, and other parti-culars appeared from the following table, which he read out:—

Year ending	Total Revenue.	Price of Gas per 1000 Cubic Feet.	Number of Consumers.
May 31, 1825 . . .	£1,969 12 3	11s. 4d.	568
" 1830 . . .	3,094 18 3	11 4	1,333
" 1835 . . .	7,240 19 1	9 6	5,777
" 1840 . . .	9,697 10 3	8 6	7,728
" 1842 . . .	8,706 2 4	8 6	6,088
" 1845 . . .	9,618 15 1	6 6	6,846
" 1850 . . .	9,628 2 3	6 0	6,867
" 1855 . . .	11,849 1 1	5 5	7,510
" 1860 . . .	13,267 6 10	5 0	8,326
" 1865 . . .	13,252 7 6	4 2	9,157
" 1870 . . .	16,568 7 1	3 9	9,618
" 1875 . . .	27,654 12 8	5 0	10,720
" 1880 . . .	25,250 16 0	3 9	12,052

When, he continued, the authorities of the present day were being blamed for not giving the lieges sufficient gaslight on the streets, it would be well if the grumblers would notice that their forefathers were apparently con-tented with a very small number of feeble lamps compared with the number that now shed light on their path. In 1825 the public lamps only numbered 180; in 1840 they had been increased to 637; in 1850 to 659; in 1860 to 794; and in the present year to 1171. A marked feature of the foregoing statement was to be seen in the period when Paisley was suffering one of those terrible depressions of trade, from which she was now so happily free. In the year 1840 the consumers of gas numbered 7728, whereas in 1842 they had fallen to 6088, or a decrease of more than 21 per cent. in two years.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Feb. 2, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul-phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	18.1	16.6	17.3	Station closed	for repairs		0.0	0.0		None.	In excess
	Camden Town	18.6	17.1	17.8	15.0	12.0	13.9	0.0	0.0	0.0	"	"
	Dalston	18.1	17.2	17.7	12.9	11.0	11.7	0.1	0.0	0.0	"	"
	Bow	17.5	16.8	17.1	12.9	10.2	11.8	0.9	0.2	0.5	"	"
	Chelsea	17.8	17.3	17.6	16.2	13.0	15.0	0.2	0.0	0.1	"	"
South Metropolitan Gas Company . . .	Kingsland Road	17.8	17.3	17.6	19.7	16.3	17.9	0.3	0.1	0.2	"	"
	Westminster (cannel gas) . . .	21.6	20.6	21.2	17.0	6.5	9.7	0.4	0.0	0.1	"	"
Commercial Gas Company	Peckham	17.8	16.7	17.1	11.5	9.1	10.5	0.5	0.0	0.2	"	"
	Old Ford	18.3	17.2	17.8	18.5	12.8	16.2	0.1	0.0	0.0	"	"
	St. George-in-the-East . . .	17.9	17.1	17.4	11.4	8.5	9.7	0.0	0.0	0.0	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolitan is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

TO CORRESPONDENTS.

W. H.—Next week we will publish the information you send.
 RECEIVED.—"Measures, Weights, and Moneys of all Nations." By W. S. B. Woolhouse, F.R.A.S., F.S.S., &c. Sixth Edition; revised and enlarged. London: Crosby Lockwood and Co.; 1881.
 No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 15, 1881.

THE MEETING OF THE GASLIGHT AND COKE COMPANY.

THE ordinary half-yearly general meeting of The Gaslight and Coke Company, which was held at the offices of the Company on Friday last, was well attended, and the Directors' report and statement of accounts were adopted, apparently with great satisfaction, by the large gathering of Proprietors. As we indicated last week, the holders of the Company's ordinary stock will receive a dividend for the past half year after the rate of eleven per cent. per annum, and a considerable balance has been added to the reserve fund.

In moving the adoption of the report and accounts, the Governor (the Hon. Richard Howe Browne) opened up a great number of subjects in the course of a somewhat lengthy speech, and his example was afterwards improved upon by many of the Shareholders present, until it might be said that everything related to gas and lighting, from the electric light to gasoline, received some share of attention. The Governor gave some highly interesting statistics in reference to the

present position of the Company, stating—as will be seen by our report of the proceedings printed in another column—the number of miles of mains through which the Company distribute gas, and the number of consumers who are dependent on the Company for their nightly and daily supply of gaslight. By these figures some idea may be gained of the extent of the business carried on by the Company, especially when their meaning is further explained by the truly remarkable account given of the productive powers of the manufacturing stations from which such an enormous network of mains are fed. Perhaps the statement that on one day before the year expired no less than sixty-eight million feet of gas were sent into the mains, and that at Beckton alone two and a half million cubic feet of gas were turned out in a single hour, is more calculated to impress a listener than any other manner of explaining what is meant by the work of supplying even a portion of this Metropolis with gas. We have always advocated the full publication of statistics of this nature, for many reasons which need not all be set down here; but while gladly acknowledging that on this occasion The Gaslight and Coke Company have drawn aside, for a little space, the veil which ordinarily shrouds their "awful state," we are not sure that they have done it in precisely the most effective way. It may be said, on general principles, that long speeches at business gatherings are a mistake. Especially is this the case when material which, however interesting and valuable, would be more intelligible if printed with the report, forms the bulk of the address. Proprietors are anxious to know these facts, but they do not, as a rule, form the subject of debate at general meetings. Neither would we advocate the admission of argumentative matter or questions of policy within the bounds of a printed report. Shareholders like to meet their Directors in order to discuss the latter class of subjects, and they are the more likely to do so with benefit to the organization in the welfare of which all are concerned, if they are previously supplied with ample and well-digested facts. Therefore, although it is to be hoped that the typical Company in question will, in future, give more rather than less information respecting their general position, it may be suggested that the Governor could with advantage be relieved from the troublesome duty of communicating it, when he may have other and more suitable matter to talk about.

In connection with these figures we may, however, proceed at once to draw attention to at least one striking observation which they enable the friends of the extended use of gas to make. Taking the number of the consumers of the Company's gas as stated, and adding thereto the number to be considered, on a fair estimate, as being entered on the books of the three other Companies within the inner Metropolitan district, it will be found that the total is not more than about 270,000 out of 700,000, which may be roughly stated as the number of houses in the Metropolis. From this may be seen how poor the gas consumption of London is in comparison with what it might be; and while suggesting somewhat melancholy reflections on the backwardness of the Metropolis in the matter of gas consumption, the same observation points to the great future possibilities of gas supply for domestic purposes in London even as it is, without reference to the wonderful annual growth of the capital.

One of the most remarkable features of the meeting was the importance with which the electric light was invested alike by official and independent speakers. It is not that electric lighting has taken any new departure, or threatened more portentously than usual to interfere with the Company's business. On the contrary, it was solely in reference to the use of electricity for lighting railway stations and streets that mention of it was most generally made; but its progress in these and allied directions was admitted, and the Governor was warmly supported in his announcement that, in view of this perpetual competition, the Company would again light up a line of thoroughfare—this time including Whitehall and Parliament Street—with gas, in a manner calculated to vindicate its capabilities for brilliant outdoor illumination. Such an evidence of the vigilance and spirit of the Board was apparently most welcome to the Proprietors, who seemed, in some instances, to have come primed for an attack upon the Directors for their imagined supineness in giving way to the electric light without making any effectual protest.

Upon the subject of the Tottenham Court Road explosion we need not dwell in great detail, and will therefore be content with remarking that, although most persons will now agree to drop argument as to whose fault it was that the disaster occurred, it is quite possible, in contending for its absolute unpreventability, to go too far, and to rouse some

popular fear that the unforeseen and uncontrollable, having happened once, may recur at any time. It would be better, in this case in particular, to confess at once that "some one" had blundered," but that, from the nature of things, the recurrence of such a concatenation of circumstances, which could alone ensure to a similar blunder the like terrible consequences, is highly improbable.

With the assurances of the Governor that the state of the market for the Company's residual products, and the cheapness of the necessary materials of manufacture, aided by the care and skill of their officers, combine to make their immediate future one of almost unclouded serenity, the Proprietors may well rest satisfied, not without a confident expectation that when they next meet they will be cheered with the prospect of a still higher dividend for the current half year.

PROPOSED REVISION OF THE SALE OF GAS ACT.

THE Metropolitan Board of Works have put themselves into communication with the Board of Trade with regard to a matter of great importance to makers and consumers of gas. It has long been the conviction of the officials entrusted with the working of the Sale of Gas Act—and, we may add, of other observant persons as well—that the method of testing gas-meters practised by the inspecting officers is not calculated to give a correct indication of the defects which a meter may develop in ordinary use. The inspector, in fact, only tests the capacity and efficient working of the drum or measuring chamber of the meter, and has no opportunity of seeing whether the index is properly fitted for registering the action of the drum throughout the complete revolution of the pointers on every dial. It follows, therefore, that a meter may measure five or ten feet of gas with sufficient accuracy to pass the ordeal of inspection, as now carried out, and will consequently receive the official seal, although the index may be altogether wrong. If inspectors of weights and measures were only to examine the accuracy of a tradesman's scales, and were to neglect to test the rectitude of his weights, they would be only carrying out the ordinary principle of gas-meter inspection. The index is the thing by which the amount of gas consumed is determined; and if it should happen to contain a wrong wheel, or be otherwise carelessly fitted, the accuracy of the measuring chamber is of small account. The Metropolitan Board have accumulated such store of evidence respecting the errors of the common meter index, that they are sanguine of being able to prove their case for the necessity of a thorough system of inspection of indices; and we believe that the principal object of their communication to the Board of Trade has been to recommend an alteration of the law with the view of rendering illegal the use of unstamped indices. If the representations of the Board are successful in this respect, all indices will have to be sent for examination to a qualified official, who will test them through a complete revolution, and probably also examine the workmanship and gearing of the wheels; and if proved correct they will receive an official stamp. The sizes of the meters for which indices are to be used will also be marked conspicuously on the dial-plate, and any index found in a meter of a different size to that for which it is intended will subject the maker to a penalty. It is difficult to see any objection to these proposals, for if meters are to be inspected at all the inspection should be as thorough as possible, which is decidedly not the case while any sort of indices may be fitted in an otherwise perfect machine. A stamped meter with a stamped index should leave nothing to be desired by either gas producers or consumers, to whom accurate registration is equally important.

The next subject taken up by the Board is that of the verification of the standards used by meter examiners. There is no legal provision for having these verified after they have been once issued, and, as a matter of fact, some of them have been in use without examination for over twenty years. The Board suggest that all standards used in the testing-stations throughout the kingdom should be made subject to verification every seven years; and this again is a wise provision.

The last suggestion of the Board to the Executive Government is of a different character. They ask that Gas Companies and others should not be allowed, under a penalty, to send out an old meter to be refixed, unless it shall have been re-stamped by the regular official inspector. This is a sweeping demand, the justice of which is not likely to be generally conceded without some further understanding as to its scope. For instance, it may be asked how long a meter may be used before it is to be considered old. A meter may be removed from a consumer's premises before it has been fixed a month, whereas another meter may remain for years in its first connection. This point, at least, requires clearing up when the

matter may be further inquired into. Meanwhile, the Government will probably allow ample time for the formation of opinion on the subject on the part of those interested, before any definite steps are taken. The matter is not likely to raise much excitement, but it is advisable that it should be well ventilated before anything is done by way of legislation.

PROPOSED LEGISLATION ON GAS RESIDUALS WORKS.

A MEASURE has been introduced in the House of Lords, under the title of the Alkali, &c., Works Regulation Bill, which should not be overlooked by gas manufacturers and others interested in the conversion of gas residuals. The measure is intended to come into operation on Jan. 1, 1882, and has for its object the better regulation of alkali works, and also of certain chemical manufactures mentioned in the schedules to the Bill, comprising (among others) chemical manure, gas liquor, sulphate of ammonia, and muriate of ammonia works. The owner of such works will be required to use the best practicable means for preventing the discharge of noxious and offensive gases therefrom under penalty, in default, of £20 for a first, and £50 for any subsequent offence, with a daily fine of £5 during the continuance of the nuisance. It is also proposed that all such works shall be registered by April 1, 1882, and that annually thereafter, during the month of January or February, the certificate of registration shall be renewed. The registration fee in the case of the scheduled works will be £3, and any change in proprietary will have to be notified to an inspector. The Bill includes provision for the appointment, and states the duties of inspectors, and also indicates the facilities for inspection which the owner of works is to give to the officials; and power is to be given to owners to make rules, under the sanction of the Local Government Board, for the conduct of workmen employed in any offensive trade process. Sanitary authorities are intended to have wide powers of complaint against manufacturers who may contravene the provisions of the proposed Act, and the Local Government Board may thereupon hold an inquiry. A nuisance contributed to by several persons is to be constituted an offence, under the proposed Act, by any one of them, although the act of each, taken separately, might not create a nuisance. A saving clause as to general law is inserted, and, as will have been perceived, the measure is fostered and will be administered by the Local Government Board.

MR. V. WYATT ON THE TRANSPORT OF MATERIALS IN GAS-WORKS.

WE commence to-day the publication of an important series of articles by Mr. V. Wyatt, the Engineer Constructor to The Gaslight and Coke Company, on the subject of the transport of material to and from gas-works. The articles will, we are sure, be read with the consideration due to the authority whence they come. Mr. Wyatt is a consistent practitioner of those principles of design for gas manufacturing stations of which he is one of the prophets. Time was when the planning of a gas-works—when it did not happen to fall together fortuitously by the unpicturesque and disjointed additions of successive years—was looked upon as a kind of landscape gardening. The site being selected, the approach was finished off with big gates, and he was the best constructor who could dispose of his retort-house in front, his purifier-house on the one hand and meter-house on the other, &c., all very neat, well built—and extravagant in structure and administration. Mr. Wyatt does not disdain a certain amount of architectural grace in his work, but he primarily regards a gas station as a place where heavy goods have to be got in and out, and hence the prominence given by him to facilities of railway, water carriage, and roads, in the treatment of any site for gas-works. Mr. Wyatt is not so singular in this respect at the present day as he would have been some few years back; but he has carried out the principle perhaps to a greater extent than any other Engineer. This is partly due to the fact that he has had unrivalled opportunities, for it is not given to every man to try his skill at turning an unapproachable marsh into the largest gas-works in the world. But lest it should be considered that facilities for transport are only of primary importance in colossal establishments, Mr. Wyatt commences his memorandum with an example on a comparatively small scale, from which he will proceed, through a larger illustration, to a description of the traffic arrangements of Beckton. Nothing more is necessary from us in order to point out the importance of this communication.

THE PURIFICATION OF GAS FROM SULPHUR.

AT the last meeting of the London Association of Foremen Engineers and Draughtsmen, the President, Mr. J. Newton,

in the course of his address, mentioned a process for the purification of gas from sulphur compounds, which he said had been invented by Mr. Versmann. This process, which Mr. Newton stated to be capable of removing every trace of sulphur from the gas consumed in the Metropolis, at an annual cost of £10,000, appears to consist in heating the gas in pipes containing certain occult materials known only to Mr. Versmann. Without knowing anything more about the proposed process, and certainly without any desire to pre-judge it, we may point out that the use of hot chambers and hot lime purification for the decomposition of carbon disulphide into sulphuretted hydrogen was advocated by the Rev. W. R. Bowditch so long ago as 1860, and was carried out on a practical scale at Wakefield, but without permanent success; and other experimenters, including Mr. Vernon Harcourt, also tried something of the same kind long ago. So that unless appearances are strangely misleading, we may say that Mr. Versmann's great discovery is more like a revival. The true discovery would be a method of making the laboratory experiment answer when dealing with a million cubic feet of gas per hour. Nobody has been able as yet to manage this little detail satisfactorily; but it remains to be seen whether Mr. Versmann will be more successful than his predecessors in this particular.

THE MEETING OF THE SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

THE annual meeting of the members of the Southern District Association of Gas Engineers and Managers was held on Thursday last, when the President, Mr. Broadberry, of Tottenham, delivered the very interesting inaugural address which is reproduced in to-day's JOURNAL. The discourse in question is more suggestive than didactic; and in this way it fulfils its real object in a manner which might be copied with advantage by many more pretentious addresses of a similar character. The President of a scientific and professional society is in reality *primus inter pares*, and not a dictator. It would lighten the mental toil and anxiety frequently endured by men temporarily elevated to such a distinction, if they could always bear in mind that, as it has been said that the greatest humourist is he who is not more a wit in himself than the cause of wit in others, so a President of a technical body will fulfil his mission better if he succeeds in awakening thought in others, rather than by indulging, on his own behalf, in a blaze of oratorical fireworks. Mr. Broadberry carefully outlined many subjects on which, in his opinion, fuller information is desirable, and thus performed a good service in indicating subjects for papers to be prepared by the members of the Association. The President's suggestion that the Association, as a body, may serve a useful purpose by assisting members in perfecting any scheme or invention calculated to be of use in improving the manufacture and distribution of coal gas is very valuable, and deserves the attention which it will doubtless receive, as, with proper safeguards against abuse, a system of close communication on professional topics between members of the same Association cannot fail to be advantageous to all concerned. Beyond the delivery of the presidential address, there was only formal business before the meeting, and the members afterwards dined together.

DISCOUNTS.

At the meeting of the Chartered Company, last Friday, Mr. E. Vaughan Richards, Q.C., the Deputy-Governor, condemned in very emphatic language the practice of some Gas Companies of allowing discounts to large consumers. His opinion was apparently endorsed by a large proportion of the Shareholders present, possibly because it was so forcibly expressed. It will, however, need more than the mere expression of an opinion—even by such an authority as Mr. Richards—to dispose of the strong arguments in favour of the custom. Can it be unreasonable, for instance, in the familiar case of a Railway Company—especially at some great goods stations, where the supply of gas is taken from the main at the entrance gates, and distributed through miles of pipes laid at the consumers' expense over the vast premises? In such a case the costs of inspection, collection, and leakage are reduced to a minimum; while bad debts are unheard of. There can be no doubt, in such circumstances—and they are paralleled in large mills, iron-works, and similar establishments—that the advantage to the Company is very considerable over that obtained from a similar rental gathered in the ordinary way, say, from a street or two of modest villas; and neither the Gas Company nor the small consumer should grudge some special share of the profit to those who bring so large a proportion of it.

Water and Sanitary Affairs.

THE Protection of Person and Property (Ireland) Bill, which yesterday had ninety-nine amendments hanging on to it, has delayed all the other business in the House of Commons. With the Arms Bill and the Land Bill to follow, the prospects of the anticipated Metropolitan Water Bill are far from brilliant. A kind of "continuous brake" impedes the progress of the parliamentary train. "Owing to the state of public business," Mr. Dodson cannot hold out any hope that the Government will introduce a Bill this session to amend the Rivers Pollution Prevention Act. Colonel Alexander having asked the Home Secretary whether, in view of the general incapacity of the Vestries, and that of Westminster in particular, he would consider the advisability of placing the local government of the Metropolis in more competent hands, has been told that there is another and more august body than the Westminster Vestry which fails to transact its business satisfactorily. Parliament, in fact, has enough to do just now to look after itself. Even the juvenile offender seems to be dropping out of sight. The London Water Companies will, nevertheless, hold themselves in readiness for an attack, although the attention of the Government seems to be effectually absorbed in another direction. Mr. Firth, it will be observed, is seeking to bring on his motion for the establishment of municipal government in the Metropolis, and has extracted from the President of the Local Government Board an admission that the Corporation of the City, and the Vestries and District Boards of the Metropolis, expend between them annually about three millions sterling. Of course, nothing is satisfactory—neither the Corporation, nor the Metropolitan Board, nor the Vestries and District Boards, nor the Water Companies. Here is a wide field for the energies of an ambitious Home Secretary; but even Sir W. Harcourt feels that this "is not the exact moment" for attempting everything, and Mr. Dodson is of the same opinion. The Vestries are safe for another year, and perhaps the Water Companies also, though in suggesting this we do not necessarily imply that the Water Companies and the Vestries belong to the same category, nor that they are destined to stand or fall together.

The idea that the Rivers Conservancy Bill introduced by the Government was so framed as altogether to exclude the jurisdiction of the Thames Conservancy from its operations, appears to be erroneous. In reply to a deputation from the Lewisham and Lee Inundation Committee, the Lord President has stated that the saving clause with reference to the Thames Conservancy Act only applies to the inflow of sewage. This makes an important difference, and at once excites a hope that something may be done to limit the ravages of the floods which come down upon London from the districts that lie either partially or wholly outside the Metropolitan area. Without some such law as that proposed by the Rivers Conservancy Bill, there seems no prospect of any substantial relief being given to the flooded areas which border the Ravensbourne and the Quaggy. The Metropolitan Board appear quite unequal to the emergency, and seem also content to remain in that condition. They do, indeed, propose to make a relief sewer from Lee Bridge to Deptford Creek; but the Greenwich District Board have an injunction which bars the outlet. Credit may be given to the Metropolitan Board for a determination to proceed in the teeth of this injunction; but the new sewer, which is to cost £30,000, is not likely to be sufficient of itself for the effectual mitigation of the floods. In some quarters the argument is held that it is not just to the ratepayers to spend the public money in order to add to the value of house property which has been built below the flood level. To this it may be replied that a great deal of property in and about London has been seriously depreciated in value by the increased depth and frequency of the floods within the last few years. Watercourses have been diverted into sewers, insufficient in capacity for the work which the open channel formerly accomplished. Ditches have been abolished, absorbent fields have been covered with slate-roofed houses, interspersed with hard roads and asphalt pavements, and house drainage has added a portion of the London Water Supply to the volume of liquid which has to be discharged, while the country beyond is yearly becoming more thoroughly permeated by subsoil drains. If forces like these are not to be counteracted in some way, a portion of the Metropolitan area, which might otherwise be occupied by decent dwellings, will have to be abandoned, and left to degenerate into dismal swamps, engendering malaria and disease, and lowering the value of contiguous property not actually visited by the floods. That this is a possible contingency is shown by the fact that

there are parties connected with the local government of the Metropolis who contend that it would be cheaper to buy up the property and to leave it waste, than to prevent the overflow of the waters. A better answer than this is expected from the Metropolitan Board, and if they have not the necessary authority they should say so, without seeking to justify a state of things—not affecting Lee and Lewisham alone—which is disgraceful to the Metropolis, and a satire on its management.

One of the medical journals, in discussing the vital statistics furnished by the periodical returns of the Registrar-General, remarks that "London and Edinburgh still maintain their pre-eminence for health of all the important cities of the world." On the other hand, attention is drawn to the fact that about a fortnight ago there were four cities in the United Kingdom—Glasgow, Liverpool, Manchester, and Dublin—whose death-rate was as high as that of any of the foreign cities. The notoriously unhealthy St. Petersburg was better than Dublin and Manchester, Liverpool was on a level with Calcutta, and Glasgow worse than Budapesth. In the face of facts like these, it is difficult to see how the water supply of London can be deemed otherwise than wholesome. Certainly Loch Katrine does not exhibit the properties of the *elixir vite*.

The Town Council of Stafford are experiencing considerable disappointment in their search for water. They have been boring on a spot called the Common, in accordance with professional advice, and were in the expectation of getting to the required depth more than a year ago, whereas they have expended nearly all the money borrowed for the purpose of the enterprise, and have lost the diamonds of the boring-tool without finding the water. The Council held a special meeting a few days ago to consider the matter, when the subject was opened by Alderman Cox, who concurred in a suggestion made by Alderman Shallcross, that all expenditure at the bore-hole should cease, with the exception of an effort to recover the lost diamonds, and that the opinion of some eminent Engineer, not hitherto connected with the work, should be obtained. In the subsequent discussion Alderman Shallcross stated that the expenditure amounted to £13,000, and with the exception of a portion laid out on mains, the outlay had been without result. They had only £1000 left, and the depth they had reached was but 227 feet, whereas they were told that probably they would have to go down 2000 feet to reach the conglomerate beds. It was intimated, however, by the Mayor, that Professor Green had named 1100 or 1200 feet as the probable depth at which these beds would be found. Mr. F. J. Bramwell, as well as Professor Green, were cited as the authorities on whose recommendation the enterprise had been undertaken. It was at last resolved that the operations should be continued until the month of April next, and if no success then appeared, further advice should be sought, as proposed by Alderman Shallcross. From the particulars given in the course of the discussion, we are inclined to think that the Council have themselves to blame for their present failure. Either the mechanical appliances are bad, or there is some want of skill or supervision. Moreover, if water is to be found at a depth of 1000 feet, it is early to criticize the plan when only a quarter of that depth has been reached. A large sum of money seems to have been spent with a very small result, and the circumstance is the more surprising when we consider the improved character of boring machinery in the present day. The whole affair looks very like a muddle, and is in strong contrast to the success of boring operations elsewhere.

We have received a very complete and admirable set of meteorological observations for the past year, as taken by Mr. M. Ogle Tarbotton, M.Inst. C.E., the Borough Engineer of Nottingham. Some of these have been supplied to the Registrar-General, and have appeared in the weekly and other returns issued by that authority from Somerset House. The central station is Nottingham, but Mr. Tarbotton also furnishes a set of rainfall registers collected from as many as fifteen stations on the watershed of the River Trent above that town. Taking the total rainfall at Nottingham for the last fourteen years, that of the past year was only exceeded in one instance, and that very slightly, the quantity in 1872 being 35.903 inches, as against 35.452 in 1880. In 1870 the rainfall was rather less than 18 inches. The observed depth of rain last year at the various stations above Nottingham ranged from 29.68 inches at Burton-on-Trent, to 59.323 at Buxton. A variety of other particulars enter into the tables, rendering them very valuable for meteorological purposes.

The cremation of town "dust" increases in popularity. We have on former occasions called attention to the adoption of the furnace system in different parts of England, and there

is now a prospect that it will gain a footing in London. A Committee appointed by the Vestry of St. Pancras have been on a tour for the purpose of seeing how some of the northern towns dispose of their house refuse, and have presented a report to the Vestry recommending that a premium of £50 should be offered for the best scheme of disposing of refuse by fire. It is curious that we are so far falling back upon a sanitary method as old as the days of the Jewish kings. One special advantage in the combustion of the so-called "dust" consists in the fact that this prevents—partially if not wholly—the use of unwholesome materials for the purpose of making up the ground preparatory to the erection of house property.

GAS BILLS FOR 1881.

(Continued from page 215.)

PROCEEDING with our account of the Gas Companies' Bills in the present session of Parliament, we note that seven Companies seek to be vested with additional powers. These Bills are as follows:—

The *Brighton and Hove Gas Bill* is to authorize the Brighton and Hove General Gas Company to purchase the undertaking of the Brighton Gaslight and Coke Company, or to amalgamate with that Company, and to purchase the undertaking of the Aldrington, Hove, and Brighton Gas Company. The Brighton and Hove Company's incorporation dates from 1839, and that of the Brighton Company from 1848, while the third Company was a legislative experiment of 1866, which has never entered upon an active existence. The Brighton and Hove Company seek power, at any time after the passing of the Act, to agree with the Brighton Company for purchase or amalgamation, upon such terms as may be agreed upon, to be sanctioned by the Board of Trade and confirmed by an Order in Council. Any scheme of amalgamation to be prepared under the proposed Act is to provide for the proper compensation of officers. The Company also desire to be enabled to purchase the undertaking of the Aldrington Company, by agreement, within three years from the passing of the Act, whereupon the Aldrington Company's Act is to be repealed. The name of the amalgamating Company is not to be changed, in spite of such purchases or amalgamations as are contemplated in the Bill. The Company also seek power to extend their own works by the purchase of additional land.

The *Cambridge University and Town Gas Bill* is intended to authorize the Company to acquire additional land, to extend their works, and to raise further capital. The Company in 1867 obtained an Act whereby their capital was fixed at £37,440 original, and £50,000 additional capital, with power to borrow £21,800. The Company now desire to raise £40,560 fresh seven per cent. capital under the auction clauses, and to be enabled to borrow £10,200 in respect of the new issue. The Company also seek power to acquire, by agreement only, about four and a quarter acres of land for the purpose of erecting manufacturing works thereon.

The *Dudley Gas Bill* is for the purpose of enabling the Dudley Gas Company to raise additional capital. The Company were last in Parliament in 1853, when their capital was fixed at £54,000, with power to borrow £2000. All this has been raised and expended, and the Company now wish for power to raise £46,000 additional share capital under the auction clauses, and to borrow £11,500 in respect of the present capital, and a further sum of £11,500 in respect of the new capital. Gas of fifteen-candle power is to be supplied and tested in the usual way.

The *Hyde Gas Bill* is intended to confer additional powers, in respect of capital and otherwise, upon the Hyde Gas Company. By an Act of 1855 the capital of the Company was fixed at £25,000 original, and £11,000 additional share capital, with £9000 to be obtained on loan. All this share capital has been raised and expended, and the whole of the loan capital, with the exception of £10, has been converted into share capital and subscribed. The Company seek power, under the auction clauses, for £56,000 additional capital, £20,000 of which is to be raised within a year after the Bill shall have become law, and £10,000 is to be issued in any subsequent year. Power is also desired to borrow £14,000 in respect of the new capital contemplated by the Bill. The Company wish to acquire additional land whereon to erect works, and they are to supply sixteen-candle gas, under the usual restrictions as to pressure. The Company ask to pay only four per cent. interest on deposits.

The *Richmond Gas Bill* is to enable the Richmond Gas Company to raise additional capital to the amount of £60,000, at the same rate of dividend provided for the capital issued under the powers of the Company's Act of 1867. Power to

borrow £15,000 in respect of the additional capital is included in the Bill. The Company seek to acquire four acres more land for the purpose of constructing new gas-works thereon, and to take by agreement three acres of land for other purposes of their undertaking. The gas to be supplied by the Company is not to contain more than twenty grains of sulphur in one hundred cubic feet, and to be of fourteen-candle power. A testing-place is to be provided by the Company in the town of Richmond, in addition to the testing-station established by the Vestry at their Hall in the same town. Certain provisions as to the number and qualification of Directors are also included in the Bill.

The *Sevenoaks Gas Bill* is intended to confer additional powers upon the Sevenoaks Gas Company, chiefly in regard to money. The Company's Act of 1876 fixes their share capital at £15,000 original, and £25,000 additional capital, with power to borrow £9750. The Company now desire to raise £40,000 new share capital by auction, and to borrow £10,000. They also wish to acquire additional land on which to erect works.

The *South Metropolitan Gas Bill* is mainly intended to enable the South Metropolitan Gas Company to purchase additional lands for the establishment of new works, and to increase their capital. The Company have at present five manufacturing stations, besides distributing centres, most of which are situated in densely-peopled districts, and cannot be extended without great public disadvantage. A suitable site for new works has been selected on the banks of the Thames at Greenwich Marshes, and the Company wish for power to acquire the lands described in the schedule, extinguishing and diverting certain rights of way, and also to take by agreement thirty acres of additional land. The Company seek to raise £1,000,000 additional capital, under the auction clauses, to bear equal dividend with, and to form part of the "C" capital mentioned in the scheme for the amalgamation of the South Metropolitan Gas Company with the Phoenix Gaslight and Coke Company, which was confirmed by an Order in Council on March 18, 1880. The Company also desire power to borrow on mortgage such sums as they may require, not exceeding one-fourth part of the paid-up capital. The Company are not to convert any borrowed money into stock. They also desire power to sell gas in bulk, and to purchase and convert residual products from other Companies, or to sell their own products for the purpose of conversion by any other Company authorized to manufacture products.

There is only one Bill now remaining before Parliament for the acquisition of a private gas undertaking by a public authority.

The *Irvine Burgh Bill*, among other general municipal requirements, contains clauses to empower the Corporation to acquire, by agreement, the undertaking of the Gas Company, in consideration of a capital sum of money or by annuities, such annuities to represent shares in the Company, and to be redeemable at twenty-four years' purchase. The Corporation desire to be enabled to acquire, by agreement, five acres of additional land for gas-works purposes. The price to be charged by the Corporation for gas supplied by meter is not to exceed 7s. 6d. per thousand feet, and it is to be of twenty-candle power, supplied at the usual pressure. The limits of supply are to be conterminous with the boundaries of the extended borough. The Corporation seek power to supply, in connection with the gas-works, the electric or other light in addition to, or as a substitute for gas. On and from the proposed gas transfer, the Corporation desire to be able to borrow £5000 on account of the undertaking; and three years after the transfer they are to establish a sinking fund to redeem, at four per cent. compound interest, the money borrowed and annuities, within seventy years.

Four Corporations have deposited Bills providing increase of powers in regard to gas supply. They are the following:—

The *Aberdeen Corporation Bill* is to give the Corporation power to borrow for gas purposes a further sum of £55,000, on which two per cent. per annum is to be set aside as a sinking fund. They also wish to open a cash account with a bank, for the purpose of drawing on credit to the extent provided by the above borrowing powers. The quality of the Corporation gas is intended to be reduced to twenty candles, as tested in a five-feet union jet burner.

The *Barrow-in-Furness Corporation Bill* is, among other purposes, intended to enable the Corporation to supply gas for heating, and to sell and lend on hire gas fittings and engines of all kinds, and to confer upon the Corporation certain legal powers in respect of the recovery of debts, &c.

The *Bingley Improvement Bill* only includes, in respect of gas, a single clause to give the Improvement Commissioners power to deal in gas stoves and fittings.

The *Birkenhead Corporation (Gas and Water) Bill* is to enable the Corporation to construct, on lands scheduled in the Bill, works for manufacturing gas. The Corporation are not to charge more than 5s. and 5s. 6d. per thousand cubic feet for fourteen-candle gas supplied within and beyond the borough respectively, and it is also stated that the price of gas outside the borough is never to exceed sixpence per thousand cubic feet more than the price charged at the time within the borough. The Corporation desire to be enabled to borrow £125,000 for the purposes of the proposed Act. It is also intended to separate the capital of the gas and water undertakings, by taking the sum paid at the time of the purchase of the Birkenhead and Claughton Gas and Water Company as two-thirds for gas and one-third for water, and adding thereto the various sums since expended on capital account. Hence £231,031 is to be considered as forming the capital of the gas undertaking formerly belonging to the Commissioners. Of the net gas profits, after paying capital charges and setting aside one per cent. for the sinking fund, one-half of the remainder is to be carried to the credit of the borough fund.

WATER BILLS FOR 1881.

WITH respect to water supply, three Companies have Bills in Parliament for purposes of incorporation in the present session. They are as follows:—

The *Beverley Water Bill* is to incorporate a Company with a share capital of £18,000, and with power to borrow £4500 for providing a supply of water in the borough of Beverley, in the East Riding of Yorkshire. The supply is to be obtained by pumping, and the water is then to be stored in a covered service reservoir, and the works are to be completed within five years. The Company desire powers for the compulsory acquisition of land and for the purchase by agreement of five acres of additional land. The rates for water supplied to dwelling-houses are to range from 8s. 8d. per annum upon houses of less than £7 annual value, to seven per cent. per annum for houses worth from £7 to £30 annually, and six and a half per cent. upon the annual value of houses of higher value; with the usual extras. Water for other than domestic purposes is to be furnished by meter, and the Company seek power to supply fittings.

The *Dundalk Water Bill* is to incorporate a Company for the supply of water to the town and district of Dundalk. The capital of the Company is to be £24,000, divided into £4000 of five per cent. preference, and £20,000 of ordinary shares, with power to borrow £10,000. The system of supply is to include an impounding reservoir and service-tank, with filter-beds and lines of conduit or main-pipes, and the works are to be completed in five years. Water-rates to be levied at the rate of seven and a half per cent. upon the annual value of dwelling-houses, with the usual extras. Water for other than domestic purposes is to be supplied by meter at an agreed price, not exceeding 2s. per thousand gallons. Clauses are inserted giving power to the Company, with the consent of three-fifths of the Proprietors, to sell their undertaking to the Town Commissioners of Dundalk, on terms to be agreed upon at any future time.

The *Holland (Parts of) and Sutton Bridge Water Bill* contemplates the establishment of a Company with a capital of £60,000, and power to borrow £15,000, for the purpose of supplying water to certain parishes and places in the parts of Sutton and Kesteven, in Lincolnshire. The supply is to be by pumping, and a service reservoir is to be erected. The source of supply is the Braceborough Spa stream. The Company seek power to purchase five acres of land in addition to their compulsorily-acquired site, and also to hold such lands as may be necessary for the protection of their works, which are to be completed within seven years. The Company desire to levy rates for domestic supply at seven per cent. on the annual value of premises worth over £6 and under £30 rental, and six per cent. for houses of higher value; except in the case of inns and hotels, which are to be rated at seven per cent. per annum, irrespective of their annual value over £5. The Company seek power to supply by agreement water for other than domestic purposes, and also to sell water in bulk beyond their limits of supply, and the public authority of any district served by the Company may demand a supply of water in bulk at a rate not exceeding sixpence per thousand gallons. Services are to be fixed at the expense of the consumer, and the Company wish to supply meters and fittings.

The *Goole and District Gas and Water Bill* is to enable the Company to construct water-works for supplying the town and district of Goole, as part of the undertaking of the Company. The water is to be constantly laid on at the head given by water towers 120 feet above the ordinary top water level of the Knottingley and Goole Canal. Dwelling-houses are to be supplied at rates ranging from seven per cent. for houses of from £20 to £40 annual value, to five per cent. for houses of over £100 rental; with extras. Water for shipping purposes is to be supplied at the rate of 1s. per thousand gallons; and for manufacturing or trade purposes at 1s. 6d. and 1s. per thousand gallons, according to quantity. Saving clauses are inserted in the interest of the North-Eastern Railway Company, and also in respect of the Aire and Calder Navigation Company.

The *Woking Gas and Water Bill* includes among the objects of the Company the supply of water in the parish and district of Woking, Surrey. The water is to be drawn from a well in the parish of West Clandon, and a service reservoir is to be provided in conjunction therewith, the necessary works to be completed within five years. Water-rates are to be levied ranging from seven per cent. on the annual value of houses worth from £20 to £40 per annum, to five per cent. on houses worth £100 a year and upwards; with 10s. extra for every water-closet and fixed bath. The charge for water supplied for other than domestic purposes is to be fixed by agreement.

The *Woking Water and Gas Bill* is to empower the Company, among other things, to make water-works for supplying the parish and neighbourhood of Woking, Surrey. The supply is intended to be drawn from a well in the parish of West Clandon, whence a conduit or line of pipes is to run to a service reservoir in the same parish. A separate high-service reservoir is also to be provided. Water is not to be laid on under constant pressure. The supply may be paid for by measurement, if so agreed upon between the Company and the consumer; with extra charge for water-closets and baths.

BOARD OF TRADE REPORT ON THE GAS AND WATER BILLS AND PROVISIONAL ORDERS FOR THE SESSION OF 1881.

THE "Report by the Board of Trade, upon all the Railway, Canal, Tramway, Gas, and Water Bills" for the session of 1881—in continuation of their previous annual reports—was presented to the House of Commons yesterday week. From it, it appears that the number of Bills of the last two kinds, deposited for the present year, is 44—viz., 24 relating to the supply of gas (10 of which also contain provisions in respect to water supply), and 20 relating to water supply solely. In addition there are 19 Provisional Orders—12 relating to gas, and 7 to water.

Of the Gas Bills, 22 are English and 2 Scottish; the proposed capital amounting to £2,422,574, about two-thirds of which (£1,795,874) is intended to be raised as shares, and the remainder (£626,700) by loans. The Water Bills refer—16 to England, 3 to Scotland, and 1 to Ireland. The capital proposed in these cases amounts to £4,946,250, or £3,243,240 of shares, and £1,703,010 of loans. The amounts proposed to be raised under the Provisional Orders are: By shares—gas, £901,500; water, £187,000—total, £1,088,500. By loans—gas, £802,500; water, £48,500—total, £851,000.

The whole amount of capital asked for is thus somewhat less than in the session of 1880, the respective totals being £9,308,324 and £9,893,400. It should, however, be borne in mind that there is not this year such an extensive scheme before Parliament as that embodied in the Liverpool Corporation Water Bill of 1880, which alone was responsible for about £3,250,000 of the larger of the two above amounts.

As in former years, the report tabulates the various Bills, so as to show at a glance what is the object of each Bill, the capital proposed (by shares and by loan); and, in regard to the Gas Bills, the special rate of dividend (if any), the illuminating power proposed, and the maximum price per 1000 cubic feet.

MR. THOMAS W. RUMBLE, M.Inst.C.E., F.G.S., Chief Engineer of the Southwark and Vauxhall Water Company, was, on the evening of the 7th inst., elected a Fellow of the Royal Society, Edinburgh.

THE Fourth Annual Meeting of the Midland Association of Gas Managers was held on Thursday, the 3rd inst., at Birmingham, on which occasion the newly-elected President (Mr. R. O. Paterson, of Cheltenham) delivered his Inaugural Address. We shall publish next week our usual full report of the proceedings at the meeting.

MR. C. E. BOTLEY, A.Inst.C.E., who has for several years been Engineer of the Wormwood Scrubbs Gas-Works, has joined the staff of the Great Western Railway Company. The works, which were established in 1858 to supply gas to the Company, have, after a chequered career, been transferred to them, and Mr. Botley is attached to the Locomotive Department of the Railway Company as Gas Engineer at Swindon, Wormwood Scrubbs, &c.

Notes.

THE ORIGIN OF RADIOPHONIC SOUNDS.

According to various accounts of the most recent French researches, it is said to be shown with great probability that the musical sounds produced by Professor Bell's photophone, when a beam of light falling upon the receiver is rapidly interrupted by perforated discs of certain opaque substances—such as india-rubber, metal, and wood—are, in reality, due to heat and not to light. These sounds, which have received the name of "radiophonic tones," have been obtained by M. Mercadier from ordinary gas-lamps without employing lenses to concentrate the interrupted beam, but by simply bringing the receiving disc close to the burner. Even a plate of copper heated to a bright red produced very distinct musical tones, which gradually died away as the plate cooled. One of the observed facts adduced in proof of the belief that the sounds are due to heat is that when the receiving discs of the photophone were coated with silver on the side next the light, the effects were feeble; but when a coating of lamp-black was tried, they became much stronger. If Professor Bell should be wrong in assuming that light and not heat is the active agent in the photophone, his error will be similar to that of Professor Crookes in regard to the radiometer; but this is unlikely, for the part assumed to be played by light in the two instruments is very different. Professor Crookes assumed that a direct mechanical action was performed by the impact of light-waves—an assumption which was opposed to all previous ideas and experiences of the effect of light. Professor Bell's instrument, on the contrary, makes use of a well-known power of light to cause molecular changes in certain substances, and his photophone merely translates into audible impressions effects which had previously been only visual.

A NOVEL MATERIAL FOR ENGINEERING CONSTRUCTION.

A revolution in the common use of materials is promised by Mr. F. Siemens, who is at the present time making arrangements for the production in this country, on a large scale, of his special make of toughened glass. This material has for some time been manufactured in Germany, and with most satisfactory results; but it is believed that in England even greater facilities exist for its establishment as a regular industry. The glass is made from materials found naturally in great quantities in the neighbourhood of Barrow-in-Furness, and other localities, where fuel and labour are also to be obtained on favourable terms. The method of manufacture is as simple as the reduction of ironstone, and the annealing process, instead of being a separate and costly addition to the ordinary routine, as with the system of M. De la Bastie, is as strikingly direct and economical as it is efficacious. The finished material may be made of any degree of fineness, and coloured or enamelled like ordinary glass, from which it differs chiefly in being practically unbreakable. Gas-lamps glazed with Siemens glass cannot be broken by the most violent storms, and pebbles thrown with force against the panes will rebound harmlessly. It is said that the lamps along a promenade in Hamburg were regularly broken every winter by storms of sleet, until the tough glass was used, whereupon this destruction was no longer experienced. Other qualities of the material are used for railway chairs and sleepers, tiles, bearings, &c., and for gas and water main-pipes. These articles are much stronger than iron castings, and are imperishable and incorrodible. It is said that common castings, which are now procurable at prices which do not return the ironfounder more than the barest profit, or none at all, can be produced in Siemens's glass at about twice the figure, giving ample profit to the manufacturer. As the specific gravity of glass is only about one-third that of cast iron, the purchaser will be able to obtain glass articles at about 33 per cent. cheaper than similar goods in cast iron, as he will get, say, three pipes for the weight of one cast-iron piece of main. It should be remarked that the Siemens glass does not crumble to powder or break explosively when it is crushed, but cracks in precisely the same manner as cast iron.

THE STRENGTH OF HEATED IRON.

A valuable series of experiments to determine the breaking strain of iron at high temperatures has been lately carried out, by Dr. J. Kollmann, on the ordinary iron and steel manufactured at the Gutchoffnungshütte, near Oberhausen. An account of the method of making the tests appeared in a recent number of *Engineering*, from which we extract the following particulars of the results of fifty-two experiments:—The iron was of fairly good quality, cold tests giving a breaking strain of 23.83 tons per square inch, with 20 per cent. contraction, and 16.1 per cent. elongation at the moment of rupture; thus presenting the characteristics of a soft tough iron. Taking the initial temperature at 0° C., at which the breaking strain of the iron is assumed to be 23.81 tons per square inch, and calling this strength 100, then at a temperature of 200° C. the breaking load is reduced to 22.6 tons, or 95 per cent. of the initial load; at 300° the breaking load is diminished to 21.4 tons, or 90 per cent.; at 400° to 17.39 tons, or 73 per cent.; at 500° to 9.14 tons, or 38 per cent.; at 600° (red just visible) to 4.44 tons, or 19 per cent.; at 700° to 3.94 tons, or 16 per cent.; at 800° (dull cherry red heat) to 2.54 tons, or 11 per cent.; at 1000° to 0.05 tons, or 4 per cent.; while at 2250° the iron broke without the application of any appreciable load. Up to about 450° C. there is an increase in the extension as well as in the reduction of sectional area; but after this point has been reached the extension decreases, but the contraction increases. Between 600° and 700° the contraction decreases, but above 700° it again increases. The extension also increases between 700° and 850°, but beyond this point it rapidly decreases. It therefore appears from Dr. Kollmann's experiments—

which, besides being the latest, are perhaps the most carefully conducted of the kind that have yet been made—that long before iron shows, by a change of colour, any visible sign of being heated, its tensile strength will have almost departed. It is also stated that for temperatures between 460° and 700° C., with loads (in tons per square inch) equal to 2.86 and 2.35 respectively, the reductions in sectional area of the test bars were 7.5 and 40.83 per cent., and the elongations 4.5 and 22 per cent. These results show, therefore, that permanent set and crippling of iron under tensile stress is to be expected when such iron, loaded to the usual maximum of 5 tons per square inch, is subjected to a rise in temperature to between 300° C. (572° Fahr.) and 400° C. (750° Fahr.).

INFLUENCE OF FROST ON GASHOLDER COLUMNS.

The recent frost was doubtless the means of affording to many gas managers much valuable information, which in due time, it may be expected, they will bring under the notice of their professional brethren for their common good. As one contribution, we may relate an experience gained by Mr. Samuel Stewart, at the Inch Gas-Works, Greenock. It bears upon a singular and what was at the time a rather alarming accident—namely, the splitting of several of the cast-iron columns, forming the framing of two large gasholders. The accident occurred on Sunday, the 16th ult., when the frost was exceedingly intense. The holders are 120 feet and 100 feet in diameter, respectively, and are both telescopic; and the guide columns are arranged in sets of four, and in two lengths. It was observed that the splitting of the columns took place about noon on the day mentioned, and it seemed as if the cracks were made just about the time of the sun breaking out through the foggy clouds. When they were carefully examined, it was found that the cracks had occurred in the lower sets of the columns, four in the framing of one holder, and two in that of the other; and at the parts cracked the columns were about 18 inches in diameter, the metal ranging from $\frac{3}{4}$ inch to 1 inch in thickness. The breakages did not occur on any particular side of the holders, but with one exception the cracked side of each column was that next the holder. At their widest parts the cracks did not exceed $\frac{1}{2}$ inch in width, and they were in all cases vertical, generally extending from 4 to 8 feet, and in one or two instances to nearly 10 feet. Of course, if the cracks had taken anything like a horizontal direction, the consequences would have been very much more serious than they were. The columns were supposed to be closed on the top, but they were not hermetically sealed, and the presumption is that rain water had found its way through some aperture, and had accumulated in the columns of the lower series, possibly through a portion of the core in each case remaining in at the time they left the foundry. Going on the assumption that the cracks were due to the freezing and expansion of the water, Mr. Stewart had holes bored at one or two points, and into these holes a steam hose was introduced; and as the ice melted, the water ran out at the lower apertures. All that was required afterwards was to clamp the columns in the region of the cracks. Hoops of flat iron—3 inches broad by $\frac{1}{2}$ inch thick—were prepared, and made to bend round the columns while quite hot. They were then drawn up with a $1\frac{1}{4}$ inch bolt, and as the hoops cooled they shrank and closed round the columns most thoroughly, thereby drawing the parts together so completely that the cracks can scarcely be distinguished.

THE Directors of the South Staffordshire Water-Works Company, at the half-yearly meeting of Shareholders, to be held at Birmingham on the 24th inst., will recommend the declaration of a dividend for the past half year, at the rate of 4 per cent. per annum.

It is announced that, at a meeting of the Directors of the Andover Gas Company last week, the resignation was received of Mr. Samuel Shaw, who for many years has been connected with the management of the works, the state of his health having necessitated his taking this step.

DEATH OF MR. W. ARNOT, F.C.S.—The death is announced of Mr. W. Arnot, F.C.S., who was formerly Manager of the Maryhill, and subsequently of the Falkirk Gas-Works. After leaving the latter works Mr. Arnot was for some time chemist to a firm of sugar refiners at Liverpool, and was subsequently employed in connection with the purifying of the South Esk. Mr. Arnot was next interested in a chemical manufacturing business near Glasgow, but eventually settled down in Edinburgh as a Consulting Chemist and Chemical Engineer. Mr. Arnot died at the comparatively early age of 88.

BRADFORD CORPORATION WATER SUPPLY.—Some particulars have recently been published in regard to the water supply undertaking under the control of the Bradford Corporation. There are two separate sources of supply—the high-level and the low-level service. All places situated at a lower elevation than 500 feet above sea level are included in the low-level service, and those above this height are served by the high-level service. The sources of supply for the former lie to the north of Bradford, in the valleys of the Aire and the Wharfe; while the high-level service is supplied from the west of Bradford, in the valleys of the Denholme Beck and the River Worth. The number and capacity of the various reservoirs at present constructed by the Corporation are as follows:—High-level: Studden, 93,184,000 gallons; Horton Bank, 160,000,000 gallons; Brayslaw, 57,000,000 gallons; Idle Hill, 5,500,000 gallons. Low-level: Barden, 483,404,000 gallons; Chelker, 228,580,000 gallons; Heaton, 31,000,000 gallons. Old works: Chellow Dean upper reservoir, 50,000,000 gallons; lower reservoir, 28,000,000 gallons; Whetley Hill, 2,650,000 gallons. Compensation reservoirs: Grimwith, 634,000,000 gallons; Silsden, 230,000,000 gallons; Doe Park, 110,000,000 gallons; Hewenden, 70,000,000 gallons; Geeming, 121,474,000 gallons; Leeshaw, 126,562,000 gallons. On water account the Corporation have borrowing powers amounting to £1,740,000, and the amount borrowed, being a mortgage debt on this account, is £1,641,971. The annual receipts on revenue account were in 1879, £87,874; the annual payments, £97,317. The amount paid for the old works, purchased on Oct. 1, 1855, was £191,816.

Communicated Articles.

THE TRANSPORT OF MATERIALS FOR GAS-WORKS.

ILLUSTRATED BY THE PLANS OF THE
YORK, NEWCASTLE-ON-TYNE, AND BECKTON GAS-WORKS.*

By V. WYATT,

Constructing Engineer to The Gaslight and Coke Company.

INTRODUCTORY ARTICLE.

The conveyance of the necessary materials, such as coal, coke, lime, and gas products, into and out of gas-works, with the utmost facility, despatch, and economy, is of the first importance in the operation of a successful gas undertaking. This is equally as essential as is the efficient carbonizing of the coal in the retort-house, the purification of the gas in the scrubbers and purifiers, or the manufacture of gas products on the site. Unless the supply and exit of the heavy materials used upon gas-works be conducted with the best arranged modern appliances and plant, it will be next to impossible to conduct the business of a gas factory with regularity, economy, and order. With an ill-designed plan or arrangement of means of ingress and egress, there are endless and hourly blocks to the progress of the daily work in an establishment which should have its materials of manufacture constantly in transit to and from during the twenty-four hours of the day.

An attempt will be made in these papers to describe, and also to delineate in the accompanying model plans, the arrangement of the buildings and structures of gas-works, so as to ensure the necessary expedition and working of the establishment with equal facilities by night and by day. The plans selected for examples will be those which the writer has arranged and constructed for the new gas-works of York, Newcastle-upon-Tyne, and Beckton; and these will exemplify most fully the wants of a gas factory to supply not only moderate demands, such as York, with its 60,000 inhabitants, but the wants of larger districts, such as Newcastle, with 200,000 inhabitants, and also the still larger wants of a Metropolis supplied to a large extent from Beckton. Taking these three examples for illustration, it will be convenient to commence my description with that of York, the more simple and economical of the series. This example is also the most modern of the three, as it was only conceived during the past year, and is still in course of completion. The site and works being of limited extent, it may convey to my readers a greater interest than the larger works of Newcastle and Beckton, which are undoubtedly beyond the requirements of most places. Before, however, describing in detail the York New Gas-Works, it will be essential that I should explain a few general principles connected with the subject of transit of material to and from gas-works.

In laying down a plan of modern gas-works, the first consideration is naturally to utilize the site to the utmost, and at a reasonable expense, for the rapid and safe ingress and egress of heavy material. In doing this, recourse must be had to the most modern arrangements of structures, railways, and plant in connection with the road, river, and railway routes leading up to, feeding, and relieving the works. The arrangement of plan will be rendered the more complete and efficient, if only the external aids of the road, the river, the canal, or the railway system exist near the site, and so that they can be worked in economically and with engineering success. A site for gas-works is an unfavourable one in proportion as any one of these means of supply and relief is absent. When these physical features are wanting, then some of them must be created at a certain expense, in order to make good the unfortunate position of site; such, for instance, as means of navigation, a branch railway to a trunk railway system in the district, a branch canal, or roads. In the case of Beckton, there existed only the river in connection with the site, and this presented itself in an unapproachable and crude form, with its primitive and muddy tidal foreshores. The piers, quays, railways, and roads had to be created and formed at a great expense, and the position was two or three miles from the civilized points of the Metropolis. At Newcastle there was the railway system and the River Tyne in happy proximity to, and almost surrounding the site, and the works only wanted a small communication by road to bring the position into immediate use. At York the situation was equally fortunate, being surrounded by a combination of road, navigation, and railway facilities, having direct communication with the North-Eastern Railway system. The York new site is alongside of, and touching, by means of a bridge across the navigation and public road, the old gas-works, forming, as it were, a connected establishment of old and new gas-works in one manageable undertaking.

Human labour is a troublesome and costly commodity to deal with on public works and in factories. It has its strikes, whims, caprices, and Employers' Liability Act; its everlasting desires for an increased wage, whether earned, deserving, or otherwise, and its combinations for forcing up labour prices, and for doing the minimum of daily work for the maximum of daily pay. Therefore, the only conclusion that the manager of a gas-works can come to, in the present state of the labour market, is, that this same article of human

* It is a fact not generally known, we believe, that the "Specimen Plan of Gas-Works," issued by the Board of Trade in 1870, attached to their "Regulations" for carrying out the Gas and Water Works Facilities Act of that year, was prepared by Mr. V. Wyatt. This model plan, to which all works proposed by any Order under the above-named Act must, as far as may be, conform, was reproduced in the JOURNAL, Vol. XXVII., p. 684, and in "King's Treatise on Coal Gas," Vol. II., facing p. 290. It will be interesting to set this plan side by side with the three plans placed at our disposal by our esteemed contributor, and which will be given in subsequent numbers of the JOURNAL, with the continuation of the article we have to-day the pleasure to lay before our readers.—Ed. J. G. L.

labour should be dispensed with as much as possible in the establishment, and its place taken by machinery, plant, and special planning of the works to carry on the entire business. There being neither sentiment nor sinews in roads, railways, plant, and machinery, the engineer need not have either compunction or thought, other than an economical one, how he works, wears away, and disposes of the same in order to attain his ends and purposes. The plans of gas-works should, therefore, be so arranged as to embody and utilize the most modern forms of structure, machinery, and plant for all the heavy work of the establishment, even assuming that the cost of such machinery and plant is somewhat greater than in cases where the work is done with a large proportion of human labour about the concern. This extra cost is rarely incurred, excepting for small works and where the minor and complicated operations about a gas factory hardly admit of special plant and contrivances.

The plan of a gas-works should exhibit on its face some of these four great means of access to and from the outer world of commerce—viz., railway, river, canal or navigation, and road. The greatest and most valuable of these is the railway communication, and it must be looked out for and obtained, even at what may be deemed considerable cost, otherwise the works will be isolated, left out in the cold, and in constant want of the necessities of existence. In most situations one or more of these arteries of traffic can be commanded, and those works will be the most economically and easily managed which command the greatest number of these feeders of material. Generally speaking, in modern times, the railways are everywhere, or at least they are not far away from any habitable locality, and are in a position to be taken advantage of, utilized, and incorporated into the system of a gas-works, either at a high level, to suit the storage of coal in coal stores or retort-houses, or at the low level of the coke yards and firing-floors, or even by a wise combination of both high and low level lines on the same works.

In adapting the railway system to gas-works, the details need not be carried out in the costly form exhibited on most of the railways throughout the country, where may be observed the necessarily heavy and expensive permanent way and structures, to carry on a large and mixed traffic at excessive speeds up to 50 miles per hour, with all the accessories of heavy plant and equipments. An efficient railway system of a light character can be constructed, and is all that is wanted for sidings to gas-works. The rails will be sufficient for this purpose if they weigh 56 lbs. ($\frac{1}{2}$ cwt.) per lineal yard of rail, instead of 75 to 84 lbs. as in the ordinary railway system of the country. They should be of the flat-footed type, not less than $4\frac{1}{2}$ inches broad at the base, and of about the same height. They should be fished at the joints, which occur every 24 feet, by double fish-plates, 18 inches long, weighing about 20 lbs. per pair, and secured to the rail with four bolts $\frac{3}{4}$ -inch diameter, passing through ovalled holes to allow of moderate expansion to the extent of $\frac{1}{2}$ -inch. The cumbersome cast-iron chain, with its crude compressed wooden key, and fastening trenails and pins, peculiar to the English railway, and seen nowhere else in the world, should not be thought of for a moment in the railway lines and sidings of gas-works. On the viaducts these rails are secured to longitudinal or cross sleepers, at intervals of 3 feet, by a pair of $\frac{5}{8}$ -inch diameter wood screws or spikes, with about one-fourth of their number placed as through $\frac{5}{8}$ -inch bolts, held firmly on the under side of the timber by washer fangs. The permanent way on the ground, or coke-hole level, only requires the ordinary railway sleeper 9 ft. by 10 in. by 5 in. placed at 2 ft. 8 in. centres, being nine sleepers to a 24 feet rail. The sleepers and timbers should be soaked in a hot bath of creosote and thin tar for some hours before being placed in the work. The flat-footed rail is secured to each of the sleepers by two $\frac{5}{8}$ -inch diameter spikes or wood screws, with four fang bolts to each rail, to keep the same in position, and to prevent sliding forward on the necessarily steep inclines which are inevitable in most gas sidings. In all cases it will be found advisable to use the steel in preference to the old-fashioned wrought-iron rail, on the score of great capacity for hard rubbing and dirty siding work, and a perfect freedom from that great curse of all iron rails, the constant lamination of the heads of rails. The life of the steel rail is two or three times (some say ten times) as long as the iron rail; consequently, the roads are less interrupted for repairs and changes. The prime cost of the steel rail is but little in excess of the iron. The gauge of the railway should be the universal one of the country, which for England is the well-known standard of 4 ft. 8 $\frac{1}{2}$ in., for the simple reason that the ordinary railway plant and rolling stock can be used and taken direct to any part of the gas-works from any railway, colliery, or works in the kingdom, and expensive transhipment of materials upon the site of the works avoided.

The cost of a lineal yard of railway, laid with rails of 56 lbs. to the yard, including sleepers, fastenings, ballast, and laying, is generally about 16s. This price assumes that the ordinary and expensive gravel ballast of railways is not used, but the pan and clinkered breeze of the gas-works employed in its place. Where ballast brought from a distance is used, there will accrue the expense of £1 per lineal yard, all costs included. These prices will comprise the necessary points, crossings, switches, and other appendages to work the railway system, all articles being made to the light but not necessarily the weak patterns. These figures apply to low-level or ground lines, the substructure of which is earth or bank. With viaducts or high-level lines, the price per lineal yard will reach a higher rate, as the railway must be carried at varying levels, and with more or less of complicated details, to reach the coal stores inside or adjacent to the retort-house.

The cost of a single-line viaduct, to carry one pair of rails, standing on cast-iron columns, having wrought-iron girder superstructure, with moderate foundations, will be about £12 10s. per lineal yard,

or £4 3s. 4d. per lineal foot, all included. For this sum a good substantial high-level viaduct can be secured, with a height above the coke yards sufficient to lead the coals to a store 14 feet in depth, and capable of carrying a light serviceable locomotive and train of waggons. It is well to have the viaducts sufficiently strong and stable, as the shunting and rough operations incidental to the working of all coal sidings act severely upon these structures. The height of 14 feet above the ordinary ground line is usually enough and to spare for the retort-house stores when worked from the ground line. As to retort-houses which have the accessories of coal and firing stages with coke-holes below, known as "stage houses," and as used in all modern large works, the height of coal delivery cannot be less than 21 or 22 feet above the ground or coke-holes. The cost of a viaduct to suit these improved retort-houses will be about £15 per lineal yard, or £5 per lineal foot.

The railway curves and inclines leading up to the gas-works can be laid down, if necessary, on a severe and sharp scale, as compared with the ordinary practice of railway engineers. Thus, for instance, the radius of a curve can be used here and there as sharp as 75 feet, and an incline as steep as 1 in 25. At Beckton, for some years, a temporary incline of 1 in 16 has been used, and done good service, effecting a communication between the high and low level railway systems, and interchanging the traffic between the two levels. In the examples of works which are given in these papers, the exigencies of curve and gradient will be apparent. In ordinary railway work the engineer rarely uses a sharper curve than 10 chains radius, being equal to 660 feet, or a steeper gradient than 1 in 66, or 1 foot rise to a chain in length, having regard always to the speed incidental to the railway system, and the wheel base of the large type of locomotives used. The chief points to be kept in view in laying down sharp curves and gradients are not to make either of them too long, say not exceeding 400 feet; to lay the rails with rather a full gauge—say 4 ft. 8 $\frac{3}{4}$ in. instead of the net gauge of 4 ft. 8 $\frac{1}{2}$ in.—to enable the wheel tires of the locomotives and waggons to adjust themselves the more readily to sharp curves; to have guard or check rails next the inside rail of all sharp curves, to prevent the wheels from mounting the rails and producing dead-locks; to have the rails well bolted through the sleepers at intervals with $\frac{5}{8}$ -inch diameter fang-bolts, alternating with the ordinary spikes and wood screws; and to super-elevate the outer rail above the inner one of the curve from 1 to 4 inches, according to the curvature.

A good rule to adopt in laying down sidings for gas-works is never to introduce a turntable on the system, if it can possibly be dispensed with. The turntable involves breaking up the train into pieces and hand shunting—a most expensive and slow operation, with its local delay and confusion. It will be noticed, in the examples given in these articles, that this item of railway furniture has been almost entirely dispensed with. I would advise all who have to do with railway communications to avoid, as much as possible, the turntable, with its accompaniments of hand and horse shunting, and the resultant tedious delays and stoppages.

The locomotive used for gas-works sidings should be of a light, four-wheel coupled type, and need not, when fully equipped with fuel and water, exceed a weight of from 10 to 14 tons, according to circumstances, and for all ordinary appliances and works. Even still lighter locomotives can be used with advantage to the light-railed roads of works where there is a moderate make of gas. The wheel-base of the locomotive should be restricted to 5 feet long, centre to centre of wheels, which should be four in number, about 2 ft. 9 in. diameter, and all drivers; the cylinders should be, say, 8 in. to 10 in. diameter and 18 in. stroke; and the consumption of gas coke will be about 10 to 12 cwt. for ten hours' work. The cost of a locomotive of light make as above described, of best materials and manufacture, will be from £600 to £1000. It is preferable always to have a well-finished and perfect machine, and then will result minimum of wear and tear, and consequent repairs and delays in the repairing-shop. The work on gas-works sidings is rough and dirty, and all plant should be of the best and strongest kinds to resist the ignorant and too frequently brutal usage to which it is subjected in the continuous round of night and day work.

MR. SCOTT-MONCRIEFF ON CARBONIZATION.

By Mr. G. ERNEST STEVENSON.

Engineer of the Peterborough Gas-Works.

Mr. Scott-Moncrieff, in a letter, dated Feb. 5, and published in the JOURNAL of Feb. 8, expresses the hope that some discussion will take place in the columns of the JOURNAL on the subject of his paper, "On the Prevention of London Smoke," read before the Society of Arts on Jan. 26.

If gas engineers have been reluctant to enter upon a discussion of the proposals contained in that paper, for subverting what has hitherto been regarded as one of the principles of financial success in gas manufacture, it could only be from one of two reasons: Either because these propositions bear, on the face of them, the utmost improbability that any gas company will be found, either in London or the provinces, willing to fall in with Mr. Moncrieff's scheme, and to undertake the proof, by experiment, of their impracticable nature; or because, in view of Mr. Moncrieff's known ability and genius in other directions, they were loth to state the fact, patent to all gas makers, that an eminently clever and scientific gentleman has totally misapprehended the principles of a process of manufacture of which he desires to avail himself to carry out certain views, but of the details of which he is evidently in ignorance. As Mr. Moncrieff has, however, invited criticism, and the ice having been broken by Mr. R. H. Jones, in his letter to the Society of Arts,* it

* See ante, p. 226.

becomes an easier task to show what are the difficulties of reducing his ideas to practice.

Mr. Moncrieff's statement that the proposed "smokeless fuel" would possess a heating capacity 20 per cent. greater than coal, and 10 per cent. greater than coke, was challenged in the discussion that followed the reading of his paper, and also by Mr. Jones in his letter. Mr. Moncrieff qualified this expression, by explaining that in the combustion of coal in an open firegrate, a large portion of the heat is absorbed in setting free the gaseous product; and he argued that the intensity of the heat developed by the "smokeless fuel" would be greater than that of coal, in consequence of the absence of these gases. If Person's formula for calculating latent heat may be considered applicable to the evolution of gases from coal in the process of combustion, it would not be difficult to estimate the amount of heat absorbed in this process, provided the temperature at which the gases are expelled be ascertained.

The composition of the combustible gases evolved would be about 1 part by weight of hydrogen, 2 parts of carbon, and 1 part of oxygen; also a small proportion of nitrogen, which need not be taken into consideration. The specific heat of these elements is as follows:—

Hydrogen	3·409
Carbon	0·207
Oxygen	0·217

The specific heat, therefore, of the combined gases would be approximately 1·010. Person's formula is as follows:—

$$(160 + t) \delta = Z$$

where Z = the latent heat of the substance;

" t = the melting point of ditto;

" $\delta = c - c'$ = the difference between the specific heat of the body in a solid state and that of the same substance in a fluid condition.

The specific heat of coal may be taken at about 0·200; so that the value of δ will be 0·810. In the absence of data to go upon, the value of t may be taken at 600° C. (a dull red heat). Therefore—

$$160 + 600 = 760 \times 0·810 = 615·6$$

Here we have 615½ calories = 2442 British units of heat absorbed per unit of weight, by the evolution of gas from coal at a temperature of 600° C. The weight of 3000 cubic feet of gas is about 117 lbs., so that $2442 \times 117 = 285,714$ heat units would be absorbed in setting free the 3000 feet of gas which Mr. Moncrieff thinks should be eliminated from a ton of coal before its combustion in the domestic firegrate. Taking the average heat effect of coal to be 7500 calories = 29,760 British units, one ton of coal would develop 66,662,400 units; from which it appears that the loss of heat by the evolution of the undesired 3000 feet of gas does not exceed 4 per mille of the total heat effect of the ton of coal. This trifling amount of loss would be again recovered by the combustion of the gases, with the exception of the small proportion resulting from the difference between the specific heat of carbonic acid and the original fuel; the loss under this head, it should be borne in mind, being quite distinct from that of the heat carried away by the temperature of the effluent carbonic acid.

Mr. Moncrieff is, no doubt, right in saying that it is impossible to effect a complete combustion of the gases in an open firegrate, this being chiefly owing to the cooling effect of the contact with a large volume of cold air, which quickly reduces the gases below the temperature of ignition. Herein lies a weighty argument against the use of open firegrates, but not against the use of coal. If the whole of the gaseous products evolved in the combustion of coal be properly consumed, and the heat resulting therefrom rendered effective, the value of a ton of coal for heating purposes is (unless of a very inferior quality) greater than that of coke. The pyrometrical effect, or intensity of heat produced by coal, does *always* fall short of that produced by coke. This is found by dividing the absolute heat effect by the sum of the products of combustion, after having multiplied the weight of each product by its specific heat. Amongst the products of combustion must be included the nitrogen that accompanies the oxygen consumed in the combustion. Thus the pyrometric effect of carbon burnt in the atmosphere is found as follows:—

Absolute heat effect of carbon . . .	= 5080 calories.
Carbonic acid produced by combustion . . .	= 3·66 parts by weight.
Specific heat of carbonic acid . . .	= 0·216 calories.
Nitrogen set free	= 8·88 parts by weight.
Specific heat of nitrogen	= 0·244 calories.

$$\text{then } \frac{5080}{(3·66 \times 0·202) + (8·88 \times 0·244)} = 2730.$$

The pyrometric effect of hydrogen works out at less than that of carbon, although its absolute heat effect is four times as great.

Heat effect of hydrogen	= 34·462 calories.
Water produced by combustion . . .	= 18·00 parts.
Specific heat of water vapour . . .	= 0·475 calories.
Nitrogen set free	= 26·64 parts.
Specific heat of nitrogen	= 0·244 calories.

$$\text{then } \frac{34·462}{(18 \times 0·475) + (26·64 \times 0·244)} = 2290.$$

It is evident that the pyrometrical effect of the hydrocarbons driven off by distillation must fall somewhere between the values for carbon and hydrogen; and this—together with the fact that the water, nitrogen, and carbonic acid contained in coal are also driven off, and their lowering effect on the degree of heat removed—supports Mr. Moncrieff's opinion that the intensity of the heat developed

by the fuel from which the proposed proportion of gaseous elements has been removed would be greater than that of coal. Nevertheless, it is not at all certain that for domestic heating any advantage is thus obtained.

Leaving aside now the value of the fuel for heating purposes, let us turn to the proposition for reducing the period of carbonization in the retorts of the gas companies, and the production of only 3333 feet of gas of 24-candle illuminating power per ton of coal.

On what does Mr. Moncrieff base his assumption that the illuminating power would amount to 24 candles if only 3000 feet of gas were extracted, and would he be disposed to assume that if the production were limited to 1000 feet, the illuminating value would be increased to 36 candles? Not only is there no foundation in practical experiment for such a theory, but it can easily be shown that, by the method which Mr. Moncrieff proposes, no such increase could possibly ensue. There are two ways of producing a limited quantity of gas from coal, one being to draw the charge during the process of distillation, as recommended by Mr. Moncrieff; the other to carbonize at a low heat, and produce little gas, but much tar. In the latter case the illuminating power of the gas is somewhat higher than under normal conditions, but not in proportion to the reduced make, by far the greater part of the illuminating constituents being left in the residual tar. By Mr. Moncrieff's method the heat of the retorts must be maintained at least as high as is at present customary, for in order to produce an equal quantity of gas in a given time, the retorts must be charged with three times the quantity of coal within the same period.

The consumption of fuel necessary to maintain the same heat under these conditions would be enormously increased, the coal absorbing a far greater proportion of heat during the first stages of carbonization than afterwards. If, however, the heat be maintained as at present, the first 3000 feet of gas would have no such extra illuminating value as Mr. Moncrieff imagines. In the ordinary course of distillation, the evolution of gas from the retorts does not reach its maximum intensity till the end of the first hour after the charge is introduced, after which it continues at a pretty uniform rate for the second and third hours; and there is nothing to show that the quality of the gas distilled during the first two hours is greatly in excess of the average of the total production.

By drawing the retorts when 3333 feet of gas had been produced, and quenching the coke, the result would simply be to shut up two-thirds of the gas in the residual product (whether it be called coal, or coke), after a considerable quantity had been lost during the process of drawing and wheeling out the half carbonized material.

The cost of labour for carbonizing would be the same per ton of coal, but it would be *three times* as much per 1000 cubic feet of gas produced, and would approach 9d., as against 3d. per 1000 feet at present, adding 6d. per 1000 feet to the cost of production.

There would be no material gain in the quality of the gas, as has been shown, and what gain might be realized could not, under existing legislation, be rendered remunerative.

An increase in the quantity of tar and ammonia produced has been taken credit for in Mr. Moncrieff's calculations, in proportion to the coal carbonized, but no such increase would take place. The tar deposited by the gas on its way from the retort to the gasholder would not greatly exceed the usual proportion, and the ammonia (which is in the gas, and not in the coal) would maintain pretty much the same proportion as at present. The tar *not* carried forward by the gas would remain with the half-burnt coal in the retort, and would be drawn together with it, the whole presenting a caked and sticky mass of porous coke and bubbling tar.

Mr. Moncrieff objects to the appearance of this product, as drawn from the retorts of the London Gas Company, being represented as a specimen of what would occur if his process were adopted, and says that means can be taken by which this product will possess the consistency and hardness requisite for distribution. What means can be taken to effect this without interfering with the other necessities of gas manufacture? By carbonizing under pressure doubtless a more suitable product would result; but pressure in gas-retorts is fatal, and could not be allowed to exist.

The proposition, therefore, resolves itself into the following items—viz., increased cost of coal per 1000 feet of gas in the proportion of three to one, increased cost of labour in a like proportion; and, on the other side, a residual equal in quantity per ton of coal carbonized with the coke now produced, but of which a larger quantity must be used for fuel, and the remainder either sold at whatever price it will fetch in the market, or handed over to the municipal authorities at a contract price, to be distributed by them, at doubtless a considerable profit, amongst the consumers.

Mr. Moncrieff complains that the 6-hour charge has absorbed the attention of the gas interest. This is entirely a mistake. The 6-hour charge is simply the easiest practical way of getting the best result out of the coal, having regard to the conditions of labour; and it is found compatible with financial success. There are many gas-works where a shorter period of distillation is in use, and many others where the period would be reduced if it could be seen how the difficulties in the way are to be overcome. But there are few gas makers who would much care to be placed in the position which Mr. Hay experienced at Woolwich Arsenal when his attention was uncomfortably absorbed by the necessity for reducing the length of charge to maintain the supply of gas, and no gas maker would deliberately throw away two-thirds of the gas contained in the coal he uses, for speedy financial ruin would overtake the company for whom he managed, and certain downfall would be his reward.

The theory of "interdependence between gas manufacturers and the general public" is attractive, but will not "hold water" in respect of a scheme such as this. There is a sense in which the gas com-

panies and the public may be said to be interdependent one upon another: The public depend for an element of their comfortable existence on the gas manufacturer; the gas manufacturer depends for the success of his business upon the financial and general stability of society. Beyond this the interdependence does not extend, but resolves itself very greatly into *independence* on both sides. The public will never be prevailed upon to make a concession, or a sacrifice of selfish motive, to the interest of gas undertakings, which they generally consider an inimical power, against the monopoly and supposed deceptions of which they must defend themselves as best they can. No municipal or local authority would be likely to consent to supply gas companies with coal to be carbonized free of charge, in return for the resulting "smokeless fuel;" and then undertake the sale of the latter to the public. Nor could gas companies be expected to speculate in the production of "fuel" for the public, on the chance that such fuel would always find a market at a paying price.

The ultimate object Mr. Moncrieff has in view—viz., the prevention of London smoke and the fogs which appear to be clearly traceable thereto, is worthy of the highest praise; but this object will hardly be accomplished by attempting to revolutionize a great industry, such as the manufacture of gas for the supply of London represents. The views which Dr. Carpenter put forth in his paper of Dec. 8, 1880, appear to be much more feasible. It has been shown that coal, if properly consumed, has a greater heating value than either "smokeless fuel" or coke. Mr. Moncrieff has shown the impossibility of so consuming it in an open fireplace. Why, then, should the open fireplace be considered an indispensable thing in an English dwelling-house? In Continental countries the open fireplace is not used, and its absence is not felt to be a discomfort. A few months' winter residence abroad will suffice to accustom an Englishman to the absence of his native fireplace, and time would effect the same result at home. There are at present good stoves, of pleasing design, to be had, which are constructed, on scientific principles, for the proper and complete combustion of bituminous fuel; and if a want exists in this direction, let there be only the demand created, and the fire-clay and terra-cotta manufacturers, as well as ironfoundries, will soon produce a supply to meet it.

A tax upon open firegrates would probably effect a change in less time than we conceive. The English, and especially the London householder is an individual slow to move; but touch his pocket, and he will not be long before he consents to a change, which a very short experience will prove to be a decided pecuniary gain to himself, as well as the abatement of a great public nuisance.

PROPOSED EXTENSION OF THE WOLVERHAMPTON CORPORATION WATER-WORKS.—It is stated that the Sub-Committee of the Water-Works Committee of the Wolverhampton Corporation have agreed to a scheme for an extension of the water-works. The quantity of water consumed in 1880 was 836 million gallons—a large increase upon the previous year—and the Committee consider the time has arrived for increasing the supply from the bore-hole at the Cosford pumping-station. In 1878 it was decided to sink a well and erect a pumping-engine to yield 2 million gallons of water per day. The Committee now think that the well should be deepened and the bore-hole widened to yield 4 million gallons per day, which will probably meet the requirements of the town and neighbourhood for the next 15 or 18 years. They recommend the erection of a third engine in the engine-house already built, with a lifting-pump 36 inches in diameter, and having an 8-feet stroke, fixed in a well from 80 to 100 feet deep, or at such other depth as will yield the required quantity of 4 million gallons per day. They further recommend the erection of a third engine at Cosford, which, with boilers, pumps, &c., will cost £5000, and the increased annual cost is estimated at £500. The Committee advise that Mr. H. J. Marten, C.E., be consulted for carrying out the scheme.

THE OXIDATION OF ORGANIC MATTER IN WATER.—At the meeting of the Chemical Society, on Thursday, the 20th ult., Mr. A. Downes read a paper "On the Oxidation of Organic Matter in Water." The author stated that he considered the mere presence of oxygen in contact with the organic matter had but little oxidizing action unless low organisms, as bacteria, &c., be simultaneously present. Sunlight, however, had apparently considerable effect in promoting the oxidation of organic matter. He quoted the following experiment:—A sample of river water was filtered through paper. It required per 10,000 parts, 0.236 oxygen as permanganate. A second portion was placed in a flask plugged with cotton wool, and exposed to sunlight for a week. It then required 0.200. A third portion after a week, but excluded from light, required 0.231. A fourth was boiled for five minutes, plugged, and then exposed to sunlight for a week; required 0.198. In a second experiment with well water a similar result was obtained; more organic matter was oxidized when the organisms had been killed by the addition of sulphuric acid than when the original water was allowed to stand for an equal length of time. In the paper was also discussed the statement made by Dr. Frankland that there is less ground for assuming that the organized and living matter of sewage is oxidized in a flow of 12 miles of a river than for assuming that dead organic matter is oxidized in a similar flow.

BURNLEY CORPORATION WATER SUPPLY.—It may be remembered that in October last year Mr. S. J. Smith, C.E., one of the Local Government Board Inspectors, held an inquiry at Burnley in reference to certain extensions proposed to be made in the water-works, a scheme for which had been matured by the Corporation Water Engineer (Mr. J. Emmett), but had been considered by the Inspector to be inadequate to meet the requirements of the borough. No steps having been taken by the Corporation to amend their scheme, Mr. Smith recently had an interview with the Water Committee, and explained that as he was anxious to get his report into the hands of the Local Government Board, he would be glad to be informed what the Committee intended to do with reference to the water supply in the future. He intimated that he was quite satisfied that a reservoir capable of holding 380 million gallons of water could be filled, as there was plenty of water for the purpose. But, after the additional information was obtained showing a bed of coal under the site of the contemplated reservoir, he agreed with the Committee that it would be prudent to call in a thoroughly competent Engineer to advise upon the whole scheme; and this having been done—and he advised that it should be done as early as possible—he could hold an adjourned inquiry into the application to borrow £73,000 for water-works purposes.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

SIZES OF SERVICE-PIPES AND METERS.

SIR,—I am greatly obliged to both Mr. Livesey and Mr. H. E. Jones for their notice of my letter, as to sizes of meters and service-pipes; but I seem to be in about the same position as when I first wrote, the two opinions differing. What I should like to know is, under what "definite" clause or clauses of any Act or Acts of Parliament relating to the supply of gas (irrespective of bye-laws made by companies) can I compel a consumer to enlarge his service and increase the size of his meter to proper dimensions? As I am threatened with legal proceedings for having insisted upon a service being increased (in private property), I am anxious to know how to meet the case.

Feb. 11, 1881.

D.

THE STAMPING OF GAS-METERS.

SIR,—Among the various subjects treated of by your Edinburgh correspondent in the JOURNAL of the 25th ult., there is one of sufficient importance to merit public attention.

In 1859 Parliament passed an Act for the protection of the public and gas companies in the just measurement of their gas. By the Sale of Gas Act a uniform standard was fixed for the measurement of gas, and duplicates of the same were to be deposited with the Chief Magistrates of London, Edinburgh, and Dublin. By section 4 of the Act the local authorities are empowered to fix the number of model gas-holders required, and the places where they and the stamps are to be deposited; also to appoint inspectors, who are to have the custody of them, and to discharge the duties of testing all gas-meters, according to prescribed rules, so that both buyer and seller may be protected in the accurate measurement of their gas. The magistrates and justices in all large towns have appointed inspectors, and provided testing holders, duly stamped, for the testing of gas-meters. London, Bristol, Birmingham, Liverpool, Manchester, Salford, Leeds, Nottingham, Bradford, York, Newcastle, Glasgow, Greenock, Dundee, Aberdeen, and all considerable towns, have faithfully carried out the provisions of the Act; but Edinburgh is the only exception.

The questions naturally arise, How has this occurred? and, Why has it been allowed to exist so long? When the Act came into force the Magistrates were informed by the meter makers that it was quite unnecessary to be at the expense of building a public testing-room, as they would gratuitously provide accommodation in their own workshops. This arrangement, it was said, would facilitate the work, and save the trouble of sending the meters backwards and forwards to the public testing-room to be stamped; and it relieved the Magistrates from the trouble and outlay necessary for such a building.

The necessary cost incurred for testing and stamping meters is required to be provided by the Magistrates out of the borough funds, and to be reimbursed by the fees received by inspectors for stamping meters. The amount of such fees is to be paid by the inspector quarterly into the town or county treasury. The large surplus fund which has accumulated in Edinburgh has arisen from not carrying out the portion of the Act enjoining the provision of a suitable testing-office, which in large cities it is recommended should be placed in some central situation for the public convenience. This surplus fund now amounts to £6982 5s. 6d., and your correspondent says the Magistrates are puzzled what to do with the "pile of money" they have collected, and to which they are annually adding about £600.

The chief inspector is alone responsible for the testing and stamping of meters; but his assistants, placed in the workshops of the meter makers, are removed from his supervision, and the official stamps from his custody. The public have no right of access to the private workshops of the makers, to get their meters tested when desired; and the very general dissatisfaction which prevails in Edinburgh regarding gas measurement is thus at once accounted for.

About five years ago the state of meter testing in Edinburgh attracted the attention of the late Warden of the Standards. He brought it under the notice of the Lord Provost, who promised that it should be amended forthwith, and the provisions of the Sale of Gas Act for testing meters faithfully carried out; but nothing has yet been done.

Feb. 10, 1881.

LEX.

LOWER THAMES VALLEY MAIN SEWERAGE BOARD.—At the last meeting of this Board it was announced that the Local Government Board had declined to accede to the request of the Corporation of Kingston to be separated from the Board. The reply received stated that the effect of such a step would probably be to break up the Joint Board altogether, and this would certainly be unfair to the other constituent authorities, until the Board had been allowed time to provide, if possible, a scheme for the disposal of the sewage of the entire district.

CITY OF NORWICH WATER-WORKS COMPANY.—The half-yearly meeting of this Company was held on Wednesday, the 26th ult.—Mr. H. S. Patteson in the chair. The report of the Directors announced that, after payment of working expenses, debenture interest, and dividend on the preference shares, and including the balance from the previous half year, there remained a sum sufficient to pay a dividend on the ordinary shares at the rate of 6 per cent. per annum, deducting income-tax, leaving a balance of £2182 3s. 3d. to the credit of the next half year's account. The works of the Company at the new pumping-station at Heigham were, it was stated, being proceeded with to the satisfaction of the Directors; but they did not commence the new pumping works a day too soon, as the largely increased demand for water during the past year amply showed. In order to maintain the quantity and quality of the water up to its usual standard, it was announced that they had ordered an additional filter-bed to be constructed. The retiring Directors were Messrs. W. Cadge, A. R. Chamberlin, and S. G. Buxton, who, being eligible, were re-elected. To complete the new works the Directors will have occasion for a further command of capital; and it was, therefore, unanimously resolved—"That the Directors be, and they are hereby, authorized from time to time, as they may deem expedient for the purposes of the Company, to raise additional capital by the issue of 2000 ordinary shares of £10 each, such shares to be offered for sale by public auction, under the power given to the Company by the City of Norwich Water-Works Act, 1876; and also to borrow and raise the sum of £5000 on bonds or mortgage, in pursuance and under the authority of the said Act."

Extension Railway Company; (3) London and South Western Railway Company; (4) Grand Junction Water-Works Company. Westgate and Birchington Gas, from Isle of Thanet Gaslight and Coke Company. Woking Water and Gas, from the Earl of Onslow.

SATURDAY, FEB. 12.

Petitions against the following Bills were presented:—
 Birkenhead Corporation Gas and Water, from London and North-Western and Great Western Railway Companies.
 Fylde Water, from Charles Edmund Thornton and John Addie.
 Ryton Local Board (Water), from Messrs. John Annandall and Sons.
 Stirling Water, from Sir Henry James Seton Stewart, Bart.

Legal Intelligence.

SHOTLEY BRIDGE COUNTY COURT.—MONDAY, FEB. 7.
 (Before Mr. E. J. MEYNELL, Judge.)

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY V. CONSETT IRON COMPANY, LIMITED.

Judgment was given to-day in this case, which was reported in the Journal of the 8th inst. (See ante, p. 217.)

His Honour said: This action was brought to recover £2 6s., damage to the plaintiffs' gas-pipes, occasioned by the subsidence of the ground in the Medomsley Road, caused by the working of the coal under, and adjacent thereto. The facts were nearly all agreed upon, as well as the amount of damages. The plaintiffs are incorporated under an Act of Parliament, called the Shotley Bridge and Consett District Gas Act, 1869, which incorporates the Gas-Works Clauses Act, 1847. Section 6 of this Act enables the Company to break up streets and bridges within the limits of their special Act, for the purpose of laying down pipes, &c.; and, by the "interpretation clause," the word "street" includes "highway" and "road," within the limits of the special Act. Under this power the plaintiffs, in the year 1875, laid down pipes in the Medomsley Road. This road was set out, 60 feet wide, under the powers of the Lanchester Common Inclosure Act, and the award made thereunder. By this Act the minerals under the common thereby allotted were reserved to the Bishop of Durham (the then owner in fee), his successors, and assigns; with the fullest and amplest powers of working and getting the same. These minerals are now vested in the Ecclesiastical Commissioners, of whom the defendants are the lessees. It is admitted that they have worked the coal under, and near to the Medomsley Road, at the places where the plaintiffs' pipes have been injured. The road has subsided, more or less, at these places, and Mr. Hedley, the defendants' witness, fairly admitted that such subsidence was caused by working away the pillars of coal at one place; and at the other places, where the pipes were injured, he admitted that the defendants' workings had contributed to the subsidence, though he thought it might partly have been caused by some old iron-stone workings long before the defendants' time. The main defence raised by Mr. Cooper was on the authority of the cases of the *Duke of Buccleuch v. Wakefield* (L. R., E. & I. Appeals IV. 377) and *Gill v. Dickinson* (49 L. J., 262)—viz., that the Lord of the Manor, under the reservation clauses in the Inclosure Act, could work the minerals without leaving any support for the surface; and if the plaintiffs in this case had been the owners of, or had laid their pipes under any part of the allotted land, those cases would have been strongly in the defendants' favour. But the land which subsided is part of the highway set out under the Act, and the case of the *Benfieldside Local Board v. Consett Iron Company*, relied on by Mr. Barnes, expressly decided, under this very Act, that the Lord of the Manor and his lessees cannot work the minerals so as to injure the highway; and Baron Cleasby expressed a doubt whether they were entitled at all to the minerals under the highway. Pressed by this case, Mr. Cooper contended that though the defendants might be liable to the Local Board, who have to repair the roads, the plaintiffs were only in the position of private individuals, and could not maintain an action; and that the 6th section of the Gas-Works Clauses Act only gave them a right, or sort of easement, which must be subject to the Lord of the Manor's rights. Unfortunately for this argument, the Benfieldside Local Board case is an authority that the Lord of the Manor cannot work the minerals so as to let down or injure the road; and consequently the defendants, in so working the coal, have done a wrong. The plaintiffs have required a right to lay down their gas-pipes, and I apprehend that the defendants are responsible for the wrongdoings of the defendants' action will lie against them. It was further contended that the plaintiffs were precluded from recovering, by reason of the 59th section of their special Act, which states that inasmuch as the greater part of the district supplied by the Company is a mining district, as the pipes of the Company are crossed by a great number of railways, carrying heavy mineral traffic, and causing displacement of the pipes, as the pipes are also liable to be broken by the subsidence of the ground, and as the entire district is uneven and hilly, occasioning considerable expense to the Company, therefore all the gas supplied shall be of an illuminating power therein mentioned—and which is said to be less than the quality usually required in other gas companies' Acts. Mr. Cooper argued that the section contemplated loss by subsidence of ground, and allowed the Company a privilege in consequence; and that therefore they could not recover for such damage. I do not think so. The section contemplates various difficulties the Company will have to contend with, such as hilly and uneven ground, and injuries for which they might be unable to recover compensation; but I cannot find in the section anything that, in my opinion, prevents their recovering compensation for injury which may be done to them, and for which they are legally entitled to compensation. My judgment is for the plaintiffs for £2 6s.

Mr. BARNES, on behalf of the Gas Company, applied for costs, which were granted.

CLEVELAND WATER COMPANY.—The Directors of this Company, in the report for the past half year, state that the total cost of works on capital account to the end of 1880 was £77,821 14s. 3d., which has been met exclusively by amounts received on ordinary shares, there being no loans, debentures, or mortgages in existence. On revenue account, the half year's receipts are shown as £3357 14s. 3d., which, together with £495 1s. 10d. brought forward from the previous half year, equals £3852 16s. 1d.; working expenses absorb £816 13s. 8d., and interest on calls paid in advance amounts to £53 3s. 9d.—together, £869 17s. 5d., leaving as disposable balance £2982 13s. 8d., out of which the Directors recommend the payment of dividends for the half year at the rate of $\frac{7}{8}$ per cent. per annum on the original and "A" shares, and at the *pro rata* proportion of $\frac{5}{8}$ per cent. per annum on the "B" issue of shares, which will require £2336 12s. 10d., leaving £646 5s. 10d. to carry forward as unappropriated to the current half year, the reserve fund still remaining at £2750.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

PUBLIC LIGHTING OF ST. GEORGE'S-IN-THE-EAST AND WHITECHAPEL.

At the Meeting of the Vestry of St. George's-in-the-East, on the 20th ult., the Paving Committee reported that they had been in correspondence with the Commercial Gas Company as to their proposed charge for public lamps, but had failed to induce them to further reduce their terms. During the progress of the correspondence, they had obtained from other districts some information as to the charges made by other Companies; and after consideration it was thought advisable that further efforts should be made to influence the Company. It was therefore suggested that the Vestry should postpone any further action pending such communication.

The CHAIRMAN (the Rev. Harry Jones) commenting on a return accompanying the report, said it showed that the parish was paying more than other places, and it was a necessary thing to attempt to remedy this.

The CLERK (Mr. J. G. Harrison) said the difference was not so great as it appeared, because in some parishes smaller burners were used than in others.

It was then agreed that the following return, compiled by the Clerk, should be printed and circulated; the matter being meanwhile adjourned:—

Cost of Public Lamps under Meter System.

Parish.	Average No. of Lamps.	Price of Gas per 1000 Cubic Feet.	Average Cost per Lamp.	Average Cost of Lamp prior to Introduction of Meter System.	Saving per Lamp.	Total Saving per Annum.	Cost of Introducing Meter System.
1877-8.		s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Paddington	1759	3 6	4 2 2	4 12 7	10 5	901 1 3	1845 2 8
St. Pancras	3329	3 6	4 0 3	4 14 11	14 8	2533 1 0	3226 13 9
St. George, Hanover Square	1730	—	3 6 2	3 14 1	7 11	684 0 0	1711 3 2
1878-9.							
St. George, Hanover Square	1732	—	3 5 2	3 14 1	8 11	772 1 0	—
1879-80.							
Paddington	1796	3/6, 3/4	4 3 2	4 9 11	6 9	600 0 0	—
Shoreditch	1389	3 6	4 2 1	4 12 4	10 3	711 0 0	1495 11 6
Kensington	3820	3 4	3 17 9	—	—	—	—

During the above years the Vestry of St. George's-in-the-East paid to the Commercial Gas Company the sum of £4 6s. 3d. per lamp, the price for gas to private consumers being only 3s. 3d. per 1000 feet.

Cost of Gas in Parishes under Contract for Public Lamps.

	Per Lamp.	Cost of Gas per 1000 Feet.
Bethnal Green (Commercial Company, 5-feet burners)	£4 4 0	3s. 3d.
Clerkenwell (4-feet burners)	3 10 6	3 4
Islington (3940 hours—19,700 feet, 4½-ft. burners)	3 15 5	3 4
Battersea (London Gas Company)	4 3 4	3 3
Hackney (3940 hours—19,700 feet, 5-feet burners)	4 3 8	3 4

The Crystal Palace District Company charge private consumers 3s. 9d per 1000 feet, and for the Vestry lamps only 3s. 7d. per 1000 feet.

The South Metropolitan Company are contracting to supply the public lamps in their district at £3 17s. per lamp, with discount of 5 per cent. for payment within a month of the accounts becoming due, bringing the cost per lamp down to £3 13s.

The Commercial Gas Company propose to charge per lamp (5-feet burners) this year £4 3s., the charge to private consumers being 3s. per 1000 feet.

The system of making a reduced charge to large consumers, or allowing discount for prompt payment, is adopted in many towns and districts—notably Newcastle, Faversham, Derby, Ilkeston, Sunderland, Sheffield, &c.

At the last meeting of the Whitechapel District Board of Works, the following correspondence, between the Clerk of the Board (Mr. A. Turner) and the Secretary of the Commercial Gas Company (Mr. H. D. Ellis) was read:—

Whitechapel District Board of Works, Jan. 18, 1881.

To the Chairman and Directors of the Commercial Gas Company.

Gentlemen,—The representations which have been made to you on behalf of this Board on the subject of the supply of gas to public lamps, have heretofore received your kind consideration, and on behalf of this Board I have again to address you on the subject.

The question of the comparative cost of the supply of gas to ordinary consumers and of that for the lighting of the public lamps has for some time past been occupying the attention of this and other public bodies. It would appear that in the year 1856 the difference of cost may be stated as that between 4s. 6d. per 1000 feet to ordinary consumers and 3s. 7d. per 1000 feet for the supply to public lamps. From that period to the present year the charge has continued to be less for public lamps, though not to the same extent. It is understood by this Board that you have it in contemplation, as from the commencement of this year, to make the charges, as nearly as can be estimated, equal for both purposes.

It is not presumed by this Board to insist that any concession made by you in the past, as a matter of grace or favour, ought now to be conceded as a matter of right; but would ask your indulgence to be allowed to urge some reasons why it is thought the favours already conferred may be continued.

In the first place, this Board would urge the courteous desire which has at all times been exhibited to give every reasonable advantage to the public authorities, notably illustrated as of 1856, where the difference and advantage is stated to be within a small fraction of 1s. per 1000 feet; and from past experience this Board is impressed with the fact that your Board does not desire directly to make profit from the supply of gas for purely public purposes. It is also thought that the prompt and certain payment of charges for gas for public purposes are advantages which will not be lost sight of in the arrangements—to which may be added considerable saving in the matter of checking the supply to consumers, and otherwise looking after the interests of your Company; also the cost of collection of revenue and other incidental matters, which are better known to your Board than they can be to this Board, and would seem to indicate that larger consumers might anticipate more favourable terms than smaller consumers. The sufficient lighting of the public lamps is a necessity, not only for public safety, but as a means for the commercial necessities of the district supplied; but the cost is contributed to by ratepayers of the whole district, irrespective of the immediate interests of those who contribute, and the degrees of benefit are very considerable.

That the business of a commercial body ought and must be conducted with due regard to the interests of the capital invested, is a matter which is admitted to be of the first importance, but as your Board has the power to regulate the cost of the supply to ensure an adequate return, the cost to the ordinary consumer would appear to form the most equitable mode of regulating such return, as by such mode any loss or inadequacy of price upon the public lamps would be recouped, and the difference would fall upon the actual consumers, who, as a rule, may be stated to derive advantage from the sufficient lighting of the public streets in proportion to their own consumption of gas for business purposes.

In conclusion, I have to ask that you will be pleased to give this application favourable consideration.

(Signed) A. F. TURNER, Clerk.

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing the Loan Capital.	Total Amount authorized.	Description of Loan.	RATES PER CENT. OF INTEREST.				Total Amount borrowed.	Remaining to be borrowed.
			4 per Cent.	4½ per Cent.	4¾ per Cent.	10 per Cent.		
The Gaslight and Coke Company's Act, 1868.	£462,500	Debentures. Debenture stock. Bonds for capitalized profits.	£67,000 923,300 ..	£300,000 50,000 ..	£25,850 265,350 ..	.. .. £130,000	£1,761,500	800,000
The City of London Gas Company's Act, 1859	60,000							
The Great Central Gas Consumers' Act, 1851	66,000							
The Victoria Docks Gas Act, 1857	25,000							
The Companies' Act, 1862, as applied to the Western Gaslight Company, Limited	200,000							
The Imperial Gas Act, 1854	173,000							
The Imperial Gas Act, 1866	81,250							
The Imperial Gas Act, 1869	243,750							
The Gaslight and Coke Company's Act, 1872	250,000							
The Gaslight and Coke Company Act, 1876	1,000,000							
	£2,561,500		£990,300	£350,000	£291,200	£130,000	£1,761,500	£800,000

Dr.

No. 3.—CAPITAL ACCOUNT.

Cr.

	Expended this Half Year.		Total Expenditure to Dec. 31, 1880.			Receipts to June 30, 1880.		Received since that date.		Total Receipts to Dec. 31, 1880.	
	£	s. d.	£	s. d.		£	s. d.	£	s. d.	£	s. d.
To Expenditure to June 30, 1880			8,838,006	11 9	By A Ordinary stock	4,794,430	0 0	50,000	0 0	4,844,430	0 0
Expenditure during half year to Dec. 31, 1880—					A 5 per cent. preference convertible stock, 1st issue	1,760	0 0	..	..	1,760	0 0
viz.:					A 5 per cent. preference convertible stock, 2nd issue	1,800	0 0	..	..	1,800	0 0
Buildings and machinery in extension of works	161,990	14 10			A 5 per cent. preference convertible shares, 3rd issue	4,040	0 0	..	..	4,040	0 0
New and additional mains and service-pipes	34,544	13 8			A 5 per cent. preference shares, 4th issue	7,970	0 0	..	..	7,970	0 0
New and additional meters	7,250	15 10			A 5 per cent. preference convertible shares, 5th issue	500,000	0 0	..	..	500,000	0 0
Cr.	143,786	4 4			B 4 per cent. maximum stock	100,000	0 0	..	..	100,000	0 0
By Refund of deposit on land purchase	£1,048	6 9			C 10 per cent. preference stock	300,000	0 0	..	..	300,000	0 0
Sale of surplus land	1,579	12 8			D 10 " " "	165,000	0 0	..	..	165,000	0 0
Depreciation of meters	5,507	0 0			E 10 " " "	30,000	0 0	..	..	30,000	0 0
			8,134	19 5	F 5 " " "	60,000	0 0	..	..	60,000	0 0
			135,651	4 11	G 7½ " " "	1,300,000	0 0	..	..	1,300,000	0 0
					H 7 per cent. maximum stock	1,300,000	0 0	..	..	1,300,000	0 0
					Debentures	742,850	0 0	..	..	392,850	0 0
					Debenture stock, 4½ per cent.	265,350	0 0	..	..	265,350	0 0
					" " 4½ "	50,000	0 0	..	..	50,000	0 0
					" " 4 "	773,300	0 0	100,000	0 0	923,300	0 0
					Bonds for capitalized profits	130,000	0 0	..	..	130,000	0 0
			8,973,657	16 8		9,126,500	0 0	150,000	0 0	9,276,500	0 0
To Balance of capital account			496,285	19 10	Premium capital	150,629	17 4	42,813	19 2	193,443	16 6
			9,469,943	16 6		9,277,129	17 4	192,813	19 2		
										9,469,943	16 6

+ Debentures, amounting to £50,000, have been exchanged for 4 per cent. debenture stock during the half year.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—	£ s. d.		£ s. d.		By Sale of gas—	£ s. d.		£ s. d.	
	£	s. d.				£	s. d.		
Coals, including dues, carriage, unloading, and trimming (see Account No. 9)	451,672	7 11			Common gas, per meter, at 3s. 4d. and 3s. 2d. per 1000 cubic feet	871,924	9 9		
Salaries of Engineers and other Officers at works	7,903	19 4			Cannel gas, per meter, at 4s. 2d. and 3s. 11d. per 1000 cubic feet	48,807	2 3		
Wages (carbonizing)	81,822	5 1			Public lighting and under contracts—				
Purification, including £13,580 18s. 2d. for labour	24,296	18 6			Common gas	61,715	14 2		
Repair and maintenance of works and plant, materials and labour; less received for old materials. £1907 13s. 10d.	121,561	4 11			Cannel gas	3,677	13 1		
			687,256	15 9	(See Statement No. 11)			986,124	19 3
Distribution of gas—					Rental of meters	..	..	18,992	2 11
Salaries and wages of Officers (including Rental Clerks)	19,444	1 7			Residual products—				
Repair, maintenance, and renewal of mains and service-pipes	34,448	2 11			Coke, less £19,202 7s. 8d. for labour, &c.	123,700	13 9		
Repairs and renewals of meters	18,837	12 11			Breeze, less £1601 6s. 11d. for ditto	4,828	1 6		
			72,729	17 5	Tar, less £327 3s. 11d. for ditto	78,652	2 7		
Public lamps—Lighting and repairing	..	..	11,845	18 5	Tar products	14,411	18 10		
Rents, rates, and taxes—					Ammoniacal liquor, less £366 12s. 8d. for labour, &c.	58,903	4 6		
Rents payable	4,128	8 11			Sulphate of ammonia	16,752	19 2		
Rates and taxes	35,771	10 0						297,249	0 4
			39,899	18 11	Rents receivable	..	..	2,354	11 6
Management—					Transfer fees	..	..	225	15 0
Directors' allowance	3,750	0 0			Canteen account	..	..	163	13 2
Company's Auditors	250	0 0							
Salaries of Secretary, Accountant, and Clerks	6,258	15 11							
Collectors' commission	12,438	1 3							
Stationery and printing	3,699	16 10							
General charges	1,668	8 8							
			28,065	2 8					
Parliamentary charges	..	..	41	3 5					
Law charges	..	..	3,642	8 11					
Bad debts	..	..	6,802	10 11					
Depreciation fund, for works on leasehold lands	..	..	750	0 0					
Superannuation allowances under amalgamation schemes, and annuities	..	..	7,887	5 2					
Public officers—									
Gas Referees and Official Auditor	767	17 9							
Public testing-stations	273	11 7							
			1,041	9 4					
			859,962	10 11					
Balance carried to net revenue account (No. 5)			445,147	11 3					
			1,305,110	2 2					

No. 5.—NET REVENUE ACCOUNT.

To Interest on debentures, debenture stocks, and bonds, accrued to Dec. 31, 1880	£ s. d.		£ s. d.		By Balance from last account	£ s. d.		£ s. d.	
	£	s. d.				£	s. d.		
Dividend on A 5 per cent. pref. shares and stock	12,889	5 0	40,065	18 10	Less dividend on ordinary capital for the half year to June 30, 1880	263,693	13 0		
" B stock, at 4 per cent.	2,000	0 0			Revenue account (No. 4)			192,642	9 8
" C " 10 "	10,000	0 0			Interest on money deposited			445,147	11 3
" D " 10 "	15,000	0 0						174	8 5
" E " 10 "	8,250	0 0							
" F " 5 "	750	0 0							
" G " 7½ "	2,250	0 0							
" H " 7 "	45,500	0 0							
			96,639	5 0					
Balance applicable to dividend on the ordinary stock			501,259	5 6					
			637,964	9 4				637,964	9 4

No. 6.—RESERVE FUND ACCOUNT.

Balance on Dec. 31, 1880	£167,720 0 2	Balance on June 30, 1880	£163,162 13 8
		Interest on amount invested	2,557 6 6
	£167,720 0 2		£167,720 0 2

No. 7.—INSURANCE FUND ACCOUNT.

Payments on account of claims arising out of the explosion of gas in Tottenham Court Road on the 5th of July, 1880.	£16,083 5 3	Balance on June 30, 1880	£77,770 8 1
Balance on Dec. 31, 1880	£62,904 4 3	Interest on amount invested	1,217 1 5
	£78,987 9 6		£78,987 9 6

No. 8.—DEPRECIATION FUND ACCOUNT (FOR WORKS ON LEASEHOLD LANDS).

Balance on Dec. 31, 1880	£15,319 17 9	Balance, June 30, 1880	£14,349 8 11
		Amount brought from revenue account for the half year	750 0 0
		Interest on amount invested	220 8 10
	£15,319 17 9		£15,319 17 9

No. 9.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, June 30, 1880.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, Dec. 31, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	85,942	639,716	554,401	486	170,771
Cannel	14,321	57,071	46,128	11	24,956

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, June 30, 1880.	Made during Half Year.	Used in Manufacture during Half Year.	Sold during Half Year.	In Store, Dec. 31, 1880.
Coke—chaldrons*	8,385	706,581	159,480	525,673	29,813
Breeze—chaldrons*	2,461	72,113	18,130	52,887	3,557
Tar—gallons	462,781	6,579,363	..	6,539,930	482,214
Ammoniacal liquor—batts of 108 gallons	7,652	192,816	..	189,106	11,362

* Under "Weights and Measures Act, 1878."

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made.	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	5,929,598	310,539	5,253,376	5,563,915	74,951	5,638,866	288,732	34,143
Cannel	275,522	14,127	255,478	249,605	1,883	251,488	24,034	2,490

Dr.			GENERAL BALANCE-SHEET.			Cr.											
			£	s.	d.				£	s.	d.				£	s.	d.
Capital—						By Cash at Bankers						67,354			9	11	
Balance at credit thereof (Account No. 3)			496,245	19	10	Amount on deposit at interest.						50,000			0	0	
Net revenue—						Amount invested—											
Balance at credit thereof (Account No. 5)			501,259	5	6	Reduced Three per Cent. Consols			167,720	0	2						
Reserve fund account—						Three per Cent. Consols			78,987	9	6						
Balance at credit thereof (Account No. 6)			167,720	0	2	New Three per Cent. Consols			15,519	17	9						
Insurance fund account—												262,027			7	5	
Balance at credit thereof (Account No. 7)			62,904	4	3	Stores on hand, viz.—											
Depreciation fund account—						Coals			162,715	5	5						
Balance at credit thereof (Account No. 8)			15,319	17	9	Coke			6,834	1	6						
Debiture interest for amount due to Dec. 31, 1880			32,012	11	1	Tar and ammoniacal liquor and products			154,259	7	6						
Bond interest for amount due to ditto			6,500	0	0	Sundry stores.			132,024	6	7						
Preference dividends for amount due to ditto			96,639	5	0							455,833			1	0	
Unclaimed dividends			5,715	1	2	Accounts due to the Company, viz.—											
Sundry tradesmen and others, for amount due for coals, stores, and sundries			189,768	5	5	Gas and meter rental—											
Benevolent fund			1,636	7	8	Quarter ending Dec. 31, 1880			698,285	13	3						
Debiture stock subscriptions			29,349	0	0	Arrears outstanding			13,739	14	6						
												712,025			7	9	
						Coke and other residual products			56,261	1	3						
						Sundry accounts			1,599	9	9						
												57,860			11	0	
												£1,605,100			17	1	
												1,605,100			17		

for their electricity. Therefore if the Corporation of London are satisfied to introduce the electric light into the streets, and involve the ratepayers in so very large and unnecessary an expenditure, it is their business and not ours. We are taking steps to counteract, if necessary, any invasion of our prosperity in the way of lighting; for I may mention that we are about to light, on an improved principle, Parliament Street and Whitehall, so as to show the public what we can do with gas. We have obtained permission to do this, and are going to set about it immediately. These thoroughfares are particularly suitable for the operation, for all the members of Parliament must, of course, go through them, and they will see what really good lighting gas will give. We shall charge the parishes and vestries only the contract price for lighting the lamps under the present system, and shall ourselves defray the extra cost of this operation merely for the sake of showing what we can do, and I believe it will be money well laid out. We only engage to do this in the next three months, when the evenings are dark, and then we shall either dispose of the lanterns to the parishes—and I think they will be very glad to accept them—or take them down and resume the old system of lighting. You will be astonished to hear that the rates and taxes now paid by this Company amount to £70,000 a year. It is an enormous sum to contemplate, but I regret to say that the prospects in this direction are still gloomy. Taxation is increasing in every department, and I am afraid that during the next year our taxation will be very greatly increased. Everything seems to point to it. The heavy legal expenses which you see in the accounts are principally made up of appeals we are obliged to make against increased taxation, and the large commissions we have to pay to our surveyors on those appeals. We have succeeded this year in reducing our taxes by the large extent of £17,000, and this has been done by the very clever handling of our surveyors, and our cases being made good before the assessors. As another weapon against the electric light, we are now about to carry out an experiment for lighting railway carriages with compressed cannel gas. I hope we shall be at work on it in the course of a very few days. We have nearly completed our apparatus at Victoria Station, and one of the carriages on the Great Northern Railway is now working most satisfactorily with our compressed gas. If it proves a success, it will not only be a very great saving to the Railway Companies themselves, but will afford a light that will enable passengers to enjoy themselves, instead of sitting under a very bad oil lamp, without being able to read, and it will also add a very large income to this Company. With regard to the Employers' Liability Act, which came into operation on the 1st of January this year, we have considered this question very seriously, and have come to the determination, as we differ so much from the railway companies in the amount of compensation they are obliged to give for accidents, and looking at the very small sum we have had to pay in that respect in former years, that we had better leave matters as they are. There is no compulsion, on either side, to abide by this enactment; and we have therefore thought it better to leave the thing as it is. The meeting will be glad to hear that during the last ten years we have paid only £362 as compensation for accidents at the whole of our works, and this £362 was much in excess of what our *employés* would have received under the new Act, for we deal most liberally with them in the event of any accident happening at our works. I think they are quite willing, and perfectly right in wishing to remain just as they are, depending on our liberality and generosity should any accident occur. Turning to the matters contained in the report, the first is with respect to the explosion that occurred near the Tottenham Court Road. It will be in the memory of most present that on the occasion of our last meeting this explosion was mentioned to the Proprietors, and, with their usual confidence in the Board, they left it to us to adjust the matter as best we could. We did not then admit any liability whatever, but at the same time we stated that we set to work making things as pleasant as possible to those who had been injured by the accident, and renewing the dilapidations to the houses, and setting the streets in order. Since then it has been perfectly apparent that the Company were liable for every reasonable demand, and I am happy to say, as stated in the present report, that we have not been obliged to have recourse to any legal disputes in the matter, but have succeeded, with one or two exceptions in which the demands are disproportionate and totally unreasonable, in settling the whole of the claims in a most amicable and pleasant way, to the satisfaction both of the authorities and the persons who were injured. Since we last met, we have had to raise a certain amount of capital—£50,000—by tender. We adopted this system in preference to putting it up to auction, which we are authorized to do by our Act of Parliament. There was a good deal of difficulty experienced at one auction by the different lots not suiting different people, and I believe we realized a much smaller sum than if we had originally put the amount up to tender among our own Proprietors; but it is satisfactory, as showing the confidence of gas proprietors in gas property, that the applications for the £50,000 last offered amounted to nearly five times as much money as we had to raise, and the minimum at which we put the price was far exceeded by the price that was realized for the stock. We have now, after this operation, in round figures about £2,000,000 of uncalled capital, share and loan, including premiums, which we are authorized to raise. I hope, however, we shall not be obliged to call for any more capital during the present half year—not till July next. We have sufficient to carry us on till then. It is mentioned in the report that the increase in the sale of gas has not been so great as it has been in former years. This is amply accounted for by the extraordinarily mild weather we experienced during the last three months of the year 1880; and as illustrative of this, I may mention that at some of our stations we had to dispense with several gangs of stokers, and to put out a good many furnaces and retorts, the demand for gas being so limited. However, with all these drawbacks, the normal increase in the number of our consumers and in the gas burnt has amply made up for this, and enabled us to recommend the dividend we now propose to declare. You will observe that our funds would have enabled us to recommend rather a larger dividend, according to the sliding scale, under which we are working; but the Directors, I will say with their usual prudence, have proposed to the Proprietors to agree to a dividend of 11 per cent. instead of 11½ on the present occasion. We have reduced the price of gas 2d. per 1000 cubic feet from the 1st of last month. The great weapon in favour of gas against many other competing modes of illumination is its cheapness, and I believe that in years to come we shall be able still further to reduce our price for gas to the public, and thus show that we can supply them with as good light as they can possibly desire at a very moderate price. Those who have been long in this Company will know when we were charging 4s. and 6s. for common gas, and still higher for cannel. Now, by the superiority of our working and management in all the departments of our trade, we are enabled to give the public a first-class 16-candle gas at 3s. 2d. per 1000 cubic feet, with which I am sure they must be very well satisfied. They little know, in looking at this reduction of 2d. per 1000 feet, what it means to this Company. Every penny we reduce our price costs us an annual income of £50,000, and consequently we are now giving to the public £100,000 for the year 1881, in charging for our gas at the reduced price. These are very large figures, and ought to be estimated at their proper value by the public. I do not think any mode of illumination can supersede us, so long as we keep

down our price and give a good article for public consumption. Now one word as to the financial condition of the Company. I consider it to be in the most satisfactory state. All our funds—insurance, reserve, and depreciation—are shown in the accounts, and are invested in Government securities, which I think is the most satisfactory basis for any company to work upon; and if there is any call for them we can put our hands upon them in a moment. We have a large balance carried forward for future exigencies, which is also available for equalizing dividends, or for any unforeseen accident that may occur. Our insurance fund does not stand at a very high figure, but the Directors think that, considering the other large funds we have at our disposal, we are perfectly safe in keeping it at this amount. You will perceive that a great part of the claims for the late explosion has been charged against the insurance fund, reducing it by the amount of £16,000, which is the sum we had paid on account of the explosion up to the end of last year. I believe I have exhausted the matters contained in the report, and I will now give you a few figures, which I think are interesting, and which I do not doubt will be satisfactory to you. We carbonized during the past half year 600,000 tons of coal. Our gas made per ton of coal was 10,328 cubic feet, which I consider is a most satisfactory result, showing that proper attention was paid to the carbonizing, and bearing in mind the high illuminating power we are obliged to supply—16 candles and 20 candles. The percentage of gas sold on the make has been 93·72, which is a very large proportion, and we used at our stations about 1¼ per cent. We have lost by leakage about 5 per cent., and I think that, when you consider the enormous extent of our mains throughout the whole of London—which exceed, as I have said, 1400 miles—this leakage may be really regarded as nothing in comparison with our works. The gross cost of our coal last half year was 15s., against 15s. 2d. I come now to the item which will show you the value of the works at Beckton for the manufacture of our residual products—our ammoniacal liquor, &c. The net cost of the coal per ton, after deducting the proceeds from residuals, last year was 5s. 1d., while the previous year it was 6s. 1d. This shows a net saving of 1s. per ton upon all the coals carbonized. I think this is the most satisfactory announcement I can possibly make, and it fully bears out and justifies the large expense we have incurred in carrying out these works. Our bad debts slightly increased—from about 10s. to 12s. per cent.—during the half year. This is easily accounted for by the very great depreciation in certain trades during that period. Our principal falling off has been with public-houses, and places of amusement of that sort; but taking the whole amount into consideration, I think the Proprietors will agree with the Board that it is not a very excessive amount to have lost by bad debts. The increase in the gas sold during the half year, as I have already told you, is small in comparison with what we have been accustomed to. It is not more than 2½ per cent., and this 2½ per cent. has been lost altogether during the last quarter of 1880. We are now picking up again, and I hope on the next occasion of our meeting we shall have a very much better report as to the increase in the sales of gas. I now beg to move—"That this meeting do agree with and confirm the report of the Directors, and the Auditors' report and statements of accounts of the Company, as transmitted."

The DEPUTY-GOVERNOR (Mr. E. Vaughan Richards, Q.C.) seconded the motion.

Dr. WYLDE asked who was responsible for the explosion in Tottenham Court Road, and what precautions had been taken against future explosions. Was there any risk of any persons causing an explosion in the Company's 1400 miles of mains? As to the proposed supplying of railway carriages with compressed cannel gas, Mr. Pintsch was already supplying compressed gas, and he (Dr. Wyld) wished to know whether the Company could do it more cheaply than Mr. Pintsch. He asked the question because, being a railway director, he knew that they were paying a large price to Mr. Pintsch.

Mr. COFFER said he regarded the report and the Governor's statement as very satisfactory, but thought the want of increase in the consumption of gas was not entirely attributable to the weather. He considered the electric light had had something to do with it—and he argued that the Directors must not overlook this matter. The electric light was a very beautiful light, and was being extensively adopted at railway stations and in large open spaces. A falling-off in the consumption of gas, from whatever cause, must be jealously looked after by the Board, if they wished to keep up the business and the dividend of the Company. They were working now under very exceptional circumstances with the price of coal, iron, and materials generally very low. In 1866 he remembered that the dividend was reduced to 4 per cent., owing to certain circumstances over which he would not say the Directors had any control; but being a trading Company they were subjected to everything connected with trading, and it was not because they were living now in comparative sunshine that they should close their eyes. They should, on the contrary, keep them open, and persevere in stimulating to the utmost the consumption and sale of gas. Up to Christmas last he had not heard of the Directors making any move with this object. He was, however, very pleased now to learn that they were going to light up Parliament Street on an improved principle, and that they were about to introduce gas into railway carriages, which would be a very splendid source of income if it should be adopted. He had very great faith in the superiority of gas over Pintsch's system of lighting. It only wanted energy on the part of the Directors and officers to deal successfully with any competition. The municipal authorities ought to be shown what gas could do—indeed, this ought to have been done when the electric light was in its infancy. [Several SHAREHOLDERS: It was done.] The strongest efforts, too, ought to have been made to prevent the Directors of the Victoria Docks from using the electric light in preference to gas. Let the Directors show distinctly that they could give quite as good a light, and at a much cheaper rate, with gas as that given by electricity. They must disabuse their minds that they had a *quasi*-monopoly, and always remember that they were a trading Company, and that if a good coach were run on one side of the road, they must run a better on the other.

Mr. HARTLEY said he thought the Proprietors must not lose sight of the fact that the electric light was more of a reality now than it was 20 years ago, but he considered they had little to fear from it. He thought the depression of trade was responsible for the want of increase in the consumption of gas.

Mr. SPICER said he understood that another ¼ per cent. dividend might have been declared, and as the Company's finances were so flourishing he should like to know why the Shareholders were not to have the extra ¼ per cent.

Mr. STOKES referred to the system in vogue in many provincial towns of allowing discounts to large consumers, and said he thought the use of gas might be stimulated in this way. He was glad that there was some prospect of the Company lighting railway carriages with gas. He testified to the admirable lighting by their gas of the trains on the Great Northern line.

Mr. WILLOUGHBY argued that the treatment of the Company by Parliament and the public authorities was most unfair, and in support of his contention referred to the severe manner in which they were taxed. If, he said, costs were given against the rating authorities, he thought they would be more particular in fixing the amount of the rates. Alluding to

the explosion in Tottenham Court Road, in which vicinity he lived, he complained of the careless manner in which the repairs were conducted, and the want of some superior supervision. He thought the amount paid for lighting and repairing the public lamps was very large, considering the sum the Company received from this source. The amount, too, of bad debts—£6282—he considered as very high, and thought the collectors should take more care in collecting, having regard to the large commissions paid to them.

The GOVERNOR: This gentleman has spoken so pointedly on some matters that I should like to dispose of his questions at the moment. The gentleman is under the most imperfect impression as to the conduct of Parliament to this Company. If there is any company in London to which Parliament has been more lenient and more generous than another, it is to this Company. Does the honourable Proprietor forget that, when we were last in Parliament and obtained permission from a Committee to raise a very large sum of money, that Committee enabled us to pay 10 per cent. when it was enforcing 7 per cent. on other companies? Is that nothing to have gained from Parliament? I think Parliament has been extremely just to us, and I am sure that there is not a member of the Board who does not entertain the same opinion on this subject as myself. The honourable Proprietor is also under a grave mistake in fancying that Parliament has anything to say as to the rates and taxes which are imposed by the local authorities. With regard to the lighting of Parliament Street, we are not going to do it for the special edification of members of Parliament, but we wish to show those gentlemen, they being the persons who are able to judge of the matter, what we can do with gas; and, as I stated before, I think this will be money very well spent indeed. As regards bad debts, can any gentleman in this room stand up and say that £6000 out of an income of £1,000,000 is bad. [Several SHAREHOLDERS: No, no.] I look on it as a most extraordinary phenomenon that our bad debts are so small as they are. Over £2,000,000 a year is collected from rental, and out of this, even with the increased bad debts of the last half year, for which I have accounted by the depression of trade, the bad debts do not amount to £12,000. I may also say that the honourable Proprietor is the only gentleman who has made a single complaint as to the way in which the repairs, &c., were carried on in the restitution of the buildings damaged by the explosion in Tottenham Court Road, and the parishes have by letter signified to us their entire satisfaction at what has been done.

Mr. JACKSON, as an old Proprietor, said he cordially agreed with the gentleman who remarked that a trading company must seek every avenue for advancing its business. It must not, however, be forgotten that the Directors lighted Queen Victoria Street some time since, and showed what gas could do. He had witnessed the electric light in many forms in Paris, but the gas in Queen Victoria Street was far more effulgent, and much more suited to the lighting of streets than anything he had seen of the electric light. He thought the Board might turn their attention to the common gas-lamps in the streets, which were vile, and placed gas at a disadvantage when compared with the electric light. He held that this matter should be brought before the notice of the vestries, and that a combination of the Metropolitan Gas Companies for this purpose would be beneficial. He pointed out, with regard to the reduction in the price of the Company's gas, that the 2d. per 1000 feet represented one-twentieth, which was ten times what the Shareholders would receive.

The GOVERNOR: The honourable Proprietor must not blame the Gas Companies for the badness of the lights in the public lamps in the streets of London. He must go to the Vestries, and there lay his complaint on this head. We are quite willing, and it would be to our interest, to make the street lighting of London a great deal more complete than it is at present; but the honourable gentleman may remember that when we lighted Waterloo Place for some time, as an experiment, and showed people in the parish of St. James how beautifully their streets could be illuminated at a very moderate cost, at the termination of our experiment we were absolutely obliged to remove the improved lamps and burners altogether, and to revert to the dim lights which now prevail there. We, on our part, are perfectly willing and able to improve the matter.

Mr. SPICER: How about my $\frac{1}{2}$ per cent.?

The GOVERNOR: With regard to your $\frac{1}{2}$ per cent., I hope you may get it another time; but on the present occasion we have thought it more prudent not to divide to the very utmost extent of our means, but to add, as the Proprietors have always urged us to do, a large sum to the reserve fund. Over £12,000 will go this fund.

The DEPUTY-GOVERNOR: The Governor not having heard very distinctly the questions Dr. Wyld put, has deputed me to answer him. The first question was as to who was responsible for the explosion in Tottenham Court Road. I should think the man who applied the light, and I do not say this in any degree to make fun of the question. The accident was really one of those over which it may be said that no one had any control. The man applied the light where no human being thought there could by any possibility be any gas; but unquestionably if he had not done so—and he was the foreman, and had spent his life in laying and testing gas-pipes and similar work—for the purpose, as he said, of ascertaining if any gas was in the main, the explosion would not have taken place. It is of no use talking about it now. The poor man killed his fellow-workmen, and his distress was extremely great; but to his foolish error the explosion must be attributed. As to the question of the steps being taken for preventing the recurrence of such an accident, and whether we are looking to have a similar disaster on any portion of our 1400 miles of mains, I think the question is best answered by saying that the Company has been in existence since 1812, that it was 1880 when the explosion occurred, and that in the course of this long period no such occurrence has ever taken place. I do not think that, humanly speaking, we need anticipate its recurrence; but if it is any satisfaction to you, I may mention that the greatest possible care will be taken—greater care even than before, when all human precaution was taken—to ascertain that there is no gas whatever escaping from a valve at the point of connection with a live main. There are, however, circumstances, under which accidents will occur, that seem beyond control; but all such extra precautions as we learnt from the experience of this unfortunate catastrophe to be necessary, will be taken in the future. As to Pintsch's patent system for lighting railway carriages, I believe we shall undersell him; if not, good-bye to us. That is the first simple line of trade. We, however, believe we shall give a better article than he does, and at a lower rate, which is our object. This allows me to turn to another gentleman who has given us rather a lecture on the mode of conducting commercial matters generally, and who seems to think that we have omitted opportunities of increasing our trade. I do not suppose that any step that could be taken was left untaken with the Directors of the Victoria Dock Company. They were, however, under the impression that the electric light would serve them better than gas, and I am bound to say that I hardly ever saw a more splendid light than they have there. When the gentleman says, or seems to suggest, that we should have put up a large gasholder in order to show how well the dock could be lighted with gas, he should remember that this would have involved the laying down of a whole gas system in the dock, and this was the very thing the Directors of the Dock

Company determined should not be done before they resolved on having the electric light. Do not let it be supposed that we ignore the electric light. For some purposes it does answer most splendidly. I have seen it here and abroad supplied to railway stations and large places, where the flickering and unsteadiness of the light do not signify, and it is very effective, and I think may be applied under such circumstances. If this is done we must submit; but, on the other hand, I see no ground for supposing that the electric light will supersede gas for domestic purposes, or where small and subdivided quantities of light are required. This is my impression; and when we are told that the small increase in our consumption is attributable to the electric light, I do not think it is correct, because I do not consider the electric light has been introduced to a sufficient extent to make any difference to us. There has, too, been an increase in the half year in the number of the private services, and to my mind this fact seems to be an answer to any apprehension with regard to the diminution in the use of gas for domestic requirements. There was one other question. A gentleman observed that, as a means of inducing people to burn more gas, a custom prevailed in many places of allowing discounts to large consumers. It has been my lot to have this matter brought before me in other places, and to my mind it is a most abominable shame to grant this indulgence to the very people who, of all others, can afford to pay. We, however, cannot give such an indulgence. We are bound to supply gas at the lowest rate we offer to any individual; for instance, if we allowed a great railway company to have gas at a reduced rate, we must do it for parishes and private individuals. I consider that the system referred to is extremely unfair.

The GOVERNOR then put the motion, and it was unanimously adopted, as was the resolution declaring the various dividends, and a motion placing to the credit of the reserve fund the sum of £12,017 6s. 6d.

On the motion of the GOVERNOR, seconded by the DEPUTY-GOVERNOR, the retiring Directors—Captain J. C. Giffard and Messrs. F. Bennock and H. Chubb—were re-elected, as were also the Auditors.

Mr. JACKSON then moved a cordial vote of thanks to the Governor and Directors, for their able management of the Company's affairs, and the motion, having been seconded, was carried unanimously.

The GOVERNOR briefly returned thanks for himself and the Court of Directors, and the proceedings closed.

YORK NEW WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 3rd inst.—Mr. J. F. TAYLOR in the chair.

The SOLICITOR (Mr. J. P. Wood) having read the notice convening the meeting, the report of the Directors, together with the statement of accounts for the half year ending Dec. 31 last, was presented. The latter showed that the receipts on revenue account were £11,736 11s. 9d., including a balance, less dividend, of £3504 10s. 5d. The item for water-rents was £6793 18s. 10d. The expenditure had been £3672 12s. 3d., leaving a balance of £8063 19s. 6d. The construction account showed receipts £138,000, and payments, including £2005 for new works at Acomb Landing, £137,887 11s. 6d., leaving a balance of £112 8s. 6d. The report stated that the revenue of the Company had materially increased, and that all claims in respect of the new works had been paid, and that the works were highly satisfactory. The Directors recommended that a dividend of 5s. per share on the preference shares, being at the rate of 5 per cent. per annum; a dividend of 8s. per share on the ordinary shares, being at the rate of 8 per cent. per annum; a dividend of 5s. per share on the new shares, 1878; and a dividend of 2s. per share on the new shares, 1879, being at the rate of 5 per cent. per annum for the half year, be declared.

The CHAIRMAN, in moving the adoption of the report, said the Directors were very glad there was in the revenue the very satisfactory increase on the year of £600, and taking into consideration the fact of the building operations that were in progress and the new streets being formed, all of which would require a supply of water, they had every reason to believe that they would not only maintain but increase their income. The works at Acomb Landing were so far completed, and all claims in respect to them had been paid. The Directors found them highly satisfactory, and, in fact, they would have been at a loss to have supplied the extraordinary demand that had been made for water during the late severe weather if they had not had the two new engines. They had not only had them working night and day, but had had some part of the old plant also at work. The Shareholders could form an estimate for themselves when he told them that between Saturday night and the Tuesday morning the week before last 6 million gallons of water above the ordinary supply were sent into York. And yet complaints were received, from those whose services were on the roofs or in high places of buildings, that they did not get a supply. The reason was obvious. Unfortunately many people kept the water running all night, and the consequence was great waste. By keeping the engines in constant work, the Directors had been able to maintain the supply to the city. There was a very erroneous impression abroad that because many of the services were frozen the Company were saved the cost and trouble of pumping, but the contrary was the fact. The Company did what they could to put stand-pipes in districts where there was a stoppage; but these were not placed there without considerable expense. They had to send men to take charge of them, and their wages had to be paid. Then some people whose services were not frozen were guilty of wilful waste, so that the strain upon the Company had been very considerable. Judging from the weather at present, it might be hoped that this state of things would end, and that only the ordinary supply would be required by the citizens. It was a matter of satisfaction to know that there had not been a water famine, and that York had not been in the position of some towns. There had not been in the city any want of water supply caused by the Company. The Shareholders would observe that this half year there would have to be paid the full amount of dividend on the new capital. This had been expended, and it was not the Directors' intention—which he was sure it would be some relief to the Shareholders to know—to further increase the capital of the Company at present. They thought the time had come to "rest and be thankful," and in that matter this would be the policy of the Board. At some future time extensions would, no doubt, have to be made in the way of subsidising beds and filtration power, but happily there was still £17,000 capital, which could be raised either by shares or loan. He did not mean to say there would not be a call until that time came, but a call was very far distant, according to present expectations. The Shareholders would remember that some few months ago the Directors increased the service in the Bootham district. This work, he was satisfied, was well and wisely done, as the Company were now able to supply the district, which included many new buildings, with as much water as they would require. They had it in contemplation to increase the supply to the Fulford district. A great deal of water would be required at the new barracks, and in thus increasing the supply they would be enabled to divide this neighbourhood into districts, so that, if repairs were required at any point, they would be able to shut the water off from any part without depriving the other portions of the neighbourhood of water. At present this could not be done, as when the water was shut off the supply to the whole district was stopped.

This, he thought, would be a great advantage to the public in this locality. He wished the attention of architects and builders could be roused to a sense of the necessity of properly fitting up houses in order that stoppages might be prevented.

Mr. J. L. FOSTER seconded the motion, and it was carried unanimously. The CHAIRMAN proposed, Mr. FOSTER seconded, and it was resolved that the dividends recommended in the report be declared.

The retiring Directors—Mr. Foster, Mr. R. Varvill, and Mr. J. Smith—were re-elected, and Mr. W. H. Cobb was re-appointed Auditor.

Alderman MELROSE proposed a vote of thanks to the Chairman and Directors for their efficient management.

Mr. DYSON seconded the motion, and the vote having been unanimously agreed to, the proceedings terminated.

THE SHEFFIELD TOWN COUNCIL AND THE WATER COMPANY'S BILL.

A Meeting of the Water Committee, appointed by the Sheffield Town Council, was held on Friday, the 4th inst., for the purpose of deciding the course of action to be pursued by the Corporation in regard to the Bill now being promoted in Parliament by the Water Company. The Committee had previously decided upon taking Counsel's opinion whether the Corporation had *locus standi* to appear in opposition to the Bill, and whether, in this event, there was a probability of the opposition being successful. Mr. Venables, Q.C., and Mr. Pope, Q.C., were the Counsel to whom the subject was referred, and their opinion was laid before the Committee. Both the learned Counsel are understood to have given it as their opinion that though the Corporation might succeed in proving their *locus standi*, such a result was doubtful, and the chances of a successful opposition to the Bill were thus exceedingly remote. The opinion, taken generally, being unfavourable to the Corporation appearing in opposition to the Bill.

It was moved by Alderman CLEGG, and seconded by Mr. F. P. RAWSON—"That this Committee do not deem it advisable that a petition should be presented by the Corporation against the Water Company's Bill in Parliament."

The resolution was unanimously adopted.

At the Meeting of the Town Council on Wednesday last—the Mayor (Mr. A. Brooksbank) in the chair—the minutes of the Water Committee were brought up for approval.

Alderman BEAL said he could not agree with the conclusion of the Committee that it was undesirable to petition against the Bill of the Company, and he complained that the Committee had not brought their decision before the Council until it was too late to oppose the Bill. He understood that the Committee would call the Council together if necessary, but they had practically taken the matter into their own hands. They should at least have obtained from the Company some information as to why the Broomhead, Moorhall, and Wadsley reservoirs were needed. The Committee should have ascertained whether it was necessary for the Company to have additional reservoirs, and how it was proposed to employ the £400,000 of additional capital. In 1876 the Engineer of the Company gave it as his opinion that the reservoirs then completed would, at the then rate of consumption, be adequate for the wants of more than half a million persons. What need, then, was there for these additional dams, and why ask for an extension of the time in which to complete them? The time would come when there would have to be a different understanding between the town and the Company upon this matter. It appeared from the Bill that the Company had increased their capital to about £1,700,000, and they were proposing to further increase it to considerably above £2,000,000. He reminded the Council that seven years ago, when the affairs of the Company were under discussion, the then Mayor (Alderman Fairburn) said the Company's capital account was nearly closed, and no further large outlay would be required. At that time he (Alderman Beal) showed, he thought, very clearly that instead of the account being about to be closed and remaining at the sum of £1,500,000, it would go up to £2,200,000 or £2,300,000. It was approaching this amount already, and any one examining the accounts would see what a large expenditure was going on. So far from the Company requiring increased storage, the Damflask reservoir, nearly a mile in length, and costing some hundreds of thousands of pounds, was not used, and they were paying interest out of capital upon the amount the dam cost. This was the sort of thing Parliament would not allow to go on, if it were properly explained, and he did hope that the Water Committee, of which Alderman Clegg, who knew something about the proceedings of the Company, was a member, would have shown how desirable it was that this concern should not be allowed to go on in its lavish way, spending money that was unproductive. The Council were entitled, on behalf of the water consumers and the public of Sheffield, to have some information on the matters he had mentioned. It would be remembered that after the bursting of the Dale Dyke reservoir the town and country together raised some £40,000 or £50,000 for the compensation of small claimants, and that the Company succeeded in obtaining parliamentary sanction to increase their rates by one-fourth for 25 years; but any one calculating what had been a quarter of the Company's income from that time, would find the town had paid the compensation for all the sufferers by the disaster, and he doubted whether the Company were a farthing out of pocket by it. He did think the town should be treated with some degree of courtesy by the Company, and that this question should not be lost sight of by the Council. Within the next seven or ten years the Company were sure to go to Parliament to ask for a renewal or an extension of time with respect to their 25 per cent. increase, and unless the Council were watchful they would most certainly be saddled with this extra rate.

Mr. WARREN said Alderman Beal did not appear to understand why the Company were asking for an extension of time with regard to the making of further reservoirs. The fact was the Company did not want to make the reservoirs, and were asking for an extension of time because they had plenty of water. In this he thought they were moving with great discretion. He considered the Water Committee had acted very wisely in not opposing the Company when they had not a leg to stand upon, and in not involving the Council in thousands of pounds of expenditure, as similar Committees had done on previous occasions. The Committee, he thought, deserved their thanks, and he congratulated them on their decision.

Mr. DOBB said the Council were entitled to know the grounds of the wisdom the Committee were said to have displayed, as there were none disclosed in the minutes.

Mr. FOSTER said it would have been a useless waste of money to present a petition against the Bill unless the Council intended to follow it up by appearing before the Select Committee to whom the Bill was referred; and they could not oppose without first obtaining the sanction of the ratepayers, which would have involved an expenditure of at least £500 or £600. The Council would see, therefore, that it was not for them to entertain the idea of opposing the Bill unless they had something worth fighting for, and some reasonable hope of success. They had been asked by Mr. Dobb to give the reasons for their action, but he thought it would not be advisable to make public the opinions of Counsel who had guided the Committee in their decision. Mr. Dobb might rest assured that those opinions were such as to satisfy the Committee that there was no reason-

able hope of success in opposing the Company's Bill. The Council might have obtained *locus standi*; but Counsel told them that the propositions of the Company were of such a nature that opposition would not be successful. Alderman BEAL had entered upon an elaborate argument to show how the Company were filling up their capital account; but this was a matter which concerned the Shareholders more than it did the Council. If the Directors were hanging a millstone round the neck of the Company, this was not the concern of the Council, so long as the town had a sufficient supply of water, and at the present time it was most ample. There was nothing sufficiently well worth fighting for to justify the Council in incurring the expense that an opposition to the Bill would involve, and the Committee were not sufficiently sanguine of success to advise the Council to enter upon a campaign.

Alderman HUTCHINSON approved of the Committee's decision, because he thought a petition would have been the thin end of the wedge for unnecessary expenditure. The town had an ample supply of water at lower rates than were paid at Bradford, Leeds, or Manchester.

Alderman CLEGG said he should certainly have supported a petition against the Company could he have seen his way clearly to do so; but he thought the Committee had taken a wise course in obtaining the opinion of Counsel and acting upon it. If they had acted upon their own opinions and recommended a petition, and the Council had gone to Parliament and incurred a useless expenditure of some thousands of pounds, some of the inhabitants would no doubt have said, "Why did you not ascertain before you went whether there was any probability of your succeeding?" Alderman BEAL had told the Council that they ought to know why the Broomhead and other reservoirs were needed; but they could not go into that question now, as it had been decided by Parliament long ago. If the Company could show that they need not spend money at the present time in making the reservoirs, they would be able to convince the Parliamentary Committee that they might clearly be delayed. The Council had nothing to do with the Company raising money to pay interest on unproductive capital; that was a question for the Shareholders themselves. Until the Shareholders, putting an end to the present management, took the matter into their own hands and approached the Council with a view to a sale of the undertaking, they must let them go on as they were going, and when the time came they must make them pay for the error of their ways.

Alderman PYE-SMITH (Chairman of the Committee) said the Committee did not claim any particular degree of wisdom, but they contended that they had acted with common sense in this matter.

The minutes were then agreed to.

EXTENSION OF THE PURIFYING PLANT AT THE MAIDSTONE GAS-WORKS.

In view of the stringent requirements of the Act of Parliament obtained by the Maidstone Gas Company during the last session of Parliament, the Directors at once proceeded to extend the purifying plant at the works, so as to make it as complete and efficient as the most recent improvements rendered possible. One of the last services performed for the Company by Mr. John West, before he entered upon his duties as Engineer to the Manchester Corporation Gas-Works, was to prepare designs for an additional set of purifiers: and the Directors, having regard to the great importance that all should be completed before the date when the stringent sulphur clauses contained in their Act came into operation, accepted the tender for them of Messrs. S. Cutler and Sons, of Millwall, who had already successfully carried out several contracts for the Company. Messrs. Cutler have succeeded—notwithstanding the unfavourable time of the year, and that all the work had to be done in the open—in completing their contract, and having the purifiers in use before the required time.

The new purifiers have been constructed in the most approved manner, with planed joints; and one special feature in the arrangement is that the connections are fitted up with Cutler's patent water-valves, which not only permit a most simple arrangement of pipes to enable the purifiers to be worked in the required order for extracting the various impurities contained in the gas, but have the advantage of rendering leakage impossible. The valves are fitted with an ingenious system of indices, so that the order in which the purifiers are at any time working may be seen at a glance, and any mistake of opening or closing a wrong valve is obviated.

In addition to the valves to the new purifiers proper, there is a system of connection provided—also fitted with Cutler's patent valves—by which the gas can be diverted to any or either of the respective sets of purifiers in any desired order. Some time ago, under Mr. West's direction, a similar set of purifiers was erected, in which the foul inlets and clean outlets only were fitted with Cutler's valves, the others being of the ordinary description; but Messrs. Cutler's valves were found to work so satisfactorily, that in the last erected the patent water-valves have been exclusively adopted.

In addition to the new purifiers there have been recently erected, at Maidstone, one of Kirkham, Hulett, and Chandler's "Standard" washers, and also one of Morris and Cutler's patent water condensers, both of which appliances are working most successfully.

Altogether the purifying apparatus now in use at Maidstone may be regarded as being probably as complete and efficient as any in the kingdom.

MANCHESTER CORPORATION WATER SUPPLY.

At the Quarterly Meeting of the Manchester City Council, on Wednesday, the 2nd inst.—the Mayor (Alderman Baker) in the chair—the annual report, accounts, and estimates of the Water-Works Committee were presented. The statement of receipts and payments from Jan. 1 to Dec. 31, 1880, showed that the total income amounted to £208,373 16s. 6d., the principal items being £119,207 for water sold beyond the limits of the city, £15,000 odd for rents, and £54,317 from the water-rates. The payments, including a balance of £30,000 owing to bankers at the end of the year, amounted to £238,274 16s. 6d. The assets on revenue account were estimated at £63,755, or £450 in excess of liabilities. The profit and loss account showed that the working expenses of the year amounted to £65,725, and the receipts to £210,209 17s. 9d. This left a balance of £144,483, together with the £6450—excess of liabilities on revenue account—to meet the claims in the way of interest on loans, &c. The amount paid over to the sinking fund account was £33,390 13s. 1d. Statements were also submitted on the capital account, sinking fund account, and life annuities, and the report proceeded as follows:—

Your Committee recommend to the Council to make and order a public water-rate of 3d. in the pound, and a domestic water-rate of 9d. in the pound, to be made and levied on all property assessed thereto, for the purpose of raising the amount required for payment of the expenses connected with the supply of water within the city during the year commencing on Jan. 1, 1881. The amount of estimated available rates outstanding on the 31st of December last, out of a gross sum of £54,170 0s. 7d., was £68 19s. 5d., and of rentals £160 8s. 8d., out of a gross sum of £136,318 3s. 4d. 7746 cases of inspection of rates and 11,520 cases of rentals have been examined by the inspector and his assistants during the year, and such cases have been subsequently dealt with by the Sale and Supply Sub-Committee.

The testing and stamping of water fittings continues to progress satisfactorily. During the past year 40,851 water fittings have been examined and tested, of which 38,460 have been passed and stamped; and on subsequent inspection, such fittings as have

been fixed within the districts supplied with water by your Committee, have successfully stood the pressure of the water. During the year the internal water fittings in 32,380 houses, warehouses, and other premises have been inspected, and waste therein prevented, where necessary, by putting the fittings into proper repair, in accordance with the regulations of the Committee.

During the year upwards of 12 miles of new iron piping have been laid in place of old piping on renewals account. Upwards of 7 miles of iron piping have been laid in extensions in various townships during the past year, and your Committee have made connections to 2758 additional houses and other premises by means of upwards of 44 miles of lead piping, at an expense of £1022 2s. 9d.

The whole of the works in connection with the Woodhead reservoir are in good order. The defects in the puddle lining of the Torside reservoir have been repaired, and the reservoir is ready for the storage of water to top water level. The repairs to the lining have been more extensive than was expected. The syphon-pipes for drawing off the surface water of the reservoir were finished early in the year, and have been in use. The works of the Rhodes Wood reservoir have been maintained in good condition during the past year. The syphon-pipes are completed, excepting the lowest valve, and have been in frequent use. The reservoirs at Vale House, Bottoms, Arnfield, Hollingworth, Godley, and Old Denton have been maintained in good condition. The reservoir works at Denton, included in the contract of Messrs. Benton and Woodiwise, have made fair progress during the year. The severe winters and wet summers have materially interfered with the work. The embankments are generally raised to within 5 feet of top bank level. Several slips have shown themselves in the embankments, and it has, therefore, not been considered desirable to push forward the earthwork and puddle. The stone pitching on the face of the slopes is proceeding on many portions of the work. The total sum paid to the contractors on account of this work to the present time amounts to £242,895. The works included in the contract for the diversion of drainage at the Gorton reservoirs, under Messrs. Benton and Woodiwise, are almost completed. They would now have been finished had it not been for the unfavourable weather of the past two months. The total amount paid to the contractors to the present time amounts to £28,169.

After a short discussion the report was approved, and at a subsequent stage of the proceedings the Council decided to levy a domestic water-rate of 9d. in the pound, and a public water-rate of 3d. in the pound, upon the property in the city liable to be assessed thereto, for the year ending Dec. 31, 1881, as recommended by the Committee.

PROPOSED PURCHASE OF THE ASHFORD (KENT) WATERWORKS BY THE LOCAL BOARD.

A Special Meeting of the Ashford Local Board was held on Saturday, the 5th inst.—Mr. BUGLER in the chair—to receive a report from the Water Committee in reference to negotiations which have been going on for some time past for the acquisition of the Water Company's undertaking by the Board.

The CLERK (Mr. Hallett) read the minutes of the several meetings of the Committee. At one of these meetings, held on the 2nd inst., a letter was read from Mr. G. Wilks, the legal adviser of the Committee, to the effect that the Company having given to him (Mr. Wilks) and to Mr. Hawksley, the Engineer to the Committee, particulars of the works and of the receipts and expenditure for the last 10 years, they had no hesitation in advising the Committee to purchase the undertaking. The Committee thereupon authorized Mr. Wilks to arrange terms with the Company, and this gentleman having done so, the Committee at a meeting on Friday, the 4th inst., unanimously passed a resolution recommending the Board to accept the same and purchase the works. [The draft agreement was read to the Board. The terms of it are that the price to be paid for the works shall be settled by open arbitration; Mr. S. C. Homersham being named by the Company as their Arbitrator, and Mr. T. Hawksley on behalf of the Board. The costs of the arbitration are to be settled in the award; and, further, the Arbitrators are to take into consideration the costs of the Company in making their application to the Board of Trade for a Provisional Order.] The Committee further stated that they had had three samples of the water obtained from each of the Company's three wells, and three samples as delivered to the consumers, analyzed by Dr. C. M. Tidy, and his report was also read to the Board. It was to the effect that the water was of most excellent quality, all the samples being of great organic purity.

A resolution was passed accepting the recommendation of the Committee, and the agreement for the purchase of the works was signed by the Chairman on behalf of the Board.

BURNLEY CORPORATION GAS SUPPLY.

PROPOSED EXTENSION OF THE WORKS.

On Tuesday last, Captain R. C. HILDYARD, R.E., one of the Inspectors for the Local Government Board, held an inquiry at Burnley into an application made to the Board by the Burnley Corporation for power to borrow £20,000 for works connected with their gas undertaking. Among those present were the Mayor (Alderman Howorth), the Chairman of the Gas Committee (Alderman Coultate), the Town Clerk (Mr. A. R. Creeke), and the Gas Engineer (Mr. S. P. Leather).

The TOWN CLERK said the application of the Corporation was to be allowed to borrow £20,000 for gas-works purposes, further on account of the £35,000 authorized by the Provisional Order obtained by them in May, 1878, of which amount £13,000 had already been borrowed on account. The estimated cost of the proposed extensions was £25,835 12s. 2d., and was for two gasholder-tanks, gasholders, and boundary walls. The application was originally for £38,000; but the amount granted was £30,000.

The INSPECTOR referred to the report he made on an inquiry he held some time ago, and ascertained that £4000 had since been spent upon new purifiers, £2684 upon extensions of the retort-benches, £389 upon a coal shed, £955 19s. 7d. upon street extensions, £1318 upon a new roof, and £2711 upon West's patent stoking apparatus. He remarked that this showed that considerably over the sum applied for—£6000—had been spent.

Alderman COULTATE said the Gas Committee had drawn upon their depreciation fund for the extra amount.

The INSPECTOR made special inquiry in reference to the amount expended upon the new retort-house roof.

Mr. LEATHER stated that the retort-house was formerly used as a coal store, but the coal was removed and a wrought-iron roof placed on the top of the house.

Alderman COULTATE said the Committee formed a depreciation fund, instead of a reserve fund, of £5000, as they were empowered to do by their Act, and had spent out of this sum what they thought proper, and renewed the retort-house. Instead of the reserve fund they had used the depreciation fund for ordinary purposes, but their intention for the future was to discontinue the depreciation fund, and insist upon having a reserve fund of £5000 always retained and kept standing. For instance, if they asked for £6000 from the Local Government Board, and spent £7000, they would draw the extra £1000 from the reserve fund.

Mr. LEATHER said he did not think the £1318 spent for the roof had been paid out of the £6000; he thought it was intended to be charged to revenue account, because there was a roof on the house previously, and the work was considered as a renewal of the roof rather than as fresh expenditure.

Alderman COULTATE said one-half was covered with iron and the other half with wood, and when the former came to be examined, it was found to be very much damaged, and therefore it was agreed to replace the old roof with a new wrought-iron one.

The INSPECTOR: But there was an allowance in the original estimate for some £4000 for a roof.

The TOWN CLERK said that though the expenditure on capital account for the gas department, since the granting of the Provisional Order, appeared in round figures at £16,000, only £13,000 had been borrowed, the remaining £3000 having been paid by the gas department out of its own revenue. At present the outstanding accounts stood at £3722, but by the end of March, when the accounts were collected, this would be practically wiped off.

The INSPECTOR: Can you rely upon the works to meet the wants of the place for ten years to come, or will you require the other new houses and retorts originally estimated for?

Mr. LEATHER: We shall not require a new retort-house within the time for which this estimate was framed. We may have to renew the present house.

Alderman COULTATE: It will have to be renewed and extended.

In answer to the Inspector, Mr. LEATHER said that at present the gas-works produced 1 million feet of gas per day, but when the proposed extensions were carried out they would produce 1½ million cubic feet. There was now available storage for 900,000 cubic feet.

The TOWN CLERK asked the Inspector if he required any evidence to show that it was very urgent that the Council should proceed with the work at once.

The INSPECTOR: No; I have quite sufficient as to that.

SCOTTISH GAS MANAGERSHIPS.

Our Glasgow correspondent sends a copy of the *Dundee Advertiser*, of Monday last week, containing the following account, from his pen, of the recent changes in the management of gas-works north of the Border:—

Mr. David Terrace, Manager of the Corporation Gas-Works, Arbroath, was formally appointed at the late meeting of the Town Council of Glasgow to a position of a similar sort in that city. The appointment in question is the last in a series of elections to important gas managerships in Scotland within the last three or four months, such as have probably never hitherto occurred in a like period of time during the whole history of gas lighting. Primarily the vacancies that have now been filled up arose through resignations in Glasgow and Edinburgh, and in the case of this town [Dundee] through the lamented death of Mr. B. M. McCrae, the highly efficient and popular Manager of the works owned by the Dundee Gas Commission.

The first vacancy occurred through the resignation of Mr. John Davidson, who was the Manager of the Dawsholm Gas-Works, Maryhill, belonging to the Glasgow Corporation Gas Commissioners, which is certainly one of the largest establishments of the kind north of the Tweed, if not indeed the very largest. It is this post that Mr. Terrace has been appointed to fill; but he is not the immediate successor to Mr. Davidson. The vacant office was deemed to be such a valuable and desirable one that the applications for the appointment were exceedingly numerous, there being upwards of 40 of them. Mr. Terrace was one of the candidates for the vacancy at the time, and he was in the "running" as one of the favourites, of whom there were some half a dozen, constituting a short list—viz., Mr. Robert Mitchell, Coatbridge Gas-Works; Mr. Terrace; Mr. James McGilchrist, Corporation Gas-Works, Dumbarton; Mr. J. Smith, Hawick Gas-Works; Mr. John Wilson, Saltcoats Gas-Works; and Mr. Innes, formerly of Forfar, and more recently serving as a Gas Manager in South America. Mr. Mitchell was eventually the choice of the Corporation Gas Committee, and on their recommendation he was formally appointed to the vacancy by the Town Council sitting as the Gas Commissioners. But he had scarcely got settled down to his duties and made himself familiar with the works placed under his charge than a vacancy occurred in the Edinburgh Gas Company's staff of officials through the resignation of Mr. Barclay Henderson, the Engineer and Superintendent, after a service of about 30 years. Mr. Mitchell offered himself for this vacancy; and as he had been thought the most worthy out of fully two score of candidates for the Glasgow vacancy, the Directors of the Edinburgh Gas Company practically had their work of selecting a successor to Mr. Henderson done to their hands. Certainly they made their appointment without much ado.

As Mr. Mitchell's appointment to Dawsholm left a vacancy at Coatbridge, a successor was obtained for it in the person of Mr. Wilson, of Saltcoats, the post being so eligible as to command the services of good men in the profession. Then, the Saltcoats vacancy was filled by the election of Mr. James Henderson, Assistant Manager of the Partick, Hillhead, and Maryhill Gas-Works.

When Mr. Mitchell was chosen for the Edinburgh vacancy, and his resignation of the Dawsholm managership accepted, the Conveners of the Works and Finance Sub-Committees of the Glasgow Corporation Gas Committee were instructed to select and recommend a suitable person as a successor to that gentleman. They limited their choice to the before-mentioned short list, and they had practically no difficulty to encounter. Eventually they reported in favour of Mr. Terrace, the Committee approved of the selection made by the two Conveners, and the Committee's recommendation was formally adopted. The selection of Mr. Terrace for the vacant post was due in a great measure, it is understood, to the fact that he is a thorough-bred mechanical engineer, and that his skill in this capacity may be turned to good account in working out the mechanical stoker of Mr. Foulis, in actual practice, as an appliance for economizing labour in one of its most exhausting forms. The fixed salary attached to the office is £300 per annum, in addition to which there is a bonus in the shape of "payment on results," which, as a rule, is never less than another £100, so that altogether the post now secured by Mr. Terrace is a very enviable one. He will certainly be a loss to the Gas Corporation of Arbroath, but he will be a gain to Glasgow. Besides having secured the confidence of the Glasgow Corporation Gas Commissioners, Mr. Terrace enjoys the confidence of his professional brethren in Scotland, being at present the Secretary of the North British Association of Gas Managers.

The gas managership appointments in which we have been specially interested in Dundee, consequent on the death of Mr. McCrae, are the selection of his son, Mr. John McCrae, as his successor, and the choice of Mr. Alex. Mitchell, the Assistant Manager at the Dundee Gas-Works, to succeed Mr. John McCrae in the post which he has occupied at Bury St. Edmund's during the past few years. It is an interesting fact in connection with gas managerships that Scotland supplies many suitable men from time to time to the south of the Tweed; indeed, Scotland has for many years been a great training school for gas managers. Very few of the emigrants ever return to their native country. We may mention that another Scotchman, Mr. Smith, of Peterhead, has recently been appointed to the managership of the gas-works at Heywood, in Lancashire. So far as we are aware there have only been in recent years two Scotch gas-works under the management of Englishmen, and even one of these Englishmen, Mr. Levi Monk, of Lanark, has lately resigned his office for an appointment abroad. His place at Lanark has been filled by the appointment of Mr. James Martin, of Kilmacolm. Another recent appointment is that of Mr. George Keillor, lately assistant to Mr. Terrace at Arbroath, to the managership of the Nairn Gas-Works.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of this Association was held last Thursday, at the Guildhall Tavern, London, E.C.—Mr. W. H. BROADBERRY (Tottenham), the President, in the chair.

The minutes of the previous meeting were taken as read, and confirmed.

The PRESIDENT announced that, in accordance with a resolution recently passed, the proceedings of past meetings not already printed had been printed, and would shortly be distributed. He also stated that at a meeting of the Committee held on Dec. 20, it was decided to recommend that the summer meeting of the Association should be held at Ipswich, Mr. Goddard having sent an invitation. He therefore put it to the meeting, whether this recommendation should be adopted, and the next meeting, on the second Thursday in May, be held at Ipswich.

The resolution was unanimously agreed to.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—As you have elected me to the presidential chair of this Association, the first duty devolving upon me is to deliver my Inaugural Address. I can assure you I feel it is no mean duty, and I trust you will extend the kindness you have already shown in electing me to the position of President, and overlook the faults and failings of this address. I feel that, whatever may be my *forte* in the gas world, giving presidential addresses, and writing papers to read before the Association, is not the work in which I excel.

In looking back upon the year that is past and gone, we cannot call to mind any fresh or startling inventions that are likely to affect our operations of making and distributing gas. We find that death has removed from amongst us one of the princes of our profession—I allude to our late friend, Mr. F. J. Evans, so long connected with The Gaslight and Coke Company. Those of us who paid a visit to the Beckton Gas-Works, in connection with the excursion of the British Association of Gas Managers in June of last year, will not soon forget his kindness and affability on that occasion. I little thought when I saw him then, so attentive to our comforts, and so ready to explain anything not thoroughly understood, that we should see him in the flesh no more. He was so well known and so much respected by the members of this Association, that I could not pass on without this tribute to his memory.

I must also refer to the explosion of the large main belonging to the Chartered Company, near Tottenham Court Road. This, I think, is one of the most remarkable explosions ever known in connection with gas undertakings. The effect you well know; the cause is not so easy to explain, and, to a certain extent, it will always remain a mystery.

The electric light is gradually making headway, and, with a few more improvements in its distributing apparatus, it will, I have no doubt, take its position as an illuminating agent; but I consider it cannot in any way lay claim to being a cheap method of illumination. Though Mr. Edison has not yet, so far as we know, succeeded in the division of the light, still Mr. J. W. Swan, of Newcastle-on-Tyne, appears to be successful in this direction. But even he does not seem to have much faith in its economy; for at the lecture delivered a short time since at the rooms of the Institution of Civil Engineers, in Great George Street, Westminster, he plainly stated that it will not be so economical as gas, and that gas shareholders have nothing to fear. We find that at the Royal Arsenal, Woolwich, some extensive trials have been made with the electric light; but the authorities do not appear to be at all satisfied with it, for they are making considerable alterations and additions to their gas-works.

The electric light seems to have made the progress it has done through the desire for change shown by persons in authority. Some extensive trials of the light, which certainly cannot be recommended on the score of economy, are to be made in the City of London. Certain districts which up to the present have been illuminated by some 450 gas lights, at a cost of about £1690 per annum, are to be illuminated with the electric light, at a cost of £8000 for the same period. The late Phoenix Company, under the direction of our esteemed member Mr. Corbet Woodall, and the Chartered Company, under the direction of their officers, and advised by Mr. Sugg, have shown the public some splendid arrangements for street lighting, and I think that if improvement in street lighting had been the only object of the trials to be made in the City, in all fairness to the Gas Company they, too, should have had an opportunity of showing the public what they could accomplish for a like sum in the same area; or at least they should have had an opportunity of showing what could be done at a proportionate cost according to the area of the district experimented in. As it is, I have no doubt we shall have a glowing account of the superiority of the electric light, while the question of cost will be kept in the background.

I feel bound to make these remarks, but I trust you will not think I do so on the same principle as the boy we hear about, who always whistled when he was passing through the churchyard, just to keep his courage up, and the evil spirits down. We read in another place, and on another occasion, of a certain Philosopher and Doctor of the Law, who said, "Take heed to yourselves what ye intend to do as touching these men; and now I say unto you refrain from them, and let them alone, for if this counsel or this work be of men it will come to nought." So we would say of these schemes; if they are for the purpose of bolstering up the electric light, or as bogies to the gas companies, they will come to nought. My opinion of the energy of the electric light is that it is energy expended in the wrong place, and I think I am justified in saying that there is no known method of artificial illumination that can give so much light, in proportion to its cost, as that of coal gas.

This, therefore, brings me direct to our own legitimate business, and to the object of the Southern District Association of Gas Engineers and Managers—viz., the study and discussion of the science, and, I had almost said, art of the manufacture and distribution of coal gas. This Association is, as you are all aware, one of the offsprings of the British Association of Gas Managers, and I do not think it necessary to say any more on this subject, except that we are a very respectable offspring of a very respectable parent, and we trust she will not be jealous of our success. We can assure her, through her worthy Secretary, who is with us to-day, that what we are we owe to her kind care and nursing, and that we shall always think and speak of her with respect and veneration. The British Association has done a great work. Those of us who have been engineers and managers of gas-works for over 25 years, will well remember the isolated condition of gas managers in those days, and the difficulties we had to contend with in obtaining any information from each other. The British Association broke down the barrier of suspicion that so long kept gas managers apart, and its leaders found that in commencing to teach they then commenced to learn. Speaking for myself, I can say that the papers and discussions, and the communication of thoughts and ideas with my brother managers, led me to look upon the annual meeting in June as the brightest week in the year; and I believe that many others thought and felt the same. As a natural consequence, we thought that a meeting once a year was not sufficient for our wants, and this led to the formation of district associations, and now we have the Manchester District Institution,

the North of England Association, the Midland Association, the South-West of England District Association, the Southern District Association, of course, and I do not know how many others, all doing good work, and spreading knowledge and information throughout our ranks, and cultivating feelings of friendship and brotherhood towards the members of our profession; and surely of such offsprings the British Association should be proud indeed.

I have no doubt, gentlemen, you are all familiar with the expression, so often used, that "dividends are made in the retort-house." This is true to a very great extent, for if there be mismanagement in this department, it is almost impossible for a company to pay dividends, unless the price charged for gas be considerably more than the surroundings justify. But to manage a retort-house it is not necessary to be always there, neither is it possible to manage it properly without ever entering it; but much may be done by a judicious office management, and a daily comparison of the gas made in proportion to the coal used, and the illuminating power of the gas so made. If this be done daily, a falling off, either in quantity or quality, will soon be discovered, its cause found, and the fault rectified. The retort-house of to-day is altogether a different thing from the retort-house of 25 years ago. Those of us who are old enough to remember one of that period, with its iron retorts, its old-fashioned settings and furnaces, its old-fashioned mouthpieces and connections, and I had almost said its old-fashioned make of gas per mouthpiece and per ton of coal, can and do appreciate the improvements made in the plant we now find in almost universal use. With what suspicion fire-clay retorts, the boon of our day, were received, and how universally they were condemned—the letters upon letters that were written to prove their uselessness—are matters of history. In the present day a man would be looked upon as a madman who objected to their use, for it is entirely owing to them that we are enabled to produce from a ton of coal the quantity of gas which is now considered to be fair and reasonable carbonization—a quantity which 25 years ago was thought to be, and, with the apparatus of that day, was impossible. It would be misleading to mention any quantity as a guide for what is considered fair carbonizing, for the quantity of gas which might easily be produced from one class of coal, it would be impossible to obtain from coal of another description; but it may be considered, as a general rule, that we now take about 2500 cubic feet of gas more from a ton of coal than was thought possible 25 years ago.

Though we have made many improvements in the carbonizing departments, much more remains to be done. The constant demand is for cheap gas, and if gas is to be sold at a less price than at present, it must be produced at a less price. How is this to be done? We cannot take much more from a ton of coal than is now taken in all well-managed works, and we cannot reasonably expect our stokers to carbonize more coal per man than they are now doing. The stokers, I believe, are, as a rule, fairly paid for their labour, yet you will all admit that their work is not pleasant, neither is it easy, but taxes their physical powers to the utmost. The question then crops up—How can the retort-house labour be cheapened? Or, in other words—How can we reduce the cost of the labour required to produce 1000 feet of gas? In thinking of this, our minds naturally turn to the mechanical engineer, and we ask, Can he assist us? Some of you will say, "Yes, he can, and has done so;" others will say that the mechanical assistance has yet to come. Machinery for stoking purposes is not a new idea, but has, at some time or other, employed the minds of almost all gas engineers who have a gift for mechanics. There have been many inventions, from the time of Clegg's revolving-web retort, to the stoking apparatus of the present day, but very few of them have been successful, or have ever been used except in works under the management of the inventor, and we have generally found, after a short trial, that they have fallen into disuse. As far as I am aware, there are only two or three stoking appliances that have been tried in works not under the management of the inventor, that have given satisfaction, and have continued in use after the first few months' trial; and of these the one that seems to be the most successful is the invention of our brother member, Mr. West. I shall be pleased if one of our members who is using the apparatus will give us a paper on this subject at an early date. The fault of most, I may say, all stoking machines appears to be that they require a special setting of retorts. A machine to come into general use must possess the following qualities:—It must be easily adjusted to the settings of existing retorts and retort-houses, must be simple in its construction, easily managed, require but little motive power, and must not be expensive. Any inventor who can produce such a machine will ensure the recommendation of gas engineers and managers, and receive their thanks and blessings, especially on Bank Holidays and Saint Mondays.

We often hear the expression used, "You cannot take more out of a ton of coal than there is in it." This is, of course, quite true; but something else follows. When you have carbonized a ton of coal, has it been done in the best manner? Have you sent the distilled matter to the tar-tank or to the gasholders? Have you sent the solid matter to the coke heap or to the breeze heap? This would at once open the question of high heats *versus* low heats; but I am not going into that subject to-day, for, like the dispute referred to in the "Vicar of Wakefield," much may be said on both sides. My object in mentioning the matter is to draw your attention to another—viz., the depth of the layer of coals in the retorts. This is a subject that should receive more attention than is generally given to it. Some 15 years ago I conducted a series of experiments in this direction. The coal used was Pelaw Main, the layers being from 1 inch to about 11 inches in thickness, and the time the coal lay in the retorts varied from one to eight hours. The best results, both for quantity, quality, and purity of the gas produced, were obtained from the thin layers and quick charges; but the extra cost of the labour required considerably more than counteracted the advantage gained by the increased quantity of gas produced. The advantage of a simple, reliable, and easily-worked mechanical stoking apparatus would not be confined to a saving of labour only, but light and quick charges would certainly follow, and an increase in the quantity and quality of the gas produced would be the result.

As there has been such great improvement in the retort-house and its appliances, so likewise has there been very great alteration in the minds of gas engineers as to the requirements of the purifying plant. A few years ago, in looking for the purifiers, we generally found them in some out-of-the-way place, or perhaps in a corner of the retort-house itself, and it was thought that anything would do for a purifier; but in a modern gas-works the purifying plant occupies more space than the retort-house. What with its washers and scrubbers, its sulphide of calcium and oxide purifiers, it certainly is a very imposing and very important department in all gas-works. On the question of the merits of the various washers and scrubbers that are constantly brought under your notice by advertisements and circulars, I do not intend to dwell. I would simply say that they are all good, and, if we believe the advertisements, most of them are the best. The one thing needful in them is that they should extract the ammonia from the gas, and if this be done, and a margin left in the apparatus for the yearly increase in the quantity of gas made, it is all that is required. Whatever be the shape and construction of the apparatus used, whether it be filled with coke, boards, brushwood, or with bass, so long as every portion of the gas is brought in contact with the wet surface of the same, it is a matter of indifference so far as the ammonia is concerned. I know it

is often said that there is great advantage in washing the gas with strong liquor, and that by so doing you extract sulphuretted hydrogen and other sulphur compounds, as well as carbonic acid. This is true to a certain extent, but entirely useless beyond a given point. It is impossible to cleanse gas with fouled liquor.

If we turn to the apparatus understood by the term "purifiers," we shall find, as before stated, a large increase in their size in proportion to the quantity of gas made. This, as you are all aware, is rendered necessary by the sulphur clauses in all modern Acts of Parliament referring to gas companies. These clauses are, I know, voted a bore by many people. My own opinion is that they are a disgrace to gas companies. We should not be compelled by Act of Parliament to do that which we, as manufacturers, should voluntarily and willingly do—namely, remove every objectionable impurity from the article that we manufacture and supply, if this can be done at a reasonable cost. And although we have heard of the beneficial effects of sulphurous acid, we none of us take it willingly, and we certainly should not inflict it upon our customers without their consent. If it had always been the custom to allow the gas to remain in contact with the purifying material, say, from 12 to 15 minutes, we should not have heard much of the sulphur clauses; but when we know that the size of the purifiers in proportion to the gas made would only allow it to be in contact with the purifying material from one to two minutes, we cannot wonder at the insertion of these clauses. It would not be out of place here to say that, although gas companies have their privileges, they have also their duties and responsibilities, and to a very great extent it depends upon the engineers and managers to look after the privileges and carry out the duties and responsibilities; and woe be to the man who is too anxious for the former, and too neglectful of the latter. It will certainly give him much trouble, and bring his company into disrepute.

I should now like to say a word or two on residuals. Gas companies have two sources of income—namely, the rental for gas and the income derived from the sale of residuals; and as their profits are limited to the amounts required for the payment of their dividends, and the sum they are allowed to place to their reserve fund, it is therefore very plain that the more profit can be made on the residuals the less will be required on the gas. The price of the gas is limited by Act of Parliament; the price of the residuals is regulated by the demand for them in the neighbourhood of the works. And although we can regulate the make of gas to the requirements of the locality, we cannot so regulate the residuals, for they are made in proportion to the quantity of gas required, or in proportion to the coal carbonized; and we very often find that where there is a great demand for the one there is but little for the other. How happy is that manager where the two are equal. Now the principal residual is coke; it becomes us, therefore, to do all we can to improve the sale of this article. Many companies have tried to encourage the domestic consumption of coke by breaking it ready for use before delivery. This is a step in the right direction; for, in the first place, it is difficult to get people to understand that coke should be broken into small pieces before it is placed on the fire; and, in the second place, it is not pleasant work to break it ready for use after it is laid in the coal cellar. One cannot wonder, therefore, at people not taking the trouble to break it. There is one thing connected with the sale of coke that to my mind is worthy of our special consideration—namely, can nothing be done to regulate its price and sale? I am of opinion that much evil is caused by coal and coke merchants. Coke is often sold to them at a price out of all proportion to that charged to the public; and at present there does not appear to be much help for it, for if you refuse to sell to the merchant, it is quite likely he will bring coke from some other works and sell at your own door. I think, gentlemen, much of this difficulty would be avoided if we could induce managers to communicate with each other on this subject, and make arrangements to regulate the price of coke. If this were done, I am sure our several companies would receive considerable benefit, and the public would not suffer. We find ironmasters and coalowners meeting once a month to discuss the question of prices, and we might, with advantage, follow their example in this matter. I hope some gentleman will think out a scheme, and read a paper on the subject to the members of this Association. Though I complain of the price at which we are now selling coke, I will not say much about tar and ammonia. At present they are quite able to take care of themselves. There is, however, much improvement yet to be made in the sale of residuals, before we arrive at the happy state of things mentioned by one of the members of a local board of health within 20 miles of London—namely, that gas companies could well afford to supply the public with gas free of charge, through the profit they make by the sale of coke, tar, and ammonia.

I will now call your attention to another subject which is at present the cause of much discussion and unpleasantness—I refer to meter-rents. The difficulty in the matter is that the custom is not universal. It is often said that it is unfair to charge your customer a rent for the machine to measure the article you sell to him, and that it would be quite as reasonable for the baker to charge you a rent for the scales to weigh your bread, or for the butcher to charge a rent to weigh your leg of mutton, and also for the baskets and paper used to carry your purchase home. The comparison is not fair. In the case of the baker and the butcher, one pair of scales will do for any and all of their customers; but each consumer of gas must be supplied with a separate measuring machine. If the two tradesmen before mentioned had to supply a separate pair of scales and basket to each consumer, I really think they would either charge a rent for them, or they would have to put a higher price upon their goods. So it is with the meter-rent. If it be not charged directly as rent, it must be charged indirectly in the price of gas. If the meter-rent were charged according to the quantity of gas sold, I think you will find it would work out to about 2½d. per 1000 cubic feet; it follows, therefore, that unless you are in a position to lower the price of gas, if you take off the meter-rent, you must increase the price of gas, or you will not be able to pay the full dividends. If some gentleman would kindly read a paper on this subject, it could then be fully discussed.

Another subject on which a paper might be profitably read and discussed is the insurance of gas-works and plant. This is a subject that has not received much attention, not through any fault of the gas companies, but owing to the extraordinary, I had almost said ridiculous premiums required by the insurance companies.

After reviewing the manufacture of gas, you will naturally expect a few words on distribution. This, I venture to say, is one of the greatest sources of anxiety to a gas manager. A good map of the company's district is one of the necessities of this department; the larger the scale, the more useful will the map be found. The Ordnance 25-inch scale is very useful for the purpose, and nothing less than this should be used. On the map all the mains should be carefully traced, and their several sizes duly marked. In relaying mains, plenty of margin should be allowed for probable increase. Very few engineers would think of relaying a 3-inch main with a 4-inch, or a 12-inch with a 15-inch. If, in your calculations, there should be any doubt upon your mind as to the size of main required, always give the larger main the benefit of the doubt. The cost will be very little more, and be as nothing compared with the benefit

derived from the larger size. On the subject of jointing pipes, and which is the best material to use, I would say we are most of us very conservative in our opinions in this respect. Lead was about the first material employed for the purpose. It has had many rivals, but it is still used, and in my opinion will continue to be as long as gas-mains are required. The advantages of a good lead joint are so many that they entirely outweigh the little extra cost of making the joint.

If we look at the question of unaccounted-for gas, or leakage, as it is usually called, we find great improvement has been made. The loss in distribution of 25 per cent. of the make of gas would scarcely be credited in these days; but we have not to look back many years to find that this was then about the average loss. We owe the improvement effected in this direction principally to the papers and discussions of the members of the British Association of Gas Managers. They called attention to this loss, and engineer after engineer began to move in the matter. We now find 8 per cent., 7 per cent., 6 per cent., and even as low as 4 per cent. reported as the average unaccounted-for gas in the twelve months' working; and one manager of my acquaintance actually reports more gas sold than is recorded by his station-meter.

The improvement shown in the unaccounted-for gas is not all due to less actual loss, or leakage, though much is due to overhauling and repairing mains, and also to extra care being taken in connecting service-pipes to the mains; for the actual loss of gas was undoubtedly owing, in a great measure, to the carelessness of the workmen formerly employed in making these connections. The principal gain has been attributable to the use of regulators to the public lamps, and to periodically testing meters. This is usually done by subdividing the district into four parts, and testing the meters in each sub-district in rotation, so that the whole of the meters in the district are tested once in four years. Any company who have not adopted this system should at once take the matter in hand; the advantages would be directly shown by the improved state of the balance-sheet.

Can nothing be done to encourage the day consumption of gas? It is a fact that a very costly proportion of gas companies' plant is lying almost unproductive for the greater part of the 24 hours. The retort-house, engines, scrubbers, and purifiers are, as a rule, at work and earning dividend for the whole of the 24 hours of the day, but the mains and distributing plant are almost unproductive for at least 16 out of the 24 hours. How this can be remedied is worth our serious attention. Gas-engines are daily increasing in number, and as a source of motive power—from the one-man power of the "Bisschop" engine, to the 4 or 6 horse power of the "Otto" engine—I have no hesitation in saying it is the best, cheapest, and cleanest of any motive power yet brought before the public. The only objection I have heard is the cost price of the engine itself, and to look at the machine it does not appear that the objection is groundless; but improvements and alterations are sure to be made, and a little competition in the manufacture of these articles would soon regulate the price. I have no doubt the gas-engine will be one of the means of increasing the demand for gas in the daytime. We also look to cooking and heating apparatus to help us in this matter. The manufacturers of gas-cooking stoves and ranges are bringing their wares before the public notice; but although there is a gradual increase in the demand for gas for cooking purposes, there is still room for improvements in the gas-cooking apparatus. As far as I am aware, a good, reliable, and economical heating stove, which we could conscientiously recommend to the public, has not yet been invented. There are many useful and handy stoves and fires in use, but they are far from being economical, and until something better than we now have is brought out, we cannot trust to heating stoves for a constant day consumption of gas. I should be pleased if some member of this Association, who has had experience in the matter, would give us a paper on the advantage of letting or hiring out gas-cooking apparatus.

There is another direction in which we may look for an increased demand for gas, although it will not much affect the day consumption. I allude to small cottage property, or weekly tenements. There is a difficulty in supplying this class of consumers, but the difficulty is principally connected with the office. If some scheme were devised for weekly or fortnightly inspection of meters and collecting the accounts, both for the gas consumed and the cost or rent of the necessary fittings, we should find a very large demand for gas in this direction.

Though I have endeavoured to point out the various improvements that have been made in the manufacture and distribution of gas, you must not think we are now perfect. Though much has been done, there is still more to do; and if the much-abused gas companies are to hold their own, and keep the advantage they now possess, as the purveyors of the best and cheapest artificial light, our motto must be "Onward," and our watchword "Improvement."

Coming back to the object of this Association—namely, the advancement of the science of the manufacture and distribution of coal gas—that an Association of this description was required is proved by the patronage and support we have received, for though we are but commencing the sixth session of the Association, we now have 65 members, and amongst our numbers are the most distinguished men of our profession. The Association first held its meetings at the Bedford Hotel, but in consequence of the increased number of members we removed, for better accommodation, to the Guildhall Tavern. During the past year we admitted six new members, and had three papers read and discussed—namely, Mr. Gandon's paper, on "Condensation;" Mr. Wilson's paper, on "Hislop's Method of Restoring Spent Lime;" and Mr. Goddard's paper, on the "Manufacture of Sulphate of Ammonia." Those of you who had the pleasure of hearing these papers read, and the discussions that followed, will, I think, agree with me that they were some of the best papers we have had before us.

There is another direction in which I consider this Association could be made useful, and it is in a way that, I think, has never been followed by any Association of this description—namely, to assist its members in inquiring into and perfecting any scheme or invention of merit that is likely to be of use in improving and perfecting the manufacture and distribution of coal gas. Such assistance should be either scientific, mechanical, or pecuniary, as may be rendered necessary by the circumstances of the case. Meritorious inventions are often lost to the public for lack of this assistance, or in consequence of the inventor being unable to perfect them, either on account of his time being fully occupied by his daily duties, or from other circumstances. If you, gentlemen, think this would be advisable, I have no doubt the Committee of this Association will be prepared to discuss the matter, and bring something tangible before you.

To the younger members I should like to say, in learning your profession do not be afraid to commence at the commencement, and take the several departments in their turn. The practical experience you will gain by so doing will be of more use to you than any knowledge you obtain in any other direction; and although it will not always be pleasant, bear in mind the best and most qualified members of our profession are the most practical men.

Gentlemen, in this address I have endeavoured to keep away from figures and calculations as far as possible, knowing that both are very often misleading by not being used in the same vein of thought as the writer's. I thank you for your patient hearing, and trust that you have

not been wearied by the length of the address, and also that you will pardon its imperfections.

Mr. A. H. Wood (Hastings) said he believed it was usual to propose a vote of thanks to the President for his address, and he was sure the members could never have had greater pleasure in doing so than on the present occasion. The remarks made by the President, and the way in which he had gone through the entire field of gas matters, especially in connection with their own Association, had been most satisfactory and encouraging. He had very great pleasure, therefore, in proposing a vote of thanks to the President for the very able address he had given.

Mr. GEORGE LIVESSEY, in seconding the motion, said he did not put himself forward with the object of shutting out any other members, but simply because the President had been known to him for a longer period than to any one else in the room. They were boys together, and their acquaintance and friendship dated back 30 or 40 years at least. He had, therefore, much pleasure in seconding the resolution, and saying that he had listened with the greatest attention and interest to the admirable address Mr. Broadberry had given, and he thoroughly appreciated its sentiments. He was quite sure that, although he said it was not his *forte* to write essays and addresses—and he could quite understand that he said it in all sincerity and truth—they might nevertheless be allowed to form a different opinion. It sometimes happened with regard to those who thought themselves very clever or otherwise, that others did not coincide with the view; but, at any rate, he could assure the President that his modesty was appreciated, and that they were all highly gratified with the admirable address he had given.

The resolution was put by Mr. Wood, and carried unanimously.

The President, in acknowledging the compliment, said he could assure the members that he felt now what he had said at the commencement of his address. He was not much used to public speaking, but he had endeavoured to do so sometimes, and he then generally found that his ideas ran along faster than his words; so that what with trying to catch the last thought and explaining the present one, he at times felt in the difficult position of not being able to say exactly what he wanted. He had known Mr. Livesey since they were both six or seven years of age, and he always felt very proud of his friendship.

This concluded the business of the meeting.

The members and friends of the Association, to the number of about 50, afterwards dined together—the President (Mr. W. H. Broadberry) in the chair. The Vice-Chair, in the unavoidable absence of the Ex-President (Mr. J. Hunter) was occupied by Mr. J. Eldridge. Dinner over, the list of toasts commenced with "The Queen and the Royal Family," given by the President, who replied to the second toast, of "Success to the Southern District Association of Gas Engineers and Managers," proposed by Mr. Corbet Woodall. The third toast—the "Past Presidents of the Association" was entrusted to Mr. C. Gandon, and responded to by Mr. Eldridge. The toast of "The British Association of Gas Managers," proposed by the President, was acknowledged by Mr. W. H. Bennett; after which Mr. George Livesey, recalling his early friendship with the President—and how both of them had become total abstainers at the same time, about thirty years ago—wished him long life and prosperity, a wish cordially endorsed by all present. "The Committee" was proposed as a toast by Mr. A. F. Phillips, and responded to by Mr. C. E. Botley; "The Secretary," proposed by Mr. W. A. Valon, and responded to by Mr. J. L. Chapman; "The Visitors," proposed by Mr. John Chapman, and responded to by Mr. Morfon; while the toast of "The Press" was entrusted to Mr. D. F. Goddard. Altogether a very pleasant evening was spent.

SOCIETY OF ENGINEERS.

The First Ordinary Meeting of this Society for the present year was held on Monday, the 7th inst., in the Society's Hall, Victoria Street, Westminster. The statement of accounts for 1880 was read, after which the President for 1880 (Mr. Joseph Bernays) presented the premiums of books awarded for papers read during last session.

Mr. CHARLES HORSLEY (the President for 1881) then delivered his inaugural address. After thanking the members for electing him to the chair, he reviewed the proceedings of the Society for the past year, noticing and commenting upon the various papers read during the session, and the visits made during the vacation. The general position of the Society, he observed, was very satisfactory; a considerable number of members having been elected during the past year, and the accounts which had been read showing a good balance in hand, and indicating generally a healthy condition of the Society's affairs. Turning to matters of more general interest, he reviewed the progress of electric lighting, briefly describing the various systems that stood foremost in practice, and pointing out their advantages. He referred to the development of gas illumination, which had been greatly improved since the introduction of electric lighting in our streets, the two leading systems of advanced public illumination being those of Sugg and Bray. He then described Pintsch's system of railway carriage lighting as working on most Continental railways and on many of our own. He afterwards noted the progress made in compressed air engines, as evidenced by the Beaumont system; finally describing Mr. Bower's process of preserving iron from rust, and the photophone, which latter, he observed, would in all probability, in course of time, be developed from a beautiful scientific toy into a useful practical instrument.

The address, which was very interesting, was attentively listened to by an appreciative audience, and at its close a hearty vote of thanks was accorded to the President.

MR. SCOTT-MONCRIEFF'S SYSTEM OF CARBONIZATION.

Referring to the letter from Mr. J. A. C. Hay, of the Royal Arsenal, Woolwich, which we published last week (p. 227), Mr. W. D. Scott-Moncrieff has addressed the following letter to the Society of Arts:—

"In the second sentence of Mr. J. A. C. Hay's letter, he says, 'I beg to be allowed to refute the statements in his (Mr. Scott-Moncrieff's) paper, in so far as they relate to the Royal Arsenal or any other of the Government gas-works.' He then proceeds to confirm my statement in every detail and particular. I alleged that, when in difficulties, the Manager of the gas-works at Woolwich Arsenal had used a short extraction. Mr. Hay confirms this statement. I alleged that the fuel resulting was superior. Mr. Hay confirms this by stating that the coal they used was volatile cannel, and that on a long extraction 'it contained very little heating properties, and was not used under the retorts.' Does Mr. Hay mean to say the fuel was worse under a short extraction than a long one? If so, he contradicts the statement made to me by Mr. Wallace, who said it was much better. Does Mr. Hay mean to deny that the best gas comes off during the first two or three hours? Does he deny that it comes off most rapidly during that period? In short, does Mr. Hay deny what he himself confirms, by his having 'occasionally,' and 'in order to meet a few exceptional emergencies,' adopted the scheme which I advocated in my paper? He speaks of the plan having been 'found to be very expensive and uneconomical;' but if

Mr. Hay did not carry it out with sufficient intelligence, this is hardly to be wondered at.

"With regard to Mr. Hay's postscript, as to whether Mr. Wallace did or did not supply me with the facts, this is a matter of personal veracity. I certainly understood him to state the facts precisely as I stated them in my paper, excluding any conclusions which I drew from them. This impression is confirmed by Mr. Hay's version of what has been going on at the Arsenal. I was quite unaware of any official relations between Mr. Wallace and Mr. Hay; nor, indeed, am I now aware what these relations are."

THE PURIFICATION OF GAS FROM SULPHUR COMPOUNDS.

At the Twenty-eighth Annual Meeting, held last month, of the London Association of Foremen Engineers and Draughtsmen, the President (Mr. Joseph Newton, C.E.), in the course of his annual address, said: When I tell you that it is 22 years ago since I first delivered an address to the members of this Association, and that during the intervening period I have only once omitted to address my fellow-members at the first meeting of each year, the difficulty I find now in saying anything that is new will be understood. In point of fact, it seems impossible for me to do so. It is a common observation—made alike by young and old—that time now "makes unto itself wings and flies away" with much more rapidity than it seemed to do in days of yore. Since the development of the railway system, and the practical applications of electricity, indeed, the very intellect of civilized humanity seems to have been quickened, and thought itself to move faster. What the next 22 years may do for mankind it is not easy to foresee, and it would be madness for me to attempt to predict.

Then, after noticing the progress of the Society during the past twelve months, and the deaths of members in the same period, he passed on to general topics—scientific matters outside the range of the Association. Concerning these he had not much to say, just mentioning the telephone, microphone, and photophone; while as to the electric light he remarked: Of the electric light something ought to be said, but I must leave it to those who know more of it than myself, and shall simply offer some thoughts upon its rival, gas. These were as follows:—

Perhaps no other industry in the country is so much restricted, and, as it were, hedged in by Acts of Parliament and local enactments, as the manufacture of gas. This results from the fact that the great gas companies were at their first establishment, and practically are now, giant monopolists, and have to be gagged in order to prevent them swallowing up too much of the wealth of the community.

Perhaps the most important and certainly the most stringent regulation in respect of the manufacture and supply of gas refers to its purity—or rather to the absence from it of certain impurities. Foremost among these stand various sulphur compounds. These are grouped into two classes—namely, sulphuretted hydrogen; and sulphur compounds, the nature of which can scarcely be defined exactly. The best known of these latter is termed carbon bisulphide.

Now the companies seem to have no difficulty in eliminating the sulphuretted hydrogen, and as a matter of fact they are bound under heavy penalties to supply gas free from it. Far otherwise is it with the carbon bisulphides, of which the gas, on leaving the retorts, is usually charged with from 50 to 80 grains per 100 cubic feet, the legal restrictions being not more than 20 grains to 100 cubic feet. Trifling as the difference may seem, it has been for years, and is at the present time, the cause of enormous expenditure to the gas companies.

Now one main reason that I have for touching this question is to make known to the public and the gas companies that a friend of mine has devised a very simple plan for so purifying gas as to bring it to the minimum degree of impurity defined by the Act of Parliament. Mr. Versmann, a former colleague of my own when in the Royal Mint, after a very long continued series of experiments, seems to me to have solved the problem in a most perfect way. He has, in fact, devised plans for effecting the removal of every trace of sulphur from gas—an achievement, as I have said, which has never previously been accomplished. The apparatus required is by no means costly, and, briefly described, it may be said to consist of a series of pipes set in a furnace and moderately heated. Within the pipes through which the gas is made to pass are placed certain materials—known at this moment only to Mr. Versmann, but which are abundant and cheap; and which, when moderately heated, readily decompose the carbon bisulphide into sulphuretted hydrogen, which latter may then be removed in the ordinary way.

The materials employed for effecting this decomposition may remain for a long period in the pipes before becoming inoperative, and really the chief expense of the process consists in the renewal of the cast-iron pipes themselves, which, after a time, are destroyed by the fire's action. Mr. Versmann, who has thoroughly mastered the whole economy of gas production and purification, calculates that by the adoption of his plans the whole of the gas supply of the Metropolis may be purified to a far greater extent than is the case at present, at an annual cost of £10,000, instead of £100,000, which is, in round numbers, the expense of the existing imperfect system of gas purification.

It will be readily understood that this is a gas consumer's, as well as a gas producer's question, because, whilst the quality of the article supplied would be greatly enhanced, its cost would be sensibly diminished. Nor must it be forgotten that in London the consumption of gas doubles itself during every 10 years—or, at least, it has hitherto done so. In my own opinion this will be the case in future, the electric light notwithstanding, for the employment of gas-engines is steadily on the increase, and the use of gas for cooking and heating purposes, as well as for that of illumination, is hourly extending.

I make no apology for introducing this subject on the present occasion, for it is one of great scientific as well as public interest, and as such I commend it to the consideration of the great Gas Companies of the Metropolis, and of their respective highly-talented Engineers.

After a few further remarks, in regard to colliery accidents, &c., Mr. Newton bade the members farewell, and retired from the office of President of the Association.

KILDWICK PARISH GAS COMPANY.—The Directors of this Company, in their report for the past half year, state that the total receipts on capital account, including £28,500 received in calls on 8000 shares, were £28,798 6s. 4d. Disbursements, including the sum of £14,959 12s. 7d. spent on buildings, apparatus, &c., and £2919 12s. 10d. for land and law charges, amounted in the total to £28,450 18s. 6d., thus leaving a balance in hand on capital account of £347 7s. 10d. During the six months £149 11s. 1d. was expended on new buildings, &c., £221 18s. 4d. on new mains and service-pipes, and £71 6s. 2d. on new meters. The revenue account showed payments for gas manufacture, £319 6s. 1d.; management, £86 3s.; rates, taxes, discounts, &c., £81 4s.; leaving a balance of £598 2s. 11d. Gas and meter rents realized £879 7s., and residual products £195 19s. 11d. The balance available for dividend is £481 4s., as against £374 15s. the previous half year. The Directors propose to pay an interim dividend at the rate of 2½ per cent., which will absorb the sum of £347 16s. 9d.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The inclemency of the weather which we are now, and have been for some time past experiencing has compelled many a hard-working, honest man to sink a highly commendable pride, and if not to ask, at least to accept charity to save himself and his family from starvation. Now the component parts of companies are individuals, and if, therefore, we find the aggregate in the unhappy position of the unfortunate individual alluded to, it ought not, perhaps, to excite surprise, but the rarity of such an occurrence is deserving of a passing notice. Fortrose is an ancient burgh situated on the shores of the Moray Firth. Its charters date back to the thirteenth century, and it boasts of many privileges conferred by the Alexanders and earlier Jameses who ruled Scotland. Amongst the civilizing influences which are to be found at Fortrose is a Gas Company; but as the inhabitants do not number over 1400, and as the means of conveyance to the town are limited, it has been found necessary to sell the gas at 14s. per 1000 cubic feet. Even at such a high figure the Company are far from prosperous; indeed, they have been getting into very troublesome waters, and in order to afford relief to some extent a proposal has been made, and, according to all accounts, it will soon be carried into effect, to give a concert, the proceeds of which are intended for the benefit of the Company. It is certainly to be hoped that the efforts of the ladies and gentlemen who have volunteered their services for such a worthy duty will have a siren-like effect upon the Company's creditors.

Some time ago I mentioned that the Jedburgh Gas Company had resolved upon making alterations in their plant, so as to enable them to meet the increasing demand for gas in that town. These alterations were estimated to cost somewhere about £1500, and to cover this expenditure the Company agreed to issue a number of £6 shares. The Directors had a meeting last Monday, when the gratifying news was communicated that the shares had all been taken up. There will not, therefore, be any delay in proceeding with what practically amounts to a reconstruction of a considerable portion of the works.

The Gas Corporation of Arbroath met on Monday, when formal intimation was given by Mr. David Terrace of his resignation as Manager of the works. In the letter conveying this intelligence, Mr. Terrace expressed his thanks to the members of the Corporation for the uniform courtesy he had received from them during his tenure of office. The Provost adverted to the regret they would all feel at losing the services of Mr. Terrace, to whose ability as a Gas Engineer he paid, he said, a high tribute. Under his superintendence the works had grown into a high state of efficiency; and in parting with their Manager he was sure they would cordially wish him prosperity in his new sphere of labour. It was agreed to record in the minutes of the Commission the high estimation in which the Corporation held Mr. Terrace. A discussion subsequently took place with respect to combining the offices of Manager and Treasurer, in the course of which the Provost said that in looking out for a successor to Mr. Terrace it would be important that one capable of undertaking both offices should be appointed, and he deprecated any reduction of the salary, as he held it was impossible to get a good man for low wages. Thereupon Bailie Keith moved, and it was seconded by Mr. J. Cargill, that the salary be £200—£170 as Gas Manager and £30 as Treasurer. Two separate amendments were moved, the effect of the first of which was to reduce the salary for the conjoint offices to £150, and of the second to £170; but the motion of Bailie Keith was carried by 8 to 4 votes as against the first amendment, and by 8 to 2 votes as against the second. Some of the Forfarshire people seem to have strange ideas as to what is really a proper salary for a gas manager, and also as to the best method of economizing the public funds.

The Swan system of lighting by electricity had a fair trial at Dundee on Wednesday night. The occasion was a *conversazione* given by the Dundee Naturalists' Society, and if I am to draw any conclusion from the rosette accounts which appear in the daily papers, it can only be that the trial has been more than usually successful. If the electric light is ever to gain a position among the practical illuminants of the day, such a result will be due to scientific men like Mr. Swan, of Newcastle-on-Tyne, who patiently tread the, as yet, imperfectly explored, and imperfectly understood ways of the subtle current which they are called upon to induce, control, and utilize, and whose success in any of the various departments now embraced in electrical research is not heralded abroad as the greatest achievement of the day. In Scotland few opportunities have been given to the public of seeing and judging for themselves as between the two modes of lighting, and in any such competition that may have taken place the means of proper comparison are not placed within their reach. On the one hand, we have still the old-fashioned lamp, and the quite as antiquated burner; or, if improved lamps are exhibited, it is discovered at the last moment that the motive power for the generator is deficient, or that through some cause, not easily accounted for, something essential to the proper working of the apparatus has been forgotten. Even in the case to which I am referring excuses are found. The writer of the notice in a local paper says: "The mellowness of the light, combined with the great brilliancy, gave the [picture] gallery a lovely aspect. The pictures were seen almost as well as in daylight. The machine from which the electricity was derived was not the most suited for the lamps, and it had been fitted in a rough-and-ready fashion. Otherwise the new invention would have been seen to better advantage." If the pictures were seen "almost as well as in daylight," how could "the invention have been seen to better advantage," even supposing instead of rough-and-ready, there had been the utmost finish? Unless electricians strive now to rival the sun in his brilliant splendour, I fail to comprehend how any improvement could have led to better results than those which have been indicated. But it is in this way that misleading notions are conveyed to outsiders as to the respective merits of gas and electricity. Mr. Swan deserves the utmost credit for the lamp which he has produced. It is in some respects superior to several others I could mention, if comparisons were not odious; but in saying this I have stated the most that can be said in its favour. On the occasion in question seven lamps were in operation. Each lamp had a connecting switch, and it was shown that the light could be turned on and off at pleasure. Mr. Frank Young, the Secretary of the Society, gave a short lecture descriptive of electric lighting, and at the close of the proceedings a vote of thanks was accorded to Mr. Swan for placing the lamps at the disposal of the Society, and for sending men to secure their proper arrangement.

The Benhar Coal Company, which for the past two or three years has been worked under great disadvantages, and which, if the times had been more favourable, would unquestionably have been a profitable concern, has gone into voluntary liquidation. Last week their lordships of the First Division of the Court of Session were moved, on behalf of the liquidators, for sanction to continue the business and renew contracts. It was stated for the liquidators that it would be for the benefit of all concerned if the business could be carried on. Contracts with gas companies and others are still on hand, which are alleged to be valuable and remunerative. The approximate amount of the Company's liabilities is £240,000; but against these there fall to be placed valuable assets in the shape of land, waggons, machinery, and heritable property. The motion was opposed by a

Mr. Gray's trustees, who were afraid, if powers were given as asked, that they would lose their right of hypothec. Mr. Gray leased a mineral field from Lord Deas, and afterwards sub-leased it to the Benhar Company. The trustees of Mr. Gray are held liable in the rent by Lord Deas, and yet they are unable to recover their money from the Company, and in this respect their case is a hard one. The Court ultimately authorized the liquidators to carry on the business, to continue existing contracts, and to make application to the Court in the event of new contracts arising. This power is given with a view to the speedy and advantageous winding up of the concern. In the event of any change of circumstances, creditors and contributories have leave to move the Court.

On Friday of last week a serious explosion of gas occurred in the United Presbyterian Church at Dysart. There had evidently been an escape of gas during the day, and the church officer, preparing to light up for the evening meeting, struck a match. An explosion instantaneously resulted, which did great damage to the structure, and badly injured the officer.

The Kirkwall Police Commissioners have resolved to make application to the Public Works Loan Commissioners for an additional loan of £2000 to complete their water and drainage system.

After many negotiations and local wranglings, the Stirling Water Bill is not to receive that opposition which the inhabitants of St. Ninian's had promised it. The Committee representing the inhabitants of the above district have now agreed to pay 3d. per £1 for 50 years as a contributory rate over and above the Stirling water-rate, and the Commissioners have consented to insert a clause in the Bill extending the compulsory water area to the boundaries of the parliamentary burgh, exclusive of Stirling Castle.

The dispute between the Local Authorities of Barry and Panbride as to the supply of water for Carnoustie is apparently drawing to a close. The Dundee Water Commissioners have, in reply to requisitions, stated that in the meantime they are prepared to supply water at 1s. 3½d. per £1, and that power shall be taken, in the first Bill promoted by the Commissioners to include Carnoustie in the Dundee water district. This seems a far more reasonable solution of the difficulty than that two Parochial Boards should saddle their respective constituents with a water-rate, and with practically two water schemes for the one village.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

It seems that, for the present at all events, the Glasgow Police Committee on Watching and Lighting have resolved not to undertake any experiments with the view of employing the electric light for the illumination of George Square, so that the negotiations are "off" that were pending with Messrs. R. E. Crompton and Co., who have electric lighting arrangements close by the square—namely, at the General Post Office and at Queen Street Railway Station. Mr. Hamilton, the Superintendent of the Lighting Department, has received instructions to proceed with experiments to demonstrate the possibility of greatly improving the gas lighting arrangements of the square at a much less cost than the charge which it was proposed by Messrs. Crompton and Co. to make for lighting it by electricity. Mr. Hamilton is at present bringing out some very greatly improved forms of street lanterns with a combination of flat-flame burners. I shall report progress from time to time as to this street lighting question, which is at present exciting a good deal of attention in this city, the lighting department of which is certainly being vigorously stimulated by the energetic action of the electric light people.

Having mentioned the electric light, I am reminded of the fact that the Directors of our Royal Botanic Gardens are considering the propriety of having electric lamps erected in the Kibble Palace, a very spacious iron and glass conservatory within their grounds, the desire being to render the conservatory available as a promenade for the subscribers and the public during the winter evenings. Hitherto this Kibble Palace has been a sort of "white elephant" to the Directors. There is likewise a bit more news with regard to the electric light in Glasgow. In addition to the electric lamp which has been in use for several weeks in front of the new buildings of the *Glasgow Herald*, others have now been brought into use in the spacious office occupied as the publishing and advertising departments, and in the composing-room on the topmost storey. I think I formerly mentioned that the driving power is obtained from an "Otto" gas-engine. It is also worthy of mention that the new goods shed which has just been erected at Queen Street Station is to be experimentally lighted up early next week with Mr. Swan's incandescent electric lamps, by Messrs. Crompton and Co., whose arc-lamps, three in number, are in constant use in the new passenger station, the Bray gas-lamps in which are still upon the "retired list" of useful appliances; though perhaps it should rather be said that they belong to the "reserve forces."

The annual meeting of the Kilmacolm Gas Company was held last Monday—Mr. Bryan presiding. From the printed balance-sheet it was shown that the amount at the credit of the profit and loss account was £295 12s., and the Directors, according to a previous minute, had agreed to recommend to the meeting that a dividend at the rate of 6 per cent. should be declared, and that the sum of £100 should be carried to the reserve account. The report was adopted, and Messrs. John Barr and Thomas S. Thoms were re-elected Directors.

A meeting of the Directors of the Coatbridge Gas Company was held last Monday, when it was resolved to recommend to the Shareholders the payment of a dividend for the half year, ending the 21st of December, of 11 per cent. upon the old stock, and 7½ per cent. on the new.

A hitch has occurred between the Directors of the Grahamston Gas Company and the Police Commissioners of Falkirk, in reference to a question of liability. It seems that some gas-pipes within the burgh of Falkirk had been exposed and placed in danger through the operations of the contractors for the drainage scheme now in progress in the town. As the Company had laid the pipes at their own risk, it was the unanimous opinion of the Commissioners that they were not in any way responsible for the damage that might result to the pipes.

There is also something like a hitch between the Gas Company and the Police Commissioners of Bathgate, the difficulty in this instance being the amount that should be charged per annum for supplying gas to the street lamps. It seems that the Company will not take anything less than £2 10s. a year per lamp, or about 1½d. per night. One of the Commissioners offered consolation to his colleagues by saying that if they had not an agreement with the Company, they could not help themselves. The Lighting Committee, however, have been instructed to treat further with the Company on the subject.

The Stevenston Parochial Board have resolved, on the recommendation of Mr. Gale, C.E., Glasgow, to obtain an analysis of the water of Ashgrove Loch, about two miles from Stevenston, and, if found satisfactory, to obtain afterwards a proper engineering survey and report regarding the Loch, and also regarding any other available source of supply in the district. The Ardrossan Parochial Board have declined to co-operate.

It was reported to the Police Commissioners of Helensburgh, at a meeting held on Saturday, the 5th inst., that on account of the frosty weather during January, and consumers having allowed their pipes to get frozen up, the consumption had been increased to 17 million gallons during the month.

At a meeting of the Police Commissioners of Newton-Stewart, held on Wednesday last, Mr. W. R. Copland, C.E., Glasgow, was selected to make a preliminary survey of the district, with a view to supply the town with a water scheme by gravitation. There were seven applicants for the appointment.

Dulness has been the rule in the Glasgow pig iron warrant market during the week, and a very large amount of business has been done daily at gradually receding prices, the market closing quietly about the lowest—sellers at 50s. 2d. cash, and buyers at 50s. 1½d. Holders have been selling out very freely, as the spring anticipations of the year as yet show very little sign of being realized. America continues to be almost a blank so far as Scotch iron is concerned. Makers have again reduced their prices, but the concession has not had the desired effect in the way of bringing out buyers.

Coals are firmer in price, and wages have in some instances been advanced.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been very little material change in the position of affairs throughout the Lancashire colliery districts during the past week. The pits owned by the principal Manchester firms have all been practically stopped, and the strike has continued all through the West Lancashire districts, with the exception of a small pit here and there, where the men have gone in on condition that they will obtain an advance of wages if it is given at other collieries. In the Tyldesley and Atherton districts work has been resumed, although only partially; but in the Ashton and Oldham districts the pits are now fully at work, and arrangements are being made for an arbitration to decide whether the men are entitled to a further advance in wages. So far as the districts on strike are concerned, there is no definite indication at present of an early termination of the dispute. The belief seems, however, to be generally entertained that the struggle cannot be of much longer duration, and there is certainly a strong desire on the part of a large number of the men to return to work.

Supplies of round coal are coming in freely from outside districts, but for these prices rule high, in consequence of the extra railway rates which have to be paid for bringing them over long distances, and there are no actually fixed quotations in the market. Gas-works continue mainly dependent for supplies upon the Yorkshire and other neighbouring coal-fields, and consumers who are not covered by contracts outside of Lancashire are having to pay prices considerably in excess of previous rates, ordinary gas coals delivered into this district fetching as much as 15s. per ton at the works. Engine classes of fuel are scarce, and for burgy and slack delivered to works the prices average from 10s. 6d. to 12s. 6d. per ton, the margin between these classes of fuel and round coal being now so small that manufacturers are in many cases using the latter for steam purposes.

The iron market continues very quiet, and there is an unsettled feeling so far as the price for the raw material is concerned. Local makers of pig iron, however, are not pressing sales, and their quotations for delivery into the Manchester district remain at 46s. 6d. to 47s. 6d. per ton, less 2½ per cent. Finished iron is fairly steady, and bars delivered into the Manchester district are being sold at about £6 per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The steady and progressive tone of the coal trade reported to exist in the district for the past few weeks still continues. Prices also are firm, and have an upward tendency. The demand for household qualities is, if anything, keener than it has been for a long time past. A good tonnage is now being raised at all the deep collieries for the London and other principal markets, and as coals are in good request the holders of contracts made three months ago have much the best of the market. The call for manufacturing fuel is well sustained, and consumers experience a firmer tendency in rates generally. Most of the pits are now fully employed, and the district possesses a more lively and active appearance than has been witnessed for some time past. With a further improvement in the local iron trade, it is generally admitted that the existing vigorous state of the coal trade will show an increased tendency.

The nature of the iron trade business is considered healthy. Markets are steady, with an upward tendency, and increased activity is reported. Finished iron makers are holding out for an additional 2s. 6d. and 5s. per ton on new contract orders. Though the call for best branded bars is scarcely improving, the transactions in unbranded qualities are of a more extensive character. Sheets, too, are somewhat eagerly sought after, from the prevalent impression that the market will see a further advance in prices. Sheets of all classes are, in fact, selling better, and the consumption is evidently improved, both on account of the home and the export trade. Hoop, strip, and tube-making iron, as also girder-plates, angles, and tees, are in larger request. The pig trade is promising, as makers are fairly well stocked with orders, and decline to accept additional lines at old rates. A further increase in smelting capabilities by the increase of furnaces in several parts of the district is to be reported. All-mine hot-air qualities are very firm, prices being somewhat higher than those of a week ago. Old figures are only accepted in a few cases; part-mine and cinder pigs are hardly so saleable, but for foundry purposes there is a very good look-out. The stoppage of two or three furnaces is to be regretted, those in particular of a Dudley smelter and colliery proprietor, whose estimated liabilities are very considerable.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week the tone of the house coal trade has grown quieter, and prices have assumed their ordinary level. There is, however, a good tonnage sent from the Yorkshire collieries to London, and seeing that about 7000 men and boys are idle, the pits at work are doing a good business. Transactions with the Eastern Counties, as well as with Lincolnshire, are active, whilst from West Yorkshire there is a very fair tonnage sent to the North Ridge.

The steam coal trade has of late been rather flat, so far as exportation is concerned, and had it not been for the dispute in Lancashire, business would have been very quiet indeed. For about a fortnight the Humber ports were almost closed, and the returns of the quantity sent to Hull during the month of January show a falling-off of over 28,000 tons, when compared with what was conveyed in the last month of 1880. Many of the Yorkshire collieries did not send any coal at all to Hull during the month, on account of the frozen state of the Humber and the canals. The position of affairs will be seen when it is stated that the difference in the tonnage by water in December over the month of January was 28,712 tons. Prices of steam coal, now that the strike in Lancashire is dying out, are receding.

The position of the gas coal trade is a pretty fair one, the output being something like an average one. The Hoyland Silkstone, and the Thorncliffe owners, who produce large quantities of gas coal weekly, have made terms with their men, and are working on; but Church Lane and some

other collieries which raise gas coal are now idle. There is, however, a good tonnage sent to various parts of the Eastern Counties, as well as into Nottinghamshire and other places.

Both the South and West Riding collieries have done a good business in manufactured fuel during the disturbed state of affairs in Lancashire, but both the demand and prices are subsiding. Those collieries which have coke ovens attached to their plant are, however, much better off than firms who have to depend on the market for sales. A very large consumption of slack and small coal is taking place for coke-making purposes, and although several large collieries are standing, supplies of fuel are being received from the West and South Yorkshire collieries. The demand for North Lincolnshire is well sustained, and forward supplies of coke have been booked at late rates.

The labour market in South Yorkshire is in a very unsatisfactory state, there being something like 7000 miners idle, whilst several large collieries, including Carlton Main, New Oaks, Edmund's Main, and Swarthe Main, are under notice, which expires in 14 and 28 days. At the Lundhill Colliery notices were printed on Friday to be given yesterday (Monday). The collieries already out, up to Friday, were increased by those belonging to the Trafford Collieries Company.

A conference of South Yorkshire coalowners and representatives of the three associations and the district lodges was held last Friday at the Victoria Hotel, Sheffield, for the purpose of endeavouring to establish a sliding scale. Mr. Wilson, Managing Director of Messrs. Cammell and Co., Limited, owners of the Oaks Collieries, presided, and Mr. Frith, Secretary of the South Yorkshire Miners Association; Mr. Chappell, Secretary of the Sheffield and Rotherham district; and Mr. P. Casey, head of the Re-modelled Association, with deputations, attended. The owners offered a sliding scale, based on the prices of coal sold during any six months of 1879 or 1880; but this was opposed by Mr. Frith, on the ground that the men ought first to have an advance of wages. Mr. Chappell was in favour of a sliding scale on the bases fixed at Manvers Main. The owners declared that the prices of coal did not justify an advance, and after a discussion extending over nearly three hours and a half, the meeting was adjourned for the miners leaders to lay the matter before the whole of the lodges in the district, and a reply is to be given on Thursday next.

The demand for pig iron holds well up, and all the available furnaces are kept in blast. Stocks are much sought. Considering the general state of trade, very little local ironstone is being raised, and the bulk of what enters the district is received from the Frodingham district of North Lincolnshire. The majority of the foundries are not at all well off for orders, and with the exception of slack washing and crushing machinery, and gas apparatus and castings, moulders and kindred workmen are not over well employed. The works devoted to the make of Bessemer steel rails, tires, and axles, are fairly off for orders.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

In consequence of the weather having been more favourable during the past week, I am pleased to be able to note that the trade at Cardiff presents a more healthy appearance. The collieries have had plenty to do, but shippers have not been so much hampered by irregular supplies, and business has been firm, without any undue excitement in regard to prices. The severe frost, occurring at so pressing a time, had caused the upward movement to be more strongly marked than ever; now, however, it can scarcely be said that the demand is so great. At the same time all the large houses are full up with tonnage, and for many descriptions of coal stemming means the concession of long days or hours. Patent fuel is in active request, prices ranging at from 10s. to 10s. 6d. per ton; house coal likewise sustains the previous good demand. The clearances during the past week were as follows:—In coal, 115,407 tons; in iron, 3050 tons, and in patent fuel, 1150 tons. It is a matter for satisfaction that, jointly with the spurt in the coal trade at Newport, iron and steel retain their firmness and an improvement is also noticeable in the tin-plate branches. With all our prominent industries in a healthy condition of activity, it may, indeed, be felt that the hopes of a gradually increasing prosperity will not be misplaced. The following are the shipments for the week:—Coal, 20,507 tons; iron, 2350 tons.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

There have been considerable difficulties on land and sea to surmount over the past three weeks in carrying on the gas coal trade from the Tyne, Wear, and other northern coal ports, to the Thames and South of England and to the Continent. In such weather ten or fifteen years ago there would probably have been a coal famine; but, all things considered, there has been marvellous little stoppage, and the coals got away from the Tyne to the gas-works have not been far short of an average. The contracts have been completed for the next twelve months. There has been an advance in price for very best qualities, but except in rare instances it does not exceed 3d. per ton. The iron trade has not maintained the improvement anticipated with the incoming of the year, and second-class coals therefore keep in moderate request. The coke manufacturers also have failed so far in realizing the advance in the price of that article to the extent they expected from the same cause.

The gas coal chartering of last week is represented—steamers to London, 4s.; Dublin, 6s. 6d.; Southampton and the Channel ports, 5s. 3d. London sailing vessels, 6s.; Waterford, 9s. 9d.; and the Channel ports from 7s. to 7s. 6d.; East coast, 5s. 6d. to 6s. 6d., according to size. Loading turns three days.

WHITWORTH VALE GAS COMPANY.—The Directors of this Company recommend a dividend for the past half year at the rate of 10 per cent. per annum. The gas supplied during the six months realized £2328 1s. 7½d., being an increase of £731 9s. 9½d. over the corresponding period of the preceding year.

REDUCTION IN THE PRICE OF GAS AT KIDDERMINSTER.—The Directors of the Kidderminster Gaslight and Coke Company announce a further reduction of 3d. per 1000 feet in the price of gas, to take effect from the 1st of April next. The prices will be, per 1000 feet, for a quarterly consumption under 50,000 feet, 3s. 4d.; above 50,000 and under 250,000 feet, 3s.; above 250,000 feet, 2s. 10d.

WEARDALE AND SHILDON DISTRICT WATER COMPANY.—The report of the Directors of this Company states that the revenue account (including £314 16s. 1d. brought forward from 1879) shows an available balance of £16,077 12s. 4d., which, after deducting the interim dividend at 3 per cent., paid last August, amounting to £6340, leaves an available balance of £9737 12s. 4d., out of which a dividend (clear of income-tax) at the rate of 4 per cent. per annum, making an average dividend for the year of 9½ per cent. per annum, is to be paid. This will absorb £8686 13s. 4d., leaving a balance of £1050 19s. to be carried to the credit of next year's account. The supply of water to all parts of the Company's district has been maintained without interruption during the whole of the past year. The Directors recommend that the additional capital be divided into 4400

shares of £25 each, entitled to a preferential dividend of 4½ per cent. per annum, until Dec. 31, 1885, and then to become part of the ordinary share capital; and that these new shares be offered to the Shareholders in the proportion of one new share for every four shares now held.

THE GOOLE BILL AND THE WATER SUPPLY OF SNAITH.—At the last meeting of the Goole Rural Sanitary Authority, it was unanimously resolved to apply to the promoters of the Goole and District Gas and Water Bill to insert a clause in the Bill now before Parliament, compelling the Company proposed to be formed to sell, at the water tower erected at Rawcliffe Bridge, as much water as may be required for the townships of Snaith and Cowick at the same price as may be charged at Goole. It is stated to be the intention of the Authority, should the application meet with success, to lay pipes between Rawcliffe and Snaith, this part of the proceedings being at the expense of those townships, which in this way will get an abundant supply of water at a small cost.

SLEAFORD GAS COMPANY.—The annual meeting of this Company was held last Wednesday, when the accounts for the twelve months to Dec. 31, 1880, were presented. The Company's share capital amounts to £11,200; and there are £2000 of debenture bonds, at 4½ per cent. This money has all been expended except £9 6s. 2d. The cost of management for the year, including interest on loans, totalled to £2040 7s. 7d.; the receipts being £2076 11s. 4d. for gas (less discount), and £770 15s. 3d. for fittings and sundries. The balance in hand enabled the Directors to recommend a dividend at the rate of 6½ per cent.—making an average dividend of 6 per cent. for the past four years. It has been resolved to reduce the price of gas from 4s. 7d. to 4s. 2d. per 1000 feet, with the usual discount of 5 per cent. off accounts amounting to £15, and 10 per cent. off those amounting to £30 and upwards per annum. It is hoped that this reduction, coupled with the issue of the pamphlet by Mr. H. Wimhurst, recently noticed in our pages, and the system introduced at Sleaford of letting fittings, &c., on hire, will greatly increase the consumption in the present year. The gas made in 1880 (of an average illuminating power of 17½ candles) was 10,187,000 cubic feet. This was obtained from 1056 tons of coal; thus showing the make per ton to be 9560 feet—though during the last four months of the year the make was 10,376 feet, which is due to the remodelling of the retort-house, and plant generally, under the supervision of Mr. Wimhurst. The loss by leakage is stated to be 7½ per cent.

THE GAS QUESTION IN LINCOLN.—At the meeting of the Lincoln Town Council on Wednesday last—the Mayor (Mr. B. Cannon) in the chair—the subject of the payment of the costs incurred in connection with the Bill promoted by the Corporation for the acquisition of the works of the Lincoln Gas Company, and which failed to receive the sanction of the ratepayers, gave rise to a long and rather warm discussion. The matter was brought forward by Mr. Smith, who moved that the expenses incurred

in attempting to carry the Bill through Parliament should be paid out of the corporate funds, and not out of the general district rate; and the motion was seconded by Mr. Wyatt, who thought that as the Bill was undertaken by the Corporation, the expenses thereof should be borne by them alone. Mr. Clarke proposed, as an amendment, that the expenses should be divided equally between the corporate funds and the general district rate, and this was seconded by Alderman Glasier, and supported by Mr. Dickinson, who said he did not suppose the ratepayers would shrink from paying their share of the expenses. On a division being taken, Mr. Clarke's amendment was carried by 10 votes to 2. A long conversation then ensued as to the expenses of the poll of the ratepayers, Mr. Smith remarking that, in his opinion, they should come either out of the Corporation funds, or out of the private pockets of those for whom they had been incurred. Mr. Smith's remarks in connection with this matter led to some rather sharp personalities between himself and Mr. Clarke, and eventually the conversation was brought to a close by the Mayor, who had previously expressed the opinion that the expenses referred to should form part and parcel of the entire cost incurred in reference to the Bill.

THE EASTBOURNE LOCAL BOARD AND THE WATER COMPANY'S BILL.—At the meeting of the Eastbourne Local Board on Monday last week—Dr. Jeffery in the chair—a letter was read from Mr. Marsh, Secretary of the Ratepayers' Association, in reference to the Bill of the Eastbourne Water Company, which has been presented to Parliament, asking whether such an occasion would not afford a suitable opportunity for some modification being effected in the present charge for water, and a more reasonable assessment of the water-rate adopted. Mr. Climpson produced statistics to show that the charge at Eastbourne was quite equal to, if not in excess of that in towns of a similar size, and contended that the present incidence of charge was most unfair to lodging-house keepers. He, therefore, urged that some steps should be taken to secure the insertion in the Bill of a clause to enable those who paid above a certain rent to have the option of taking the water. He proposed that a Committee be appointed to confer with the Company, with a view to a reduction being made in their charges, or some equitable arrangements carried out. Mr. Wallis, the Company's Engineer, said he did not see that any good could come of a conference, and a reduction of the rates was practically out of the question. The Chairman thought the Company were not justified in supplying water outside the town. The water under the town was the property of the townspeople, and ought not to be taken away for outsiders. He thought credit was due to Mr. Climpson for having brought so important a subject to the notice of the Board. His object was not one of antagonism to the Company, but to give every ratepayer the greatest possible advantage from the water supply, consistent with a reasonable remuneration to the Company. After considerable discussion on the subject, it was resolved to appoint a Special Committee to deal with the whole question.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Feb. 9, 1881.

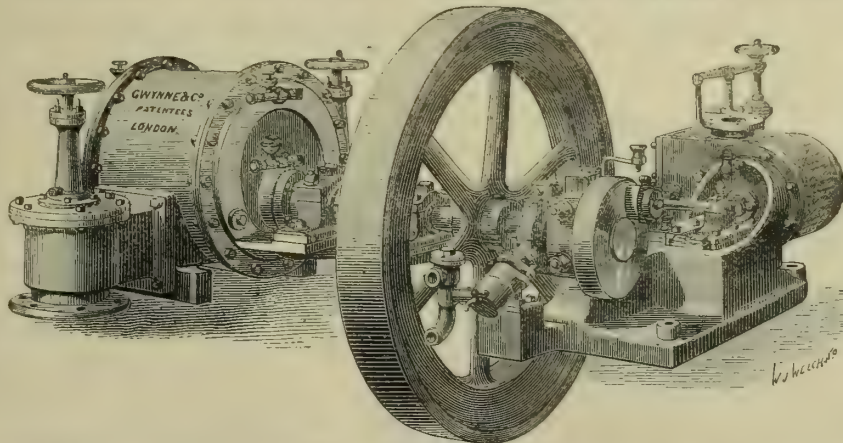
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	18.5	16.7	17.5	Station	closed	for repairs	0.0	0.0	0.0	None.	In excess.
	Camden Town	17.5	16.3	16.9	12.6	11.1	12.0	0.3	0.0	0.0	"	"
	Dalston	17.8	16.9	17.2	12.5	11.1	12.1	0.9	0.5	0.7	"	"
	Bow	17.9	16.6	17.2	16.8	9.7	13.8	0.4	0.0	0.1	"	"
	Chelsea	17.6	16.6	17.2	15.7	13.3	14.9	0.4	0.2	0.3	"	"
	Kingsland Road	21.9	20.9	21.5	16.0	9.5	11.5	0.8	0.4	0.6	"	"
South Metropolitan Gas Company . .	Westminster (cannel gas) . .										"	"
	Peckham	17.4	16.8	17.1	14.3	8.5	12.4	0.4	0.0	0.3	"	"
Commercial Gas Company	Old Ford	17.8	17.2	17.5	19.0	13.1	16.2	0.2	0.0	0.1	"	"
	St. George-in-the-East . . .	18.2	17.2	17.6	11.0	7.7	9.5	0.6	0.0	0.3	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.

Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c.
Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, by a Young and Energetic
Man, aged 30, a Re-engagement as **MANAGER** of Gas or Gas and Water Works. Twelve years' practical experience in every department of the Works, Accounts, and Collecting. Good Draughtsman. Can carry out all Extensions and Alterations. Satisfactory reasons for leaving present situation. Highest testimonials and references.
Address No. 716, care of Mr. King, 11, Bolt Court, **FLEET STREET, E.C.**

WANTED, a Working Gas Manager of
undeniable good character, to attend to the Gas Making and Distribution for the estate and residence of a nobleman. A married man without incumbrance would be preferred.
Address—stating age, salary expected, and full particulars—No. 721, care of Mr. King, 11, Bolt Court, **FLEET STREET, E.C.**

GAS MANAGER AND TREASURER WANTED.

WANTED, by the Arbroath Gas Corporation, a properly qualified person to act as **MANAGER** of their **WORKS** and as their **TREASURER**. He will be required to enter upon his duties on Monday, the 14th of March next, or so soon thereafter as may be arranged. Salary £200 per annum, with free house, coals, gas, and taxes.
Further particulars may be obtained on application to **DAVID CHAPPEL, Solicitor, Arbroath,** Clerk to the Corporation, with whom applications and testimonials are to be lodged on or before the 21st inst.
Arbroath, Feb. 7, 1881.

DRAUGHTSMAN wanted for Gas Engineering Construction.
Address—stating age, salary expected, and full particulars—No. 723, care of Mr. King, 11, Bolt Court, **FLEET STREET, E.C.**

DRAUGHTSMEN, Experienced, wanted
to make Drawings of Gas-Works, &c., Apparatus. Applicants to forward testimonials, stating salary required, &c., &c.
Address No. 722, care of Mr. King, 11, Bolt Court, **FLEET STREET, E.C.**

THE Engineer of a Provincial Gas-Works (Assoc. Memb. Inst. C.E.) will have a Vacancy for a Pupil in March next.
Address No. 718, care of Mr. King, 11, Bolt Court, **FLEET STREET, E.C.**

GENERAL CLERK AND DRAUGHTSMAN WANTED.
A Gas Engineer in London requires the services of a **DRAUGHTSMAN** and **GENERAL CLERK**. One who understands Gas-Works and can get out Working Drawings and Specifications preferred. Salary required to the extent of £50.
Applications—stating salary required, particulars of previous employment, age, and whether married or single—to be addressed to No. 720, care of Mr. King, 11, Bolt Court, **FLEET STREET, E.C.**

WANTED to Purchase medium-sized
TAR and NAPHTHA WORKS.
Address, giving particulars, to B., care of Domeier and Co., 3, Botolph Lane, **LONDON, E.C.**

THE Gravesend and Milton Gas Com-
pany have **FOR SALE**, Four 12 ft. square **PURIFIERS**, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. **GOVERNOR**, by Sugg, of Westminster.
For further particulars apply to the undersigned.
S. Sowood, Manager.

FOR SALE, Gasholder, 158 ft. by 30½ ft.,
in good condition (single, but could be telescoped), about to be taken out and replaced, by S. C. & Sons, with a Treble Lift. Excellent Guide Framing, consisting of 20 Handsome Columns and Wrought-iron Girders; may be seen at work at the Gas-Works, Portsea.
Particulars on application to **SAMUEL CUTLER AND SONS, Millwall, LONDON, E.**

FOR SALE—Two Purifiers, 6 ft. by 2 ft
6 in., by 2 ft. 6 in.; with Two Four-way Valves and Connections.
One 1500 ft. per hour Station-Meter, nearly new, with Valves and Connections.
One 4-in. Governor, with Valves and Connections, nearly new.
Four Lengths of 15-in. Hydraulic Main for beds of four, three, two, and one retort, with Bridge and Ascension-Pipes, 4-in. diameter.
Apply to **Mr. J. ESCOTT, Gas Company, Llantrisant, GLAMORGANSHIRE.**

TAR AND AMMONIA PLANT FOR SALE.
A Complete Set of Tar and Ammonia
Plant, capable of working up to 1½ tons of Sulphate per diem.
Apply to **T. V. CLARKE, Trundley Lane, Deptford,** who will contract to re-erect same in the country or abroad; also Plant for Manufacture of Sulphuric Acid in limited quantities.

GAS PLANT FOR SALE.

THE Buxton Local Board have for Sale—
One **EXHAUSTER**, Engine, Bye-Pass, &c., complete, with 8 in. Connections, for 10,000 per hour, two 8-in. Bradock's Compensating Governors, with bye-pass to serve for one or both, and one circular-cased Station-Meter, by Newton, of Oldham, 60 ft. per revolution, bye-pass, &c., complete.
For prices and particulars apply to **Mr. Geo. Smedley, Gas Office, Buxton.**
JOSIAH TAYLOR, Clerk to the Board.

GASHOLDER FOR SALE.
THE Directors of the Sleaford Gas Com-
pany, Limited, invite **TENDERS** for **GASHOLDER**, 32 ft. diameter, 14 ft. deep, including Inlet and Outlet Pipes and Syphons, Valves, and Stone Coving of Tank.
The whole in good condition, and as the room is wanted at once no reasonable offer will be refused.
For further particulars, apply to **HARRY WIMBURST, Engineer and Manager, Gas-Works, Sleaford, LINCS.**

THE Gloucester Gas Company have the
undermentioned **APPARATUS** for Sale:—
About 150 feet of D-shape Wrought-iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned,
R. MORLAND, Engineer.

Now Ready, in Pamphlet Form; Price 6d., post free.
OBSERVATIONS on Glass as an
Obstructor and Reflector of Artificial Light. By **F. W. HARTLEY, A. Inst. C.E., Hon. Memb. British Association of Gas Managers.** Being a Series of Three Articles reprinted from the **JOURNAL** of Jan. 11, 18, 25, 1881.
London: **WALTER KING, 11, Bolt Court, FLEET ST., E.C.**

WINSLOW.

The Old Gas-Works, with the Valuable Plant, Materials, and the eligible Building Land in the High Street, Winslow.

To be Sold by Auction, by Dudley and
Son, on Thursday, Feb. 17, at the Bell Hotel, Winslow, at Five o'clock in the afternoon, by order of the Liquidator of the Old Gas Company.

This valuable property is in the High Street, an important and improving part of the town. The buildings consist of a good Brick-built and Slated Cottage, Weighing Shed, Retort-House, Coal and Lime Sheds, Purifying-House, and two large Tanks, with a frontage of 90 ft. to the High Street, and a depth of 47 ft. The site and the abundant materials render it very valuable for building.

The Plant consists of seven Retorts, with Ascension-Pipes, Hydraulic Main, two large Furnaces, with Iron Doors, Iron Roof, Tar Pump, Connecting Pipes and Valves, a 6 ft. Purifier, a Smaller do. with Crane for Lift, a Gas-holder, 20 ft. diameter, with Frame, Chains, Wheels, Balance, and Weights; a Condenser of 10 Pipes, a capital Weighing Machine, with Pillar Beam and Weights.

Particulars may be had on application to Messrs. **WILLIS AND WILLIS, Solicitors; Mr. JAMES KING, the Liquidator; Mr. JOHN GRAVE, the Secretary; and Messrs. DUDLEY AND SON, Auctioneers and Land Agents, WINSLOW.**

CITY OF HEREFORD.

THE Corporation will shortly cease
making Gas at their old Works, when the following **PLANT** (and the site upon which the Works are erected) **WILL BE FOR SALE:—**
CONDENSER, on the battery principle, 16 ft. long, 2 ft. wide, and 12 ft. high.

SCRUBBER, 18 ft. high, 6 ft. in diameter, with 10-in. Pipe Connections, and three of Walker's Slide Back Valves.
PURIFIERS, four 10 ft. square with 10 in. Pipe Connections, wrought-iron Covers and Lifting Gear, and Hydraulic Centre-Valve.

STATION-METER, by Crosley, to pass 10,000 cubic feet per hour, with 8-in. Connections and Bye-pass.

GASHOLDERS—One 75 ft. in diameter 16 ft. deep, with eight Columns and Girders. One 80 ft. in diameter 20 ft. deep, with eight Columns, 40 ft. high, intended for telescoping.

STATION GOVERNOR with 10-in. Connections.
For further information apply to
WILLIAM DAVIS, Secretary and Manager.
Gas Office, Hereford, Jan. 25, 1881.

CARDIFF CORPORATION WATER-WORKS.

THE Corporation of Cardiff invite Ten-
ders for the **LAYING** of 150 Yards of 24-in. Cast-Iron PIPES; the **CONSTRUCTION** of 1000 Yards or thereabouts of **BRICK CULVERT**; and the carrying out of other **WORKS** at their Pumping Station at Ely, near Cardiff.
Plans and specifications may be inspected and forms of tender obtained, on and after the 12th inst., at the Water Engineer's Office, Town Hall, Cardiff; or at the Office of Mr. John Taylor, C.E., 27, Great George Street, Westminster.

Sealed tenders, endorsed "Tender for Ely Works," to be delivered at my Office on or before the 24th inst.

The lowest or any tender will not be necessarily accepted.
By order,
J. L. WHEATLEY, Town Clerk.
Town Hall, Cardiff, Feb. 5, 1881.

AMMONIACAL LIQUOR.

THE Directors of the Bristol United Gas-
light Company invite **TENDERS** for the Purchase of the **AMMONIACAL LIQUOR** made at all or either of their three stations, situate respectively at Avon Street, Canons' Marsh, and Stapleton Road, in the Borough of Bristol, for a term of Five or Seven years, commencing July 1, 1882.

The annual quantity of Liquor produced at present at the three stations is about 2½ million gallons.

Conditions of contract and other particulars may be obtained of the Secretary, at the Office of the Company, Canons' Marsh, Bristol.

Tenders to be delivered on or before Tuesday, May 3 next, addressed to the Chairman of the Company, and marked "Tender for Ammoniacal Liquor."

The Directors do not bind themselves to accept the highest or any tender.

HENRY H. TOWNSEND, Secretary.
Gas Offices, Canons' Marsh, Bristol, Jan. 8, 1881.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE
OSCILLATION, FRICTION, AND POWER.

TO WORK BY BELT OR WITH

ENGINE COMBINED.

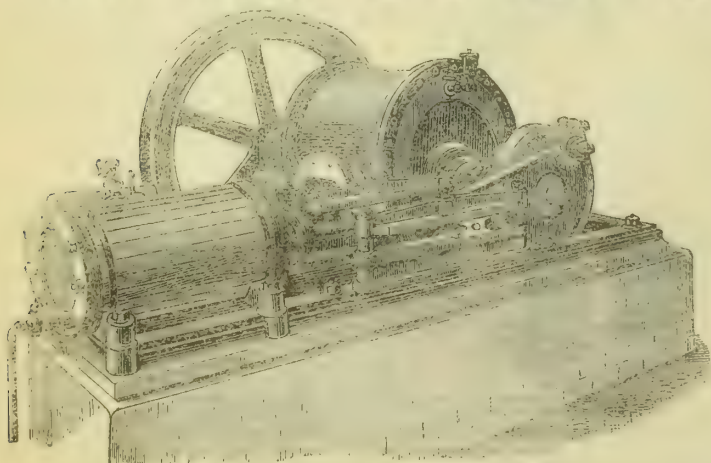
GEORGE WALLER & CO.,
Makers of **BEALE'S EXHAUSTERS,**
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
SELF-ACTING BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT PAGE 286.]

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.



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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

R. R.—See "Notes from Scotland" this week.

W. O. (Railway Charges).—We are of opinion that you are not now liable for the charge, if the places mentioned are thoroughfares dedicated to the public.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 22, 1881.

THE REPORT AND ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY.

THE report of the Directors of the South Metropolitan Gas Company, and the statement of accounts for the half year ended the 31st of December last, have been issued, in view of the ordinary half-yearly general meeting of the Company to be held to-morrow. The report commences by stating that, in spite of the mild and clear weather of the closing months of last year, which might have been expected to prevent much increase in the consumption of gas—and which, in the case of The Gaslight and Coke Company, is reported to have acted in this way—the Directors have to announce an increase of business of more than four per cent. on the corresponding period of 1879. This progress is to be partly accounted for by the fact that while London increases in population yearly, the spread of building operations in South London, and within the district of the South Metropolitan Company, is even more remarkable. In addition to the

normal increase of population in the Metropolis, there is a constant migration of residents from the thickly-populated Inner Circle to the suburbs; and this movement, in which, as a rule, whole families are concerned, takes very generally a southward direction. Families who have, perhaps, lived in lodgings in the older London, find in the South a vast and expanding area covered with small houses, in most of which gas is laid on as a matter of course. The same form of immigration is found to prevail in the northern suburbs; but not to the same extent as in the southern. Therefore the South Metropolitan Company must be congratulated on possessing a most expansive district, and having therein almost unbounded powers in respect of gas consumption.

The report states in another paragraph that notwithstanding the great reduction in the price of gas over the late Phoenix district from Midsummer last—perhaps we ought to say in consequence of the reduction having been made—the profits on the past half year enable the Directors to recommend the payment of dividends at the rate of twelve per cent. per annum on the "A" stock, and of eleven and a quarter per cent. on the "B" stock, with a small surplus to be added to the reserve fund. The surplus is not large, but the Directors are fortunate in being able to secure even so much, after their daring levelling of price over their whole united district. The comparison of the working results of the past half year, and of the corresponding period of 1879 cannot be conveniently made, as the district was then divided between the South Metropolitan and the Phoenix Gas Companies; but as it has already been stated that the gas-rental has kept up, so it may be said that the revenue from residuals has been satisfactorily maintained, and the Proprietors have every reason to be satisfied with their property, while it is needless to dwell upon the advantages that, from the consumers' point of view, have attended the consolidation of the system of the gas supply of the greater portion of South London.

It is notified that a Wharncliffe meeting will follow the ordinary meeting, in order to consider the Company's Bill in Parliament, concerning which we observe that the Metropolitan Board of Works have resolved, in contradiction of the opinion of their Parliamentary Committee, to employ Counsel to support the *locus standi* of the Board in opposition to the Bill. The hostility of the Board was aroused by Mr. Runtz, who certainly knew what he was talking about when finding fault with the clause of the Bill which authorizes the Company to purchase and manufacture the residual products of other Gas Companies' operations. He was followed by other members of the Board, who objected to this possible interference on the part of the Company with the chemical trade, and, as a result, the subject was referred back to the Committee, for further action to be taken in opposition to the Bill, as already mentioned. The Company's initial price was also threatened; but the Board will probably pause before meddling with an arrangement which has worked so well in the consumers' interest. An attempt was made by one of the speakers to get up a show of indignation with the dividend of twelve—not twelve and a half—per cent. payable, under the scheme of amalgamation, to the Proprietors of the Company's "A" capital, on the assumption that an initial price which allows such a dividend must be too high. This contention entirely ignores the conditions under which a certain portion of the Company's capital gets a proportionally increased dividend at the expense of another class of stock, entirely without reference to the consumers. The observation that in fixing the initial price under the sliding scale, it was the object of Parliament to limit dividends to 10 per cent., is manifestly absurd, for there could be no inducement to a reduction in price unless the counterbalancing advantage of a higher dividend were also held out to the manufacturers of the article. In short, if Gas Companies are not to divide higher dividends than those to which they were entitled under the old legislation, the sliding scale will obviously fail to act; and the mere possibility of a serious restriction of the liberty now enjoyed would be sufficient to prevent Gas Companies in London—and particularly the Company in question—from reducing the price of gas another penny. If this were to be the unhappy net result of the Board's action, gas consumers in South London might well ask to be delivered from their self-styled friends; but we do not imagine that the calm judgment of the majority of the Board will bear out to the full the frothy utterances of the few.

THE BOARD OF TRADE AND THE SLIDING SCALE.

THE anticipation we recently expressed that the value of gas undertakings would be materially increased by the operation

of the sliding scale—in possession or in expectation—is hardly likely to be realized, if a report which has reached us should prove to be well founded. We are informed that the Board of Trade contemplate inserting in future into all Provisional Orders a clause providing for a revision of the standard or initial price from which the sliding scale operates. We understand the proposal to be that at any time after a period stated in the Order—say four or five years—it shall be competent either for a given number of gas consumers, or for the Company, to apply to the Board of Trade, and to submit evidence in favour of a lowering or raising of the initial price, as the case may be; and that the Board, if satisfied as to the desirability of such alteration, shall be at liberty to make it.

The opinion was very generally expressed, when the principle of the sliding scale was first introduced, that it only needed to come into operation to excite dislike and opposition—according as it raised or lowered the dividends, so would the consumers or the Companies cry out. Such a view was a not unnatural one to those who had watched the contests between the Vestries and other Local Authorities of London and the Gas Companies; and, although repudiated at the time by both, was certain to be put forward in the event of any material alteration of dividend. But it must be confessed that whatever we may have looked for from the municipal bodies, we were not prepared to see the principle practically condemned, and that almost untried, by a Government Department so well informed upon the whole subject as the Board of Trade. The experimental stage of the system has not yet been passed, and it is unreasonable to suggest a change until these times of cheap prices of coal and materials generally alter, or from some other cause the present great prosperity of the gas industry is checked; or, at least, failing these, till a change has been waited for a few years longer.

We call attention to the matter now, in order to urge upon those Companies to whom the offer of such terms may be made, resolutely to decline them. Better far be without the sliding scale altogether than have it coupled with such a condition. It would be very difficult of application, and far more likely to excite bad blood than was the old contest over the maximum price. For instance, let us suppose the case of a Company—with a standard price of 4s. per thousand feet—who have reduced their charge by 4d. per thousand feet, and are, therefore, paying eleven per cent. Application is made for a revision of the initial price, on the ground that it is too high. Will the petitioners ask that the eleven per cent. shall be reduced? This is too unjust even to be supposed; and yet it is hardly more objectionable than any other method by which an alteration can be made. The price charged is 3s. 8d. per thousand feet, the dividend eleven per cent.; and there would probably be some prospect also of a further reduction. Any alteration, however, of the initial price would suspend the operation of the sliding scale in regard to a reduction, and would practically abolish it altogether, for the Company would naturally expect the same treatment repeated, and would, as long as possible, avoid the occasion for it. It would thus become simply an eleven per cent. Company with a maximum price of 3s. 8d. per thousand feet, instead of a ten per cent. Company with a maximum of 4s. per thousand feet.

One of the chief difficulties in the way of the application of the sliding scale is that of fairly determining the initial price. Gas Companies in the past have always valued highly a maximum price well in advance of their current necessity, knowing that the margin between the price actually charged and that possible to them is practically a reserve fund, often of very large amount. If there were no fear of the cost of gas becoming greater, this margin would be little cared for; it is because there is such a possibility that it is prized so highly. Under the new conditions it is perfectly natural that Companies should desire to secure some similar margin to provide for evil days. It would be unreasonable for any Company paying maximum dividends to ask for an initial price higher than that they were then actually charging. Therefore the tendency on the part of those who have the prospect imminently before them of accepting the sliding scale, will almost inevitably be not to reduce their charge to the lowest limit possible until after the change is made. This would hardly call for condemnation, if the surplus profits obtained by this diplomacy were put by as a reserve against less prosperous days; but when it is found that almost immediately after the sliding scale has been obtained the price is largely reduced in order that dividends may be increased, it is not unnatural for the authorities to feel that they have been overreached, and to be angry in consequence. The sliding scale was invented and accepted because, in a certain

sense—and that not a limited one—the honesty of the Companies was distrusted. Such a proceeding as we have sketched, intelligible though it be, tends to confirm this opinion. At the same time the proposal to revise the initial price some years after it has been fixed cannot meet this difficulty. The evil, if evil there be, is done directly too high a price is granted; for, as we have suggested, it would be immediately secured by increased dividends, which could not be again reduced without a serious injury to those who had invested on the strength of them. The guardians of consumers' interests should devote their energies to securing that not more than a fair initial price is granted to Companies with the sliding scale; but, when this is once fixed, it is worse than idle to complain because, the effect desired alike by both parties being brought about, one of them reaps its due share of advantage. We shall be glad to find that we are misinformed as to the intention of the Board of Trade; but if not, we repeat our advice to Companies to decline what is really the offering of "a stone" where "bread" is pretended.

THE CITY OF LONDON COAL DUTIES.

It is a fact, which, if generally known, is but seldom mentioned, that London, like Paris, has a kind of *octroi*, or local Customs duty, which contributes a large annual sum to the Metropolitan Government. Unlike the Continental practice, by which duties are levied upon every article of daily consumption brought within municipal limits, the Corporation of London levy their tax only on coal and wine; so that in at least one respect these very diverse articles are placed in queer companionship. The origin of this curious arrangement dates from the reign of William and Mary, when an Act was passed purporting to be for the "Relief of the Orphans and other Creditors of the City of London," which included, among other things, the imposition of a duty of 4s. per tun on all sorts of wines imported into the Port of London, to be paid to the Corporation for ever. The coal duties, consisting of two several dues of one penny and twelpence per ton on all coals, culm, and cinders brought into the London district—which included any place within the radius of twenty miles from the General Post Office—were levied by the authority of an Act of 1 & 2 Wm. IV., c. 76, and the said duties were reimposed by repeated enactments at about nine years' intervals up to 1861. In the latter year the duties on both commodities, with some slight alterations, were, by a special Act of Parliament, applied to the improvement of the Metropolis. The Thames Embankment, the Cannon Street Improvements, Queen Victoria Street, and the Holborn Viaduct, have all been made by the help of these duties, which, by a supplementary Act of 1863, were continued until July 5, 1882, in view of the heavy demands on the financial resources of the Metropolitan area. The continuance Act has, therefore, nearly run out, and at a recent meeting of the Metropolitan Board of Works it was resolved that the Board should co-operate with the Corporation of the City of London for a further extension of the duties.

The magnitude of the interests involved in the question of the retention or remission of the duties is indicated in a letter which will be found in our "Correspondence" column; the writer, moreover, shows how the dues affect Gas Companies in the Metropolitan district, and consequently, through them, gas consumers. This is, of course, what it amounts to, and there can be no doubt that the authorities regard with much satisfaction a condition of things which makes the single Company instanced by our correspondent contribute more than one-sixth of the total amount realized in one year by the coal duties of 1s. 1d. per ton. The Gas Companies and their customers will not be likely to regard the matter with so much favour, for, of all the inconsistencies and anachronisms of the age, this is surely one of the most extraordinary—that in the London of to-day the means of obtaining warmth and light should be taxed to improve the river and the streets. We say nothing here of the related wine duty, beyond remarking that the public are accustomed to regard an alcoholic beverage as a fit subject for taxation; but a tax on coal is a strangely old-fashioned device for raising money. It cannot be defended by any arguments that would not equally sanction a duty on corn consumed in the same district; it is merely a relic of a system of government that has been long exploded, although only in the memories and by the efforts of men now living. If gas consumers alone contributed these duties, relief would be long in coming; for, in the estimation of many who should know better, they form a class of the community which can be double-rated with all propriety. But the case assumes a different aspect when it is also remembered that every poor man who buys a sack of coal is heavily taxed in connection therewith, simply because

he has the misfortune to live under the protection of the Metropolitan Police. It will be interesting to see how Government will regard this question—if they can spare time to look into it.

BIRMINGHAM CORPORATION GAS SUPPLY.

THE annual report and accounts of the Gas Committee of the Corporation of Birmingham have been issued, and show that the undertaking is making substantial progress. The operations of the past year have afforded a profit of £57,009, of which £25,000 is to be handed over to the Finance Committee for general purposes. This must be considered moderate for Birmingham, and the gas consumers should think themselves fortunate in being so lightly taxed—so lightly, indeed, that in the report there are indications of the Committee being disposed to favour the introduction of a special sliding scale, whereby a larger annual amount is to be devoted to public purposes as the price of gas is lowered. This will be a novel application of the principle, and its effect, if carried out, will be worth noticing. The consumption of gas in Birmingham proper is increasing apace, and the time approaches when the numerical difference between gas consumers and ratepayers will be much lessened. If the two classes of residents should nearly consolidate, and the sliding scale be then in full swing, it will be edifying to see the ratepayers bribed with the profits on their own gas consumption. Without absolutely pledging themselves to the adoption of the sliding scale, beyond an expression of belief in its justice, the Committee definitely recommend a reduction in the price of gas of threepence per thousand cubic feet, to commence with the current quarter. This proposal will give the Council an opportunity of debating the other question put forward in connection with it, and we shall perhaps learn shortly whether Birmingham gas is to have an initial price or not. The business of the Committee in connection with the introduction of gas stoves, &c., flourishes fairly, 601 arrangements for using gas for purposes other than lighting having been sold or lent out during the year. The increase of the dimensions and importance of gas-works plant, in accord with modern requirements, is exemplified by the statement that the ironwork for the roof of the new retort-house at the Windsor Street station will cost £42,054, and taking into consideration the vast area covered, it will be a cheap roof at that price. The Committee make one announcement of general interest to a great number of our readers. They remark upon the coming meeting in Birmingham of the British Association of Gas Managers, and state that they are taking steps to give the Association an official reception. We have no doubt that the courtesy of the Committee will be heartily appreciated by their expectant guests.

PROVINCIAL GAS COMPANIES' MEETINGS.

THE half-yearly meeting of the Liverpool United Gaslight Company was held on the 15th inst., when full dividends were declared on all classes of the Company's stock. The undertaking has prospered during the past half year, for the Chairman (Mr. G. Lawrence) stated that the half-yearly dividend had been earned during the six months, which was probably unprecedented, as the Christmas half year is not, as a rule, such a profitable time for the Company as the half year ending in June. The Directors have recently called up fresh capital, required for the extension of the Linacre station. The proposed Corporation experiment in lighting a portion of the city by electricity naturally called for some comment; but it was shown that the Company might with perfect confidence spend further capital in the enlargement of their works without dread of anything the Corporation might be able to do in this particular. The Directors do not present any accounts at the winter meetings, but the Shareholders were rightly satisfied with what the Chairman had to tell them.

The Newcastle-upon-Tyne and Gateshead Gas Company's annual meeting was held on the 16th inst., when a further reduction in price of threepence per thousand cubic feet was announced. The sliding scale is being worked to good purpose in Newcastle, for the Company will this year commence to sell gas at 2s. 3d. per thousand cubic feet, less ten per cent. discount, making the net price to consumers 2s. 0-3d. per thousand cubic feet. In spite of the sacrifice of nearly £8000 by last year's reduction in price, the Company only received £2500 less, owing to the increase in the consumption of gas, the elasticity of a cheapened supply being therefore again manifested. The Company's working has so much improved during the past year, that, although they carbonized 675 tons of coal less, they actually sold 20 million cubic feet of gas more than during the preceding year. In

consequence of the splendid record which the management of the Company showed during the past year, and of the great prosperity to which the undertaking has been conducted by the Chairman (Alderman Hedley) and the Secretary (Mr. W. Hardie), the Proprietors unanimously resolved to mark their sense of the business merits of both gentlemen by special presentations.

THE PUBLIC LIGHTING OF BURY ST. EDMUND'S.

THE small tempest at Bury St. Edmund's, respecting the price of the gas supplied to the public lamps, has now quieted down; and, after all that has been said in and out of the Town Council, the advantage remains with the Gas Company. The conditions of the public gas supply of Bury are peculiar. It appears that in consideration of a loan of £2500 advanced to the Company, without interest, by the Paving Commissioners, many years ago, the Company bound themselves, by an Act of 1849, to supply gas for lighting the streets and public places of the borough at cost price, exclusive of charges for lighting, cleaning, &c. By virtue of this provision the Company have lately been charging 2s. 3d. per thousand cubic feet for such supply, which, considering the size of the town and other circumstances affecting the cost of gas manufacture, must be regarded as a very reasonable price. A minority of the Council, however, thought otherwise, and a proposition was made that the question should be referred to a skilled arbitrator—a course which would, of course, have involved sufficient expense to sink for some time any paltry saving that might have been ultimately decided upon. The case against the Company, led by an ex-Director, has utterly failed in its legal aspect, and when it was stated to the Council there was nothing in it to lay before an arbitrator. The malcontents tried to make out that the cost price of the gas meant the cost of gas into the holder, while the Company contended, with obvious truth, that the cost must be taken at the point of consumption. The dispute at last narrowed itself down to this point, and it was therefore easy for the Council to come to a decision, which was done, and a motion expressing satisfaction with the Company's charge was carried by a majority of nearly three to one.

GAS AFFAIRS AT BARNSELY.

THE price of gas at Barnsley has formed a subject of negotiation between the Town Council and the Directors of the Gas Company, and a deputation of the former body recently had an interview with the Directors, to lay before them certain requests emanating from the Council and from a meeting of ratepayers. The Directors had to listen to the demands of the deputation with the uncomfortable conviction in their own minds that the Company's revenue is a diminishing one. In their annual report, since published, the Directors lay the request of the Local Authorities and their customers before the Proprietors, as an appendix to a statement of affairs which shows, after the payment of the statutory dividend, a balance of only £456 to go to the reserve fund. Almost every source of revenue has produced less during the past year, while the expenses have been much the same as usual, especially under the heading of renewals and repairs, which forms a very serious item in the Company's expenditure. Still, in the face of this unsatisfactory state of things, the Directors recommend a reduction in the price of gas of fourpence per thousand cubic feet, in the hope that the rental may be rendered more buoyant thereby, and that the public may be satisfied of the Company's willingness to do anything in their power to help the consumers, even at a probable loss to themselves. We trust that the effect of the Directors' proposal may be satisfactory to both parties. The Company are unfortunately circumstanced, but they will not lose in the long run by a wise concession, even if it should involve them in some trifling loss at first.

THE MIDLAND GAS MANAGERS' ASSOCIATION MEETING AT BIRMINGHAM.

THE annual meeting of the Midland Gas Managers' Association was held at Birmingham on the 3rd inst., under the presidency of Mr. R. O. Paterson, of Cheltenham. The presidential address was of a practical character, and dealt chiefly with considerations respecting the manufacturing department of gas-works. The careful manner in which reference was made to the question of heating retorts shows how the regenerative gas furnace and its results, as tried by various engineers in England, have appealed to gas managers throughout the country. Mr. Paterson was right in distinguishing gas furnaces from regenerative furnaces, properly so called. The two things are substantially different, although only perfect when united. The President was also justified in his reference to another subject, when ex-

pressing regret that in the early days of gas lighting the control over internal fittings was so generally permitted to be separated from the work of gas makers. It is indeed too true that beyond attempts to improve the consumers' meter, gas engineers in the past took but small interest in anything put up by their customers for utilizing the means of illumination supplied to them. Mr. Paterson almost appeared to despair of retrieving the ground that has thus been lost; but surely he is too despondent in this regard. If gas lighting were to become extinct in a short time, a feeling of remorse for the omissions of our predecessors would be intelligible; but while we indulge the belief that the state of gas illumination in the past or the present is far short of the possibilities or even probabilities of the illimitable future, it cannot be too late to try to rectify now what has been wrong in the bygone time. We give elsewhere the full text of the President's address, with a report of the general proceedings of the meeting, which included the reading of a paper by Mr. Cross, of Leamington, on "The Inexpediency of doing 'away with the Hydraulic Dip.'" The paper, with the very interesting discussion which took place upon it, will appear in our next issue.

Water and Sanitary Affairs.

THE Birmingham Corporation, who find the water-works which they acquired in 1876 to be extremely profitable, are obliged to plead the severity of the frost as a reason for certain inconveniences endured by consumers in the month of January. As many as 5000 or 6000 private services between the mains and the houses were broken during the frost, as also 171 mains belonging to the Corporation. At the meeting of the Town Council last week, Alderman Avery said that there was an abundant supply of water, the difficulty being to supply it for the use of the consumers. We presume the Birmingham authorities do not entertain the idea which has been mooted in the Metropolis, that when the water fails to flow through the pipes it ought to be supplied in buckets. The financial success of the Birmingham Water-Works may certainly serve to encourage a liberal policy. In the year when the undertaking was transferred to the Corporation the profits were less than £2000, whereas last year they amounted to £12,000, to which must be added a substantial sum laid aside in the same year by way of sinking fund, and £9604 added to the reserve fund.

There is good authority for saying that a house divided against itself cannot stand. How, then, can two parishes, having each an interest in a particular village, expect to continue their separate existence there if they cannot agree as to the best mode of supplying water to the villagers within their respective jurisdictions? Carnoustie, a somewhat populous village in Forfarshire, is the place to which we refer. Geographically it is somewhat unfortunately situated. The line which divides the two parishes of Barry and Panbride passes through the village, with the result that the former Board have charge of a population of 2433, and the latter of 629 persons. Such an arrangement must undoubtedly lead to disputes, and an instance of this we have with regard to the water supply. The Barry Board, having the greater number of followers, some time ago resolved to introduce, from the district of Brax, a supply which, it has been computed, will cost about £6000; but the Panbride Board, being neither satisfied with the quality of the water nor the capability of the springs at Brax to afford the requisite quantity, called in the assistance of Mr. Gale, Engineer of the Glasgow Corporation Water-Works, who confirmed the fears of the minority. Against his report, however, the majority placed that of Mr. McCulloch, C.E., of Dundee, who endeavoured to establish that Mr. Gale was wrong in his estimates. The inhabitants of the village in both parishes are in a quandary. They are fully realizing the bitter truth of the adage that "doctors disagree," and for this difference of opinion some of them are likely to suffer, if not in their purse, at any rate in their feelings. Panbride called upon Dundee to assist them out of their difficulty, and the Commissioners of that town agreed to give a supply of water from their Crombie reservoir at something like 1s. 3½d. per pound of rental. But the Barry Local Authority have taken the wind out of their opponents' sails by accepting tenders for the completion of the Brax scheme. Whether the difference will now end is extremely doubtful. Some members of the minority have appealed to the Board of Supervision, who have control over all Local Boards, and inquiries have been and are being instituted as to the want of unanimity. Such squabbling is very unseemly.

Why cannot the people of Carnoustie adopt the Police Act, and so control their own sanitary and other arrangements?

The application of the Ipswich Sanitary Authority for a further loan of £20,000 to defray the cost of their sewerage works, was the subject of an investigation before Mr. Robert Morgan, one of the Inspectors of the Local Government Board, last Friday. The Town Clerk stated the case, showing that the total estimate now amounted to £64,563, while the net rateable value of the borough was £160,032. Allowing for certain items on either side, the cost to the town would be represented by a sixpenny rate. The Engineer for the sewerage works explained the circumstances under which the original estimate had proved insufficient, and some hope was expressed that only £15,000 would be required out of the £20,000. Mr. Grimwade, a ratepayer, declared himself to be "astonished and vexed" at the large additional amount now proposed. Mr. Fisk, another ratepayer, contended that the Dock Commissioners had not constructed the sewerage works which their Act bound them to make, and extra expense had thus been thrown on the town. The Inspector signified that Mr. Fisk was rather too late with his point of law, as the works to which he referred had been constructed, and the money borrowed. Some discussion followed, in the course of which Mr. Fisk called attention to a speech made by Alderman Mason at a recent meeting of the Town Council on the subject. The Town Clerk rejoined that Alderman Mason spoke without facts or figures before him, and was, "as Mr. Grimwade was, a grumbler." The Inspector said that he did not see how the town could avoid the further expenditure, and the inquiry then came to a close. We adverted a short time back to the extraordinary history of the Ipswich sewerage works. One curious incident mentioned by the Engineer on Friday was, that when a certain portion of the work came to be carried out, the Authority desired to have an alteration made in one of the sewers, which had the effect of bringing the crown of the sewer above the level of the road. To meet this difficulty "the streets had to be raised." Throughout the entire area, the nature of the ground seems to have been such as to cause every possible kind of embarrassment, and we should say the people of Ipswich will have cause to rejoice when they learn that the works are finally completed.

A Sub-Committee of the Accrington Town Council, appointed to visit various localities in order to inspect systems in operation for the disposal of town excreta, have presented their report, which is of considerable length and of much interest. The pail system is not spoken of favourably, and a very commendatory account is given of the "modified water-closet" adopted at Hyde. Mention is made of the successful use of Fryer's patent destructor at Heckmondwike, Bradford, Leeds, Warrington, Derby, Blackburn, and Bury, for the disposal of dry refuse. With regard to the precipitation of sewage, the Sub-Committee were discouraged, in several cases, by the enormous quantity of sludge which had to be disposed of, but it is stated that the Local Board of Aylesbury were evidently satisfied with the A. B. C. system. As for irrigation, it was considered hopeless to look for suitable land in the neighbourhood of Accrington. The Committee, to whom the report of the Sub-Committee was presented, have held as many as ten meetings to consider the subject, finally agreeing to a series of resolutions, recommending the Council to adopt the following measures:—To construct tanks for the purpose of precipitating the sewage of the borough so as to comply with the Rivers Pollution Prevention Act, and to rescind the resolution respecting new property being put upon the pail system, that system only to be applied in cases where the situation of the property or other circumstances might appear to render it preferable to the Hyde water-closet. The virtual rejection of the pail system is a notable feature in these proceedings. The Sub-Committee evidently failed altogether to be satisfied with what they saw of that method at Rochdale and Manchester, and they have also experience of it at home. While at Leeds they had conversations with several engineers and surveyors respecting the disposal of sewage and night-soil, and it appeared that these officials had no very good opinion of the pail system, but looked upon it generally "as a temporary makeshift, to supersede the open ashpit, until 'some better method was hit upon.'" The Accrington authorities also tested the question by asking the Local Government Board whether a loan would be granted for the further construction of sewers to discharge at the existing outfall, providing the pail system were adopted, so as to "keep out all solid matter from the sewers." The purport of the reply from the Local Government Board was, that to construct additional sewers for the conveyance of slop water

would be a further offence against the Rivers Pollution Act. Hence there being "no alternative but to purify the sewage," the adoption of precipitation works had to be entertained. The idea that by abolishing or prohibiting water-closets there will be nothing offensive to discharge into the rivers, is a delusion which the Local Authorities everywhere will have to get rid of. Irrigation or precipitation becomes the real alternative.

A return, moved for by Mr. Alexander Brown, the member for Wenlock, has been presented to Parliament, giving an account of all the local visitations which have been made by Medical Inspectors under the direction of the Local Government Board from the date of the establishment of that Board to the commencement of 1880. The return is of considerable extent, and relates to about 370 localities. Among other things it shows on what ground of complaint, or otherwise, the visitation was ordered. In each instance there is a *précis* of the facts reported by the Inspector with regard to the prevalence of disease and the existing defects of sanitary administration. The results of re-inspection are also given, in those cases where it has occurred, and the latest information available is recorded as to the condition of the several localities. We have thus a concise sanitary history of these places, commencing with the year 1871. The rural communities surrounding the large towns, as in the registration districts of Bolton and Dewsbury, have shown, in the course of inspection, the fearful sanitary evils associated with the rapid increase of a working-class population connected with manufacturing industries. But in many cases the large towns have also been found to exhibit a very unsatisfactory state of affairs. Thus Bradford, in 1871, with a population of nearly 150,000, was suffering from "defective sanitary administration," which might account for the reported "prevalence of fever and diarrhoea." Since then there has been a large expenditure for paving, and £50,000 has been laid out on main sewerage extension. Among the smaller towns, Goole, in Yorkshire—a place of very moderate size, having a population of under 9000—was found in 1871 to illustrate "every kind of insanitary condition in the most aggravated form." At the latest date there was "no proper water supply," and many of the wells were polluted; but the water question had "recently been much discussed," and it appeared probable that a private company would be started to supply the town.* "More than half the houses" were efficiently drained, and building bye-laws had been adopted, but "much bad building took place while these were under discussion." The nuisance of polluted wells presents itself in the great majority of cases, as also houses unfit for habitation, and dwellings placed back to back, so as to occasion almost every form of inconvenience. Over-crowding, defective drainage, and other concomitants of misery and disease, have been found to prevail very largely, and on the whole there cannot be any difficulty in accounting for the sickness and mortality which have served to attract the notice of the Local Government Board. On the other hand, there is the brighter picture presented by the later reports, showing the improvements effected in recent years, in accordance with the recommendations made by the Government Inspectors. It is not often that everything is done that has been declared necessary, and in one instance—that of a small place in Radnorshire—the latest account says: "Nuisances generally are removed in a temporary way; in all cases as little as possible is done, and the evils complained of soon recur." Few of the large towns have purged themselves of all their evils; but a vast amount of sanitary work has been effected, while much is still in progress. Sometimes the difficulties in the way of improvement are peculiarly great, as at Gomersal, one of the Dewsbury localities, where it is said "the Sanitary Authority labour under the disadvantage of having four separate and distinct outfalls," and "have met with the most strenuous opposition from neighbouring Sanitary Authorities in endeavouring to obtain land for treating the sewage." The mass of information contained in this return will command the attention of all who are interested in sanitary progress, and will doubtless be the subject of reference in parliamentary debates.

TRAM CAR MOTORS.—Some experiments have recently been carried out in Dublin, and so far with great success, in the driving of tram cars by means of gas. The engine used is the invention of Mr. J. R. Wigham, of the firm of Messrs. John Edmundson and Co., and one of the Directors of the Alliance and Dublin Consumers' Gas Company. The trials have not, however, been so far completed as to admit of a description of the apparatus being given just at present; but we shall shortly publish full details of the system employed.

* A Bill with this object is being promoted in Parliament in the present session.

WATER BILLS FOR 1881.

(Continued from p. 256.)

OF the Water-Works Companies seeking extended powers, the following is an abstract of the Bills now before Parliament:—

The *Eastbourne Water Bill* is to extend the limits of supply of the Eastbourne Water-Works Company, and to enable the Company to construct additional works, comprising a well and pumping-station and three reservoirs, to be completed within ten years from the passing of the Bill. Rates for domestic supply are provided, ranging from ten per cent. on the rental for houses of £10 annual value, to seven and a half per cent. for houses of above £20 per annum. The capital required for the extensions is to be raised by issuing new shares to the extent of £79,000, to bear seven per cent. dividend. The Company also wish to borrow £19,750 in respect of same.

The *East London Water Bill* is to enable the East London Water-Works Company to raise £179,440 by the issue of new shares, to be sold by auction or tender, such new capital to bear seven per cent. dividend. The Company also desire power to borrow £55,560 in respect of the additional share capital. The previously authorized capital of the Company amounts to £2,020,000 in shares or stock, and by borrowing or debenture stock. Debenture stock to the amount of £394,440 has been created by the Company, but in so doing they have, by inadvertence, exceeded their powers in this respect, and the present Bill contains a clause to confirm this proceeding. It is also intended that in the event of the net revenues of any one year being insufficient to pay full dividends on all classes of stock, the whole shall participate equally up to seven per cent., any surplus going to that portion of ordinary capital which is entitled to a higher dividend.

The *Fylde Water Bill* is intended to authorize the Fylde Water-Works Company to raise £80,000 additional seven per cent. capital, and to borrow £20,000 in respect thereof. The Company draw their supply from the Glazedale Brook, and by existing Acts they are directed to provide compensation water to several landowners. By the present Bill power is sought to take the whole of the waters of the said stream, on condition that compensation is made for any loss or damage that may be caused by the cessation of the compensation water down the brook as heretofore.

The *Matlock Water Bill* is to empower the Matlock Water-Works Company to raise £2800 of additional capital, and to borrow in respect of same the sum of £700. The Company wish to construct extended works, consisting of a storage reservoir and three lines of main, to be completed within five years. A clause is inserted to introduce a modified form of sliding scale, by authorizing the Company to pay ten per cent. dividend upon their 1860 capital for any year in which they shall not have charged more than two-thirds of the maximum water-rate; and to divide five per cent. for any year in which they shall have charged more than two-thirds of such maximum rate.

The *Sheffield Water-Works Bill* is to enable the Company to raise £300,000 additional capital, to be considered as part of the original capital, unless issued in the form of preference shares, and to borrow £100,000. The Company also seek to have the time originally fixed for the construction of certain reservoirs extended by sixteen years.

The following are the Bills of public bodies seeking powers for the construction or acquisition of water-works:—

The *Cleator Moor Local Board Bill* is to enable the Board to construct and maintain water-works, at a cost of £26,000, for the supply of their own district. The works contemplated comprise two reservoirs and sundry lines of mains. The time for the compulsory purchase of lands and the completion of the works is to be five and eight years respectively. Rates are to be levied for domestic water supply, ranging from seven per cent. on the annual rental of houses under £40 yearly value, to five per cent. on houses of which the annual rental exceeds £100; with the usual extras. The repayment of money to be borrowed for the purposes of the Bill is to be provided for by a sinking-fund within sixty years, the formation of such fund to be commenced five years after the Act is obtained.

The *Colne and Marsden Local Board Bill* is to authorize the Local Board to acquire the undertaking of the Colne Water-Works Company, for which, with the extensions contemplated, they desire to borrow £50,000, to be repaid in eighty years. The transfer is to take effect retrospectively as from April 30, 1880. The Local Board contemplate the construction of additional works, comprising a reservoir and several lines of main, to take the water of the River Lane-

shaw, as to which they propose to allow 18,100 gallons hourly of compensation water, under a penalty for default of £5 per day. Until the construction of the Laneshaw reservoir, the Local Board desire to appropriate the water in the river in excess of the regular discharge of 125 gallons per minute. Water-rates ranging from eight to six per cent. are to be chargeable for domestic supply, with extras.

The *Egremont Local Board Bill* is to enable the Local Board to construct and maintain works of water supply for their own district. The proposed works include two reservoirs and two lines of main, with the diversion of certain roads, &c., to be completed within seven years. Compensation water to the amount of 200,000 gallons a day is to be provided into the Kirkbeck, the waters of which will be impounded. Water-rates can be levied at from seven and a half to five per cent. on house-rental, for domestic supply, with extras; or the supply may be by meter if desired. The Local Board seek power to supply water in bulk beyond their district. They also wish to borrow £18,500, repayable in sixty years, for the purposes of the Bill.

The *Oban Burgh Bill*, among other things, is to empower the Police Commissioners of the borough to construct water-works, consisting of an enlargement of Loch Colaglin and the necessary lines of pipes, to be completed within three years from the passing of the Bill. Compensation water amounting to 4000 gallons per hour is to be given from the reservoir. The present rating of the borough is to be increased by one penny in the pound, to form the public water-rate.

The *Ryton (Parish) Local Board Water Bill* is to enable the Local Board to take waters and lands for the purposes of a water undertaking which they are about to engage in under the powers contained in the Public Health Act, 1875, the general Act not being sufficient for the purpose. The sources and springs from which the water supply is to be taken, and the lands of which compulsory acquisition is desired by the Local Board, are stated in the Bill, which only contains eight clauses.

(To be continued.)

THE appointment, recently advertised in the JOURNAL, of Engineer and Manager to the Georgetown (British Guiana) Gas Company, Limited, has been filled up by the election of Mr. Thomas Blair. Mr. Blair took the first "honours" prize, with a silver medal, in the "Examination in Gas Manufacture" held last May by the City and Guilds of London Institute, and he was a short time since elected an Associate Member of the Institution of Civil Engineers.

THE Eleventh Annual and Forty-fifth Quarterly Meeting of the Manchester District Institution of Gas Engineers will be held at Manchester next Saturday. After the election of new members, and the office-bearers of the Institution for the current year, the new President (Mr. John Chew, of Blackpool) will deliver his Inaugural Address. Two papers are down on the programme to be read—(1) "Is the Elimination of Light Oils from the Tar and their Retention in the Gas desirable?" by Mr. T. B. Ball, of New Wortley; (2) "Six Months' Experience in Working Retorts without the Hydraulic Main," by Mr. G. Smedley, of Buxton.

REDUCTIONS IN THE PRICE OF GAS.—The Directors of the South Shields Gas Company, in their report to be presented to the annual meeting of the Proprietors on Monday next, recommend a further reduction in the price of gas, at the rate of 2d. per 1000 cubic feet, to take effect from the beginning of the present year. This will make the prices within the boroughs of South Shields and Jarrow (after deducting the usual discounts) about 2s. 7½d., 2s. 6½d., 2s. 5d., and 2s. 3d. respectively.—The Directors of the Exeter Gas Company announce a reduction of 3d. per 1000 cubic feet in the price of their gas, to take effect from the 1st of January. The price will now be 3s. 9d. per 1000 feet.—The Directors of the Cardiff Gaslight and Coke Company, at their meeting last Wednesday week, resolved to reduce the price of gas in the borough of Cardiff to 2s. 10d., and in the outlying districts to 3s. 4d. per 1000 cubic feet, with a discount to large consumers. They also reduced the charge for public lamps 3s. each per annum, the reduction to take effect from the 25th of December last.—In last week's notice of the reduction of price at Kidderminster, the highest price should have been given at 3s. 1d. (not 3s. 4d.) per 1000 feet.

DORCHESTER GAS AND COKE COMPANY.—The half-yearly meeting of this Company was held on the 1st inst., when the statement of accounts for the half year ending Dec. 31, 1880, and the Directors' report were presented, and unanimously adopted. The report stated that the paid-up capital of the Company consisted of £17,000 of original shares, and £1890 of preference shares; of which there remained a balance in hand of £631 8s. 4d. The balance of the profit and loss account was sufficient to pay a dividend of 10 per cent. per annum on the capital; to add £150 to the insurance fund, making the total of this fund £700; and to add a further sum to the reserve fund, increasing it to £521 2s. 10d. The Directors think, as the insurance and reserve funds are now together equal to 5 per cent. on the Company's paid-up capital, and there is every reason for believing that the present prosperity of the undertaking will continue, the time has arrived for reducing the price of the gas. They therefore propose that from the 1st of January the price of gas should be reduced 2d. per 1000 feet, which will make the present price 4s. 4d. per 1000 feet; also that a further reduction of 2d. per 1000 feet be made at Midsummer next, should the present favourable circumstances still continue; and also that the charge for the public lamps be reduced, from the 1st of January, to the extent of 2s. 6d. per lamp. Two of the Directors, Messrs. J. Galpin and W. Slade, retired by rotation, and were unanimously re-elected; as was also the Auditor. The meeting closed with a vote of thanks to the Chairman, and to Mr. W. Osmond, the Secretary and Manager, for his efficient services.

Notes.

CANNEL COAL IN ITALY.

In the last number of our contemporary, the *Journal des Usines à Gaz*, is to be found a short account of the opening up of a mine of so-called "boghead" at Resiutta, in the province of Udine, North Italy. The deposit has long been known, but down to the present time it has been practically unapproachable, not only because of the absence of railway communication, but from the fact that not even ordinary roads existed in the locality, which is at the altitude of about 3400 feet. The proprietors have now constructed, at considerable expense, a rope railway by which the mineral is sent cheaply and in large quantities into the valley. The cannel will, of course, serve to the best advantage the northern Italian gas-works, but it is expected to be also available on good terms all over the Mediterranean seaboard. Our contemporary has received some samples of the cannel, and of the schist which forms its bed, and intends to publish the results of their analyses. Meanwhile, it is stated that although the residue of the "boghead" has no value as a combustible, on account of the small proportion of carbon it contains, a discovery has been made that the product has preserving and disinfecting properties in reference to animal and vegetable matter. MM. Moride and Covy use it for absorbing, and reducing to the form of inodorous powder, urine, fœcal matter, slaughter-house refuse, and blood; of which last it is calculated to absorb and disinfect a quantity (clotted) equal to its own weight. By agitating the cannel residue with fresh blood, an inodorous powder is obtained, which possesses the remarkable quality of preserving the blood and albumen in a fresh condition; consequently, the powder, when diluted, may be used with advantage in sugar refineries. In Brittany, valuable nitro-phosphate manures are said to be made by the mixture of blood with powdered cannel coal ashes. The coke of the schist has no present value.

THE SIEMENS REGENERATIVE GAS-LAMP IN PARIS.

At a recent meeting of the Society of Civil Engineers, in Paris M. Cornuault read a paper on modern improvements in burners for the illumination of large spaces by gas. The author of this important communication passed in review the existing types of gas-burners, from the humble batwing of domestic utility, to the great lamp of Herr Frederic Siemens. The inventions of Messrs. Coze, Mallet, Sugg, Wigham, Gautier, and others, received their due share of attention, the French patterns being perhaps invested by the author with an importance not always warranted by their intrinsic value. In describing the Siemens lamps, which were the principal novelties of the occasion, M. Cornuault, however, gave them due prominence, and explained very clearly the principle of construction and working followed by Herr Siemens in their design. It was stated that the heating of the air previous to its combustion is carried to a temperature of about 930° Fahr. The Siemens lamps are now made in France in four sizes, of which the following particulars are given:—

	No. of Tubes in Burner.*	Consumption of Gas, Cub. Ft. per Hour.	Illum. Power of Lamps, Candles.	Illum. Power in Candles per Cubic Foot.
No. 1.	32	56.50	450	8.00
No. 2.	24	28.25	200	7.07
No. 3.	18	21.20	135	6.37
No. 4.	15	10.60	50	4.97

It is in contemplation to construct a burner on the same system, to give the light of from 950 to 1000 candles, which is expected to consume not more than about 100 or 110 cubic feet of gas per hour. The Siemens street lamps are about to be tried at the Palais Royal.

STREET LIGHTING BY EDISON'S LAMPS.

The long-promised public manifestation of Mr. Edison's system of electric lighting is now to be seen at Menlo Park. According to the *Scientific American*, the plant concerned in this experiment consists of 500 lamps, distributed over an area of about a mile long and half a mile wide. The central generating station is Mr. Edison's own laboratory, which stands at about the middle of the district. The lamps are in a circuit comprising 7½ miles of wire, the current being supplied by nine dynamo-electric machines, driven by one engine. The lamps in this instance are of 16-candle power each, although three sizes are made, or one-third, one-half, and full size, corresponding to 5½, 8, and 16 candles respectively. The lamps have been but slightly modified in form and construction since they were first introduced here. According to the latest tests, the force of electric current required to maintain one 16-candle lamp for an hour is produced by the consumption of two-fifths of a pound of coal; and a still larger economy is expected to be realized by the great generator now being constructed by Mr. Edison. This apparatus, which is calculated to replace sixteen of the largest machines of the kind previously made, is simply a steam-engine with its crank coupled direct to the armature of an Edison generator. The dynamo machine and its driving engine are mounted on the same bed, and together weigh 8 tons. The "field magnets," three in number, are 6 ft. 6 in. long, and the armature weighs 30 cwt. The steam-engine is of 100-horse power. It has a cylinder 9 inches in diameter, the stroke being 10 inches, and it makes 600 revolutions per minute. This machine will generate sufficient current for 800 full-size lamps. In reference to this subject it may be stated that Dr. Cohn, of Breslau, thinks he has discovered that, so far from the electric light being injurious to the eyes, it is actually better than daylight! Especially is this said to be the case

* Corresponding to holes in an Argand. See description in JOURNAL, Vol. XXXVI., p. 886.

with colours. Compared with daylight, the electric light increased the sensation of yellow sixtyfold, of red sixfold, and of green and blue about twofold. Eyes that in daylight could perceive and distinguish colours with difficulty only, were considerably aided by the electric light, and the visual perception generally was much strengthened by it. It is not stated what particular system of electric lighting it was that so favourably impressed Dr. Cohn.

THE FRICTION OF WATER IN HOSE-PIPES.

The loss of water pressure by the use of hose-pipes was forcibly shown in the course of some recent American trials of fire-engines. With india-rubber hose-pipes 200 feet long and 2½ inches in diameter, the difference in pressure at the engine and at the connection of the branch-pipe was equal to a loss of about 50 per cent. for the length of pipe named. The actual figures showed an initial water pressure of 173 lbs. per square inch, reduced at the end of the hose to 93 lbs. It is stated that with two hose-pipes delivering equal quantities of water, one being twice the diameter of the other, the friction and consequent loss of pressure in the smaller will be 30 times greater than in the larger; or the larger will deliver, with an equal friction, 30 times as much water as the smaller. Hence the advisability of using large hose-pipes for fire extinguishing, or other purposes for which large quantities of water are required. The larger hose will be little more expensive than the smaller, sometimes used, for the latter is frequently specified to withstand pressures of from 300 to 600 feet of head, whereas, according to the data here adduced, whenever those pressures are given by a pumping-engine or from a main-pipe, the hose is not subjected to much more than 50 per cent. of the maximum.

ARTIFICIAL INDIGO.

As one derivative of coal tar—alizarine—has supplanted madder in the dyeing of Turkey red, so another and even more important natural dye-stuff—indigo—has been successfully imitated by M. Adolph Baeyer, of Munich, and the particulars of the process, first announced a short time since, are now published. M. Baeyer begins with orthonitrophenylpropionic acid, which he mixes with it from 10 to 20 times its weight of sulphuric acid of sp. gr. 1·840, taking care to prevent a rise in temperature above, say, 20° C. The mixture rapidly assumes a bright yellow or orange colour, and the reaction is allowed to proceed until no appreciable quantity of the first-named acid can be detected. The orange-coloured mixture is then treated with a 5 per cent. solution of ferrous sulphate, and allowed to stand until the blue colour is fully developed, when the dye-stuff or colouring matter thus produced is separated out of the mass by diluting it with water, by which the dye is precipitated. The colouring matter resembles vegetable indigo in appearance and properties, but it is soluble in aniline at ordinary temperatures, and also in an aqueous solution of sulphurous acid.

IMPROVEMENT IN DRY GAS-METERS.

On the 27th ult., Mr. W. Haldane, of Edinburgh, applied for a patent for "Improvements in the Construction of Dry Gas-Meters;" the improvement consisting in placing in the inlet and outlet chambers vertical instead of slide valves. By this means the inventor believes there will not be the same liability to wear, so as to allow the gas to pass without being registered, as with slide-valves of the ordinary construction and action. The effect, too, of condensation from the gas—which has a tendency to make the slide-valves stick, and so not only interfere with the correct registration, but often stop the meter altogether—it is asserted, is entirely removed in Mr. Haldane's meter; besides which, the vertical valves being lifted and lowered by a horizontal cam, the meter works with less friction than with slide-valves.

Communicated Article.

THE TRANSPORT OF MATERIALS FOR GAS-WORKS.

ILLUSTRATED BY THE PLANS OF THE
YORK, NEWCASTLE-ON-TYNE, AND BECKTON GAS-WORKS.

By V. WYATT,

Constructing Engineer to The Gaslight and Coke Company.

SECOND ARTICLE—YORK GAS-WORKS.

In proceeding to describe the three examples illustrated, and detailed in these papers, the first taken will be that of York, including the railway system and communications for the combined old and new gas-works. By an inspection of the plan accompanying the present number of the JOURNAL, it will be seen that the old gas-works are in close proximity to the new ones, being divided only by a navigation and a public road; and the two sites are joined together, and almost made into one, by the Gas Company's bridge, which crosses these thoroughfares. The old works are to the west of the new site, and are situated at Monkgate, near the Monk Bridge, York, and chiefly bounded by the Foss Navigation and public road over which the before-mentioned connecting bridge is placed. The old gas-works have attained a make of 1½ million cubic feet of gas per diem, consuming about 150 tons of coal as a maximum, and having a yearly gross make of gas in 1879 of 220 million cubic feet, with a gross consumption of over 26,000 tons of coal. These works are now utilized to their fullest extent, and cannot be extended on the present site. The coal hitherto used at these works has been from year to year carted from the railway station, over the streets of the city, at a cost of upwards of 1s. per ton, including the necessary waste from double loading, exposure, cart transit, extra trimming in coal store, and other losses. The old works being

insufficient for the growing demands of York, which has a population of about 60,000 inhabitants, the new site was secured, situated to the east of the Foss Navigation and the public road, and to the south of the Scarborough main road leading from York, between Monk Bridge and Layerthorpe. Upon this site are being erected the new works shown on the plan, and which when fully developed, will turn out an additional make of gas of 1½ million cubic feet per day of 24 hours; thus giving to the manufacturing power of the combined establishment of the old and new works a total yield of about 3 million cubic feet per diem.

The means of communication for the transport of the coal and other materials into and out of the works have been laid out for the united accommodation, as before stated, of the old and new works. The coals and materials will, for the future, be mostly brought from the North-Eastern Railway system, by means of the York Cattle Market branch, to which latter line, the works of the Gas Company are joined, to the east of the property, and distant about 130 yards from the new site. At the point of junction with the North-Eastern Railway branch, parallel sidings have been put in for 20 loaded and 20 empty 10-ton coal waggons. The special line of railway built by the Company for the use of their works, diverges from this point in a cutting, and goes by single line on to the viaduct across the site of the new works, through lands specially purchased, with curves of 330 feet and 500 feet radii, and a rising gradient of 1 in 40. It then passes over the new site on a level double-line railway viaduct for a distance of about 100 yards to the navigation, supported by cast-iron columns, with 20-feet centres, or bays, the rails being 14 feet above the new formation or ground-level of the new works. The line is then carried by a single-line wrought-iron girder bridge across the navigation and public road by two spans, of 58 ft. 3 in. and 46 ft. 3 in. each, when it enters the old site. This combined bridge is an essential and somewhat expensive part of the undertaking, as a headway of 16 feet had to be given to the navigation, and 14 feet to the public road; and a condition of its erection, on the part of the York Corporation, was that it must be of an ornamental character, and subject to the approval of that body. The bridge is now in course of construction with the other new works, and by wisely conceding to the wishes of the York Municipality in some matters of detail, and through the instrumentality of the late Lord Mayor, Mr. Wilberforce, the Gas Company have been saved the expense and worry incidental to a supplementary application to Parliament for fresh powers. This fact shows that all corporations and public bodies are not of an obstructive and perverse type, as is too usually assumed, for the above consent was graciously given by the York authorities without exacting the usual *quid pro quo* in money, and other black-mail, so common to the inception and carrying out of public works. The bridge will connect the old and new works together not only for the purposes of transport of materials and railway communication, but also as an ordinary road access to and fro, and with the necessary means for pipes and mains to link together the factories of the combined undertaking. The railway, upon a single-line viaduct, is continued to the west of the bridge, on the high level, by curves of 100 feet and 75 feet radii, and on an incline, still rising, of 1 in 200, round the three old gasholders of the old works, and turning round north, and almost at right angles, it enters the old coal store, at a level of about 12 feet above the floor where the coal will be deposited for the use of the old works. This method of coal delivery will feed these works with the least possible interference with the buildings and mode of manufacture, and dispense with the present costly and inconvenient system of horse carting of coals, which has been carried on for so many years.

To return to the double line of straight viaduct across the new site, previously described; by a reference to the plan it will be seen that there is a branch single-line viaduct which turns off at the east abutment upon a curve of 150 feet radius, which afterwards splits up into two single-line viaducts, on reverse curves of 150 feet radii, entering the new retort-house on each side, still at the high level of 14 feet above the ground line, and 13 ft. 6 in. above the firing floor of the retort-house. The two lines will run the entire length of the new retort-house, and put the coals under cover, in front of each face of the retort-benches. The retort-house being intended for the storage of coals as well as for carbonizing them, it has been designed 210 feet long by 110 feet in width. The viaducts upon the new site can be utilized as coal stores in the open, whenever it may be necessary, from increased manufacture, colliery strikes, or other causes, to add to the storeage. Generally speaking, however, the coals will be used in a fresh condition from the colliery, as the means of communication will be direct, and almost daily with the northern and other coal-fields, similarly to the prompt and rapid systems of delivery laid down for the Newcastle and Gateshead and the Beckton works, where the supply of coals has been likened to the coming in of the morning's new milk—constant and diurnal. In the York works it is intended, in the future, to construct low-level or ground railway lines, as shown by the dotted lines on the plan, descending from the high-level or viaduct system at the east end, to transport the coke, materials for repairs, spent lime, and other products, so as to link in the railway system with the navigation quay and roads, and to utilize to the utmost extent the economical features of the new site.

The resultant economy to the Company by the introduction of the new transport arrangements will be immediately upwards of £1500 per annum for these moderately sized works; to say nothing of the facility, quietude, and certainty of the new system. The confusion and muddling together of waste, delay, dirt, horse and human labour, speculation, and worry with the "one-horse cart style" of delivering coals upon gas-works, can only be properly understood and appreciated by those who have had the misfortune to carry out such a state of things year after year.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE TAX UPON COALS USED IN LONDON.

SIR,—At a recent meeting of the Metropolitan Board of Works, a proposal for the Board to take action, in unison with the Corporation of the City of London, for the extension of the period for levying the coal and wine dues, was carried, with one only dissentient—viz., Mr. Robert Jones, C.E. Of the 7,468,144 tons of coals on which City dues of 1s. 1d. per ton (amounting to no less than £404,084 9s.) were paid last year, the Gas Companies of the Metropolis and the surrounding towns and villages are by far the largest consumers, and with the threatened competition of other modes of lighting, it behoves all interested in them to oppose any attempt to extend the duration of this most anomalous impost.

Judging by the consumption of coal by The Gaslight and Coke Company, which last year was a little over 1½ million tons, and that of the other large Gas Companies on the south side of the river, and the outlying ones of Woolwich, Croydon, Crystal Palace District, Mitcham, Kingston, Brentford, Uxbridge, Harrow, Tottenham and Edmonton, &c., &c., the total quantity cannot be far, if anything, short of 3,000,000 tons, on which the 1s. 1d. duty amounts to £162,500. At the meeting of The Gaslight and Coke Company, on the 11th inst., the Governor said that the Proprietors would be astonished to hear that the rates and taxes of the Company now amounted to £70,000 a year; and the vast majority of them will, no doubt, be equally surprised to learn that last year the City dues on the coals they purchased amounted to £68,101, about 1½ per cent. on their ordinary share capital, or about 8 per cent. of the price which the Governor stated as the average cost of coal at the works. On the common coal, however, of which 9-10ths of their consumption is composed, the percentage on the cost, including freight by steamer, will be within a fraction of 10 per cent.

It is worse than absurd that whilst every article necessary for our food and clothing is exempt from any taxation whatever, the coal which is required to cook our meat, grind our corn into flour and bake it into our daily bread, force the water into our houses, and lighten our darkness, should be so heavily burdened.

The tax, which began in its present shape in 1832, when the change from measure to weight was inaugurated, ought to have ceased long ago; but the various Acts for its extension have been generally pushed through Parliament when public attention has been fully occupied with questions of grave social or political importance, as is the case at present. As the Gas Companies, and other great consumers of coal, have not a Remembrancer to watch the proceedings in Parliament, and defend their interests, I trust that you will allow this letter to appear in your columns, and thus assist me in bringing this subject to the notice of my fellow-Shareholders, and in urging upon them the expediency of combining together to give a most strenuous opposition to the proposed further prolongation of the time for levying these dues.

London, Feb. 14, 1881.

CUI LUMEN ADEMPITUM.

THE PROPOSED AMENDMENT OF THE SALE OF GAS ACT.

SIR,—In view of an effort to amend the Sale of Gas Act, as noticed in the JOURNAL of this week, and following in the wake of the most important of the suggested amendments—viz., the testing of indices—will you allow me to call attention to the need, as I think, of revising the scale of fees now charged for testing meters.

The present scale, as applied to the testing of dry meters only, is, I think, remunerative, considering the facility they offer in testing. The wet meter, however, is the reverse of remunerative, especially certain kinds from Scotland. When one considers the extra trouble and expense incurred in testing wet meters, in sizes up to 20 lights, as compared with dry meters, the need for an alteration seems reasonable.

First, there is the filling with water (an item of expense), and the draining off of the surplus; then testing for soundness, and also at two levels for error; and the emptying of the meter, coupled with the greater care required in the handling of it if it have an iron case. On the other hand, the dry meter being so portable and less liable to fracture than the iron-case wet meter, has but two tests applied—viz., for soundness and error.

Again, the quantity of gas or air passed through a wet meter in comparison with a dry one, size for size, is considerably less in the latter than in the former; and more uniform in quantity, among different makers, is the marking of the dial. Not so with the wet meter, in which there is as great a diversity in the sizes of index-drums as in the number of makers of meters. I have tested some Scotch meters with a 10-foot index-drum in a 2-light meter; and, as a consequence, they took nearly 1½ hours to test (and sometimes twice tested), for the absurdly small charge of 6d.!

It seems reasonable that the wet meter should pay more than the dry one up to, say, 20 lights, for above this size wet meters are in advance of dry ones in the scale of fees.

In large centres of the meter trade, the testing of meters may pay expenses—as in London and elsewhere, where the aggregate make is large, and more especially in London, where dry meters are largely made and used.

J. URQUHART.

Gas-Meter Testing Office, Manchester, Feb. 18, 1881.

SIR,—In the article contained in the JOURNAL of the 15th inst., the fact was stated that the Metropolitan Board of Works have put themselves in communication with the Board of Trade, with a view to bring about some alterations in the Sale of Gas Act, the principal alteration proposed being the compulsory verification of meter indices. Such an extension of the testing operations will, I apprehend, be acceptable alike to meter makers and to those who buy and use meters; and it is a thing to be desired, for the reasons given in the article. The present tests apply to the parts of a meter in which the smallest amount of error is possible, and leave unchecked those parts in which very grave errors might occur.

While admitting so much, I must say that I am surprised that the

Metropolitan Board have been able to “accumulate such a store of evidence” respecting errors in indices of gas-meters, because after 30 years’ experience—during which period thousands of new meters have been made, and thousands of others, including samples of meters of almost every maker in the kingdom, have been repaired in the shops of my firm—I can safely say that not more than 20 instances have occurred in which the indices have been erroneous; and some of these were due to the blundering of ignorant gas-fitters into whose hands the meters had fallen for repair (?). To some men of this class an index is a proper index if it can only be fixed on to a meter and will go. The most common mistake, however, which was made by “botchers” was in respect to spindle-wheels and worms. But errors in this direction are generally detectable by the present legalized tests, if they are conducted with great care and keen watchfulness.

I am glad to say that the operation of the Sale of Gas Act has almost entirely put an end to the miserable system of “botching” up meters which used to prevail, especially in country towns; the final result being discredit thrown unjustly on the makers.

As regards the mode of testing indices, I am decidedly of opinion that a meter should be presented to an inspector as a complete instrument, and the index be verified when attached to the meter. Such a method forms the basis of a patent held by Mr. George Joslin; and I may state that I expect within little more than a week to place in the hands of the authorities of the Standards Department a simple apparatus capable of automatically verifying indices while attached to meters wet and dry, or separated, from the smallest up to the 100-light size. The requirements for larger indices can also be easily satisfied.

Mr. Joslin’s system requires a small modification of the usual index, and this can readily be made. The advantages of the system are great, for in the event of any dispute as to the registration of a verified and stamped meter, an inspector would be able to ascertain the correctness or otherwise of the gas chambers, and of the index of such meter, without removing any part of it—thus avoiding the necessity of refitting the index or its cover box, if the meter were found to be in all respects correct.

From every point of view it appears to me that such a system is the most rational, convenient, and best suited to the requirements of trade.

55, Millbank Street, S.W., Feb. 19, 1881.

F. W. HARTLEY.

GAS COMPANIES AND THE FUTURE OF THE GAS INDUSTRY.

SIR,—I was greatly disappointed at being unable, at the last moment, to attend the meeting of The Gaslight and Coke Company; but have read your full account of, and interesting leader upon the day’s proceedings. I had looked forward with some anxiety, and a little curiosity, to the probable reference by the Governor to our old enemy, the electric light. I dub it an “old enemy,” because of the disastrous panic its re-introduction a few years since brought in respect to gas property; and I was thankful to find that the subject took a somewhat prominent position in that gentleman’s speech, and in the discussion which followed.

While, on the one hand, there is no “crisis,” and need be no panic, nor anything approaching it, yet it must be admitted that there is a “situation,” at least, hitherto unknown to gas companies—a contingency now existing for the first time. Gas, which has heretofore monopolized the whole field of artificial lighting, has now a competitor. About this there is no doubt whatever, and it must, I think, be welcome to every thoughtful gas proprietor to find that the largest gas company in the world—the pioneer of this particular industry, and the most successful in developing generally the gas interest—should be the first to set so good an example, and be alive to the desirability and wisdom of meeting our competitor upon equal terms—i.e., to demonstrate what gas can do in the way of practical and economical lighting. It is a step in the right direction to thus improve the lighting of Whitehall and Parliament Street. It would also be most prudent to light, and that permanently, one of the bridges—say London or Westminster, or both.

I trust this is but the beginning of a new policy. During the whole history of gas companies it has been deemed sufficient to leave the gas at the meter, and the consumer there too, and let them fight it out as best they might. In 1874 I contributed a paper to the British Association of Gas Managers, upon “The Desirability of Gas Companies extending their Control to the Consumer’s Burner.” Recent events make this proposition still more acceptable; for, Sir, I am convinced that the day is gone for ever when companies can afford to stand by and see their gas burned anyhow. Not only do the whole surrounding circumstances of benefit point to the wisdom of companies taking this matter thoroughly and earnestly in hand, but respect for the fair and legitimate position of the industry itself, and the important part it has hitherto played in the nation’s social development, suggest that indifference and apathy must not only be not tolerated, but condemned.

Gas is just now a very great and still growing interest in the kingdom; its field of usefulness being not yet half developed. Let us, who make it our profession, get the idea deeply impressed upon us that the future of gas lighting and its uses can be greatly improved, and then heartily set about effecting it, so that our light may have at least fair play with the electric or any other. Gas will not have anything to fear, when a proper comparison of effect and cost is made. This movement of The Gaslight and Coke Company will bring about thus much, at any rate. I trust its example and influence will rapidly spread.

2, King William Street, E.C., Feb. 18, 1881.

I. A. CROOKENDEN.

MR. G. E. STEVENSON AND MR. SCOTT-MONCRIEFF ON ECONOMY OF CARBONIZATION.—Mr. Enoch Evans writes us in reference to Mr. G. E. Stevenson’s critique last week of Mr. Scott-Moncrieff’s proposal in regard to coal carbonization. In the course of his letter Mr. Evans says: “The calculations based upon 2442 British units of heat being equal to 615½ calories are wrong, because 615½ calories = 1108 British units. The water produced during combustion is not 18, but 9 times the weight of hydrogen consumed. Besides this he [Mr. Stevenson]

ignores the latent heat of steam. If he will refer to Dr. Percy's volume on 'Fuel,' he will find the correct figures, showing the intensity of combustion of hydrogen to be 2684, and that of carbon 2718—a difference hardly worth pointing to at present." Mr. Evans adds: "To this important subject, I suspect coke makers could contribute as much useful information as gas makers. A conference of the two would probably elicit the more important facts from each."

Parliamentary Intelligence.

HOUSE OF LORDS.

TUESDAY, FEB. 15.

The Examiners reported that the Standing Orders applicable to the Bray Township Bill had been complied with.

Petitions against the East London Water Bill were presented from (1) Whitechapel District Board of Works; (2) Metropolitan Board of Works; (3) Corporation of the City of London; (4) Commissioners of Sewers of the City of London and the Liberties thereof.

HOUSE OF COMMONS.

MONDAY, FEB. 14.

Petitions against the following Bills were presented:—

Dudley Gas, from Corporation of Dudley and consumers of gas.

Holland (Parts of) and Sutton Bridge Water, from Earl of Lindsey.

TUESDAY, FEB. 15.

A petition against the Cleator Moor Local Board Bill was presented from Lord Leconfield.

WEDNESDAY, FEB. 16.

A requisition to withdraw their petition against the Bingley Water and Improvement Bill was presented from the Aire and Calder Navigation Company.

THURSDAY, FEB. 17.

A petition against the Beverley Water Bill was presented from the Corporation of Beverley.

FRIDAY, FEB. 18.

Petitions against the following Bills were presented:—

Beverley Water, from North-Eastern Railway Company.

Cleator Moor Local Board, from London and North-Western and Furness Railway Companies.

Legal Intelligence.

GENERAL ASSESSMENT SESSIONS, WESTMINSTER.

MONDAY, FEB. 14.

(Before Mr. P. H. EDLIN, Q.C., Assistant-Judge, and a Bench of Justices.)

The Court for hearing appeals under the Valuation (Metropolis) Act, 1869, was held this day. The following are cases affecting Gas and Water Companies:—

SOUTHWARK AND VAUXHALL WATER COMPANY.

There were three appeals on behalf of this Company—viz., in respect of property in the parishes of St. Mary Magdalen, Bermondsey; St. Mary, Battersea; and Lambeth. Upon the first of them being called on, Mr. WEBSTER, Q.C., who appeared for the appellants, was about to open the case, when

The ASSISTANT-JUDGE said he observed there were several cases in which Railway Companies, Gas Companies, and Water Companies, were appellants; and having conferred with the Justices, they were of opinion that it would be convenient to all parties to make separate lists of these cases, and take them together on a day that would suit Counsel engaged in them.

Mr. WEBSTER said he was much obliged to his lordship; the course proposed would be very convenient. In the present case the parties were in negotiation, and in all probability the Court would not be troubled with it. He suggested that the three cases should stand over for a fortnight.

The ASSISTANT-JUDGE said no; they had better not name any day at present, but let an application be made later.

CHELSEA WATER-WORKS COMPANY.

In this case Mr. HENSHAW appeared for the appellants, and Mr. ALLEN, jun., for the respondents.

Mr. HENSHAW said a compromise had been effected, to which Mr. ALLEN assented.

The ASSISTANT-JUDGE said he must have proof of the Surveyor of Taxes having been served with notice of this appeal.

Mr. Joseph Bond was then called, and stated that he was Clerk to the Assessment Committee. He had seen Mr. Colquhoun, the Surveyor of Taxes, after the Committee had inquired into the matter, and arranged terms; and he said he was perfectly satisfied if the Committee were. Mr. Colquhoun gave witness to understand he had received notice of this application.

The agreed alteration in the valuation was then made in the book as follows:—Gross value, reduced from £400 to £334; rateable value, reduced from £300 to £250.

EAST LONDON WATER-WORKS COMPANY.

In this case Mr. BESLEY said he believed the matter was being settled; but he was not in a position to dispose of it just at present.

CRYSTAL PALACE DISTRICT GAS COMPANY.

This case also had been settled.

Mr. POLAND appeared for appellants; Mr. CASTLE for respondents.

Proof having been given by Mr. Pitt, Clerk to Messrs. Pontifex, Solicitors to the appellants, that notice had been sent to the Surveyor, who had acknowledged receipt of it,

Mr. POLAND stated the terms agreed upon—viz., the gross value to be reduced from £14,000 to £10,400; the rateable value from £8950 to £8000; the parties to pay their own costs.

SOUTH METROPOLITAN GAS COMPANY.

This Company had presented twelve appeals in respect of property in different parishes.

In one case, that of the parish of Lambeth, it was stated by Mr. GREENE, Counsel for the appellants, that terms had been agreed upon—viz., to reduce the gross value from £28,705 to £28,000, and the rateable value from £24,000 to £23,500; but though he was informed the Surveyor of Taxes had been served with notice to this effect, he was not in a position at present to prove it.

The ASSISTANT-JUDGE said in that case he could not alter the book; but proof might be adduced hereafter.

It subsequently appeared, however, that the question of costs had not been agreed, so that the matter may yet have to be tried.

LONDON GASLIGHT COMPANY.

There were five appeals on behalf of this Company, in which Mr. BESLEY appeared for the appellants, and Mr. POLAND for the respondents.

In one case, affecting the parish of St. Mary, Lambeth, an arrangement had been made by which the following remarkable reduction is to be effected:—Gross value from £600 to £63; rateable value from £500 to £52 10s.; the respondents also to pay the costs.

The other cases stood over to come on for trial with the other Gas Companies' cases, the ASSISTANT-JUDGE stating that they would probably not be tried till this week.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

THE METROPOLITAN BOARD OF WORKS AND THE SOUTH METROPOLITAN GAS COMPANY'S BILL.

At last Friday's meeting of the Board, the Parliamentary Committee presented a report, in the course of which they stated that they had considered the question whether any action should be taken in support of the Board's petition against the South Metropolitan Gas Company's Bill, by which it is proposed to authorize the Company to purchase additional land, and to raise for this and other purposes additional share capital to the amount of £1,000,000, with borrowing powers to about one-third of this amount. One of the allegations in the petition of the Board is that the initial price should be lower than 8s. 6d. per 1000 feet, the amount fixed by the Company's Act of 1876; but the Committee reported that it did not appear to them desirable that the Board should appear before a Select Committee and press this point. Further, that as the Bill provides for the sale of the new capital by auction, the Committee considered that the interests of the consumers are sufficiently protected. They accordingly recommended that no action be taken in support of the Board's petition.

Mr. FREEMAN having moved the adoption of the report,

A discussion ensued, in the course of which an amendment—that the report be referred back to the Committee for re-consideration—was somewhat warmly supported, and eventually carried.

The Solicitor was then authorized to employ Counsel to support the Board's petition.

BIRMINGHAM CORPORATION GAS SUPPLY.

The report of the Gas Committee presented to the meeting of the Birmingham Town Council last Tuesday, contained the following, among other, intimations:—

The Committee have accepted a tender, at £42,054, for the roof of the retort-house at the Windsor Street new gas-works. The expenditure of various other amounts at the several works have also been authorized.

Favourable contracts have been made for an additional 3000 tons of coal, and the Committee have made an advantageous contract for the sale of the ammoniacal liquor produced at the Windsor Street works, for seven years from the 29th of September next.

The Committee have been in communication with the Free Libraries Committee as to the plans for the proposed New Offices and Art Gallery. The plans of the building have now been finally approved by both Committees, and the Architect has been instructed to proceed with his design for the elevations. The Committee hope to report to an early meeting of the Council that the contract for the concrete work and the foundation walls has been made. A tender for the excavations, at £888, has been accepted.

The awards with respect to Oldbury and Tipton have been taken up, and the Local Boards of these places have agreed with the Corporation to pay one-half of the costs—£791 17s. 6d. The amounts awarded are—Oldbury, £22,750; Tipton, £33,700. The Committee have been in negotiation with the Smethwick Local Board, in the hope of being able to fix the amount to be paid for the Smethwick portion of the undertaking without having recourse to arbitration. They regret, however, that they have not been able to come to an agreement, and they are now in communication with the Local Board, with the view of limiting the cost of the arbitration in this case.

The new lamps round the Town Hall have now been fixed, with the exception of a 5-light lantern which it is proposed to place at the west end of Paradise Street. When complete the additional cost of this lighting will be £650 per annum. The Committee have agreed to light courts or terraces outside the borough on the terms which are charged for such lighting within the borough; and, at the request of the King's Norton Lighting Authority, they have laid down mains for a considerable extension of public lighting in the parish of Moseley.

The Committee have been informed that the annual meeting of the British Association of Gas Managers will be held in Birmingham in June next, and they are taking steps to give the Association an official reception during the congress.

The quantity of coke in stock at the various works on Dec. 31, 1880 was 6616 tons, as against 6054 tons at the corresponding period of 1879. The sale of gas for the year was 2,675,755,400 feet, as against 2,645,396,200 feet, being an increase of 30,359,200 feet; but after deducting from the sale of 1879 the consumption at West Bromwich in the latter half of that year—viz., 62,761,800 feet, which has now ceased—the increase in the district now supplied has been 93,131,000 feet, or at the rate of about 3½ per cent. The number of new services laid during the year was 2676, as against 2557 for the year 1879, being an increase of 119; while 153 official tests of the illuminating power of the gas were made during the year, the highest being 17·87, the lowest 16·39, and the average 17·26 candles, or about 2½ candles in excess of the parliamentary standard. The number of cooking and heating stoves and gas fires supplied during the year was 601.

The annual balance-sheet and statement of accounts show a net profit for the year of £57,009 2s. 9d., and £4075 9s. 4d. has been appropriated to the sinking fund for the redemption of loans and annuities, making a total of £73,485 16s. 2d. to the credit of this fund.

The Committee recommend that the balance of the profit and loss account should be appropriated as follows:—£25,000 to the borough improvement fund for 1880, £6000 to the new offices account, and £26,009 2s. 9d. to the sinking fund, which will then amount to £99,494 18s. 11d.

The Committee have informed the Finance Committee of the Council that they hope to place £25,000 to the credit of the borough improvement fund in the present year.

The total amount of unpaid accounts and arrears available for collection on the 31st of December was £5765, as compared with £702 at the corresponding period of 1879.

They then go on to say: "In fulfilment of the promise made in their last report to the Council, the Committee have very carefully considered whether any reduction in the price of gas will be possible this year. The

Council are now expending large sums in the extension of works to meet the growing consumption of gas in the district. These sums are borrowed at considerably lower rates of interest than were possible while the undertaking was in private hands, and the Committee are of opinion that whenever a reduction is made in the price of gas, the Council are entitled to devote a further annual sum to public purposes. Although the accounts for 1880 do not show a large margin for a reduction in price, the Committee, having regard to the more favourable contracts for residuals, which will partly come into operation during this year, recommend that the price be reduced by 3d. per 1000 cubic feet from the beginning of the current quarter. The Committee are of opinion that so long as there is no advance in the price of coal it will be possible to make this reduction, and also to devote the necessary sum to the New Offices account; but they think it needful to state that the reduction cannot be maintained if there is any important advance in the price of coal before the next contracts are made."

LIVERPOOL UNITED GASLIGHT COMPANY.

The Half-Yearly General Meeting of this Company was held on Tuesday last—Mr. E. LAWRENCE in the chair.

The SECRETARY (Mr. P. F. Garnett) read the report of the Directors, which was as follows:—

The Directors having caused to be prepared and submitted to them an estimate of the profits of the Company for the half year ending the 31st of December last, and having duly considered the same, recommend the Proprietors to declare a dividend for the half year of £5 on every £100 of the ordinary consolidated stock, and at the rate of £3 10s. for every £100 on the consolidated "B" (7 per cent.) stock, and on the capital paid up in respect of the new £7 10s. shares.

The Proprietors will have received notice of a further call in respect of the new £7 10s. shares, rendered necessary by the enlargement of the Company's works in progress at Linacre, which had become imperative on account of the rapid increase in the consumption of gas. It is probable that the remaining unpaid capital will shortly require to be also paid up.

The Directors have to announce with much regret the recent death of one of the Auditors, Mr. J. A. D. Watts, whose place the Proprietors are invited to fill up.

The CHAIRMAN, in moving the adoption of the report, said he had very great pleasure in being able to tell the Shareholders that during the past half year a sufficient amount of profit had been realized to pay the full dividends for that period. This was not a usual circumstance, from the simple fact that the receipts for the first half of the year were always less than they were for the second half; but it so happened that the Company's business had materially increased, and for the first time, probably, he was enabled to say that they had actually earned their half-yearly dividend during the first half of the year. The only matter to which he need refer in the report was the fact that the Directors had made a call upon the shares so as to place the Company in better funds, in order to meet the expense of carrying out their additional works at Linacre, required by the increased consumption of gas which was continually going on. The capital account up to the end of last year showed that they had exceeded the amount actually called up to the extent of about £9000. This of course would alone necessitate a further call; but beyond this they were now under a contract for the further expenditure of a sum amounting in the whole to about £65,000 for the extension of the Linacre works. For this purpose the Directors had made a first call of £1 10s. on the "C" shares, and it was more than probable they would in the course of time have to call up the remainder of the capital on these shares. It would be satisfactory, he thought, to the Shareholders to know that the Company was in so prosperous a position; but there was this peculiarity in regard to gas companies, that they were required to meet the greatest demands upon their supply for only a short period of the year. During the remainder of the year the consumption of gas was comparatively limited, and the excessive consumption was restricted to a few weeks in winter; but, at the same time, it was necessary for the Company to be prepared to supply the extra quantity of gas required by the city during a short period. He need hardly tell the Shareholders that during the winter they were passing through the consumption had been of the most extraordinary character, and the Company had actually reached the maximum power of supply they at present possessed. Under these circumstances, it became necessary to look to the future, and the time was close at hand when they would have to provide for even a further extension of their works than was at present in progress.

Mr. H. B. GILMOUR seconded the motion.

A SHAREHOLDER remarked that the Proprietors must be almost unanimous in thinking that, on the whole, their affairs were in a very satisfactory state, but he wished, he said, to point out that the price of their stock was not so high in the market as it used to be, or ought to be. The cause of this was, no doubt, the scare raised in reference to the electric light. Sooner or later electricity would take the place of gas to some extent for certain purposes, and he had no doubt the Board had fully considered what would be the position of the Company in this event. He did not doubt that, even if the streets of the city were exclusively lighted by means of electricity, there would be plenty of scope for the use of gas in one way or another; but he thought something might be said by the Directors to reassure the public generally, and thus increase the value of their property. The speaker then referred to the new mode of extracting gas from coal, as described in the lecture given by Mr. Scott-Moncrieff before the Society of Arts a few weeks ago, by which a better quality of gas could be obtained, and a coke left capable of being consumed in ordinary grates, the result being an immense saving in the manufacture of gas. He had no doubt, he said, that the Directors had had under their consideration all questions of this kind, but at the same time he should be obliged if one of them would enlighten the Shareholders as to the position of the Company with reference to these scientific improvements which were now assuming an importance that had not hitherto attached to them.

Another SHAREHOLDER said it was apparent that at present they had a demand for as much gas as they could manufacture, but they ought to look forward to the time when they would be able to extend the supply for other purposes than those for which it was now employed. Gas was well adapted for heating purposes, and he suggested that an exhibition might be held in Liverpool similar to those which had been held in Glasgow, Leeds, and other places, showing the best kinds of gas heating and cooking apparatus, &c. He thought the Company would be justified in setting aside a sum of about £1000 to be expended in prizes to be awarded at such an exhibition. There were great outcries about London being a smoky city, and Liverpool would soon be in the same position; but this difficulty about the smoke could be greatly overcome by the adoption of gas for many purposes for which coal was now used.

Mr. J. HOUGHTON thought that the past management of the Company's affairs by the Directors was a sufficient guarantee that they would take advantage of every opportunity for extending the consumption of gas as well as economizing the production of it. He presumed the Directors were not apprehensive of any serious interference with the consumption of gas, in consequence of the experiment, about to be made by the Corporation, of lighting some of the streets by means of electricity; and if the Directors gave the Shareholders an assurance of their belief that the consumption of gas would go on increasing, it would be all the more satisfac-

tory to them as a body. He, however, had every confidence that the Directors would take advantage of everything likely to improve the position of the Company; and judging from the extension of their works which had been rendered necessary, he thought their hopes for the future were pretty fair.

A third SHAREHOLDER asked what the position of the Company would be supposing the Corporation decided to light all the streets within the city with the electric light, leaving the streets in the outskirts to be lighted with gas. Would the Company be compelled to light the streets in the outskirts, whilst the lighting of the city itself would be done by the Corporation?

The CHAIRMAN said he and the other Directors were extremely obliged to those gentlemen who had favoured them with their comments. Replying to the first speaker, he would say that he was afraid the Directors could not in any way attempt to control the price of the Company's shares in the market. This, he supposed, would be regulated by the confidence the public had in the Company. Naturally where there had been a scare, such as had been produced by the electric light, it left on the mind of the public an impression which it took a long time to remove, and people who at present invested in gas shares no doubt did so with a feeling that they did not quite know what might turn up in the future, and, therefore, they would not pay the same price, but looked to a larger return on their money than they did before, in order to provide, as it were, a sinking fund for the contingencies of the future. As to the prospects of the Company, the Directors felt the most perfect confidence in it, and that there was not the slightest reason to anticipate any trouble. With regard to electricity, they knew it was a potent factor in the lighting power of the present day, and it would be madness for any one to ignore it. What might be the future of electricity it was impossible to say, and he for one was not going to predict anything in reference to it, because scientific development was so rapid that what seemed an impossibility one day became possible the next, so to speak. He thought, however, he might safely venture to say that, from all that was known of electricity now, it was never likely to supersede the use of gas, because gas possessed properties, particularly the property of heating, which electricity did not possess. In this respect, therefore, electricity, as far as one could see, would never become a substitute for gas. The purposes, in fact, for which gas was used as a heating power were becoming so multiplied that there was every certainty of there being a continuous increase in its consumption, whatever might be the future of electricity. As to the lighting of the streets by the electric light, the Corporation had decided on making an experiment in this direction; but what might be the cost was altogether another matter. The experiment was not one that was based on economical principles, and the lighting of the streets by gas was very much cheaper. If the Corporation should decide on applying electricity on a much more extended scale than that embraced in the present experiment, it would then probably become a question for the ratepayers whether they were prepared to pay a much larger sum for the one process of lighting than the other. But even were the Corporation to decide to light the whole of the city by electricity, and not take a shilling's worth of gas from the Company, it would only affect the consumption of gas in Liverpool to the extent of 7½ per cent., which, at the present rate of increase in the consumption, would only be equal to one year's increase on the entire consumption. Therefore, as a Company, they could look with perfect indifference on such a loss, and feel satisfied they would be able to maintain their dividends and carry on their business as satisfactorily in the future as in the past. As to the suggestion made that the Company should give prizes to be competed for at an exhibition of gas heating apparatus, he thought they could not legally do this. The Directors were fully alive to the necessity of doing all they could to promote the consumption of gas, but the suggestion was hardly one which could emanate from the Directors.

The motion was then put and carried, after which the dividend recommended in the report was agreed to. Mr. T. F. Abraham was appointed an Auditor, in the place of Mr. Watts; and a vote of thanks was passed to Mr. Lawrence for his conduct in the chair.

The CHAIRMAN, in acknowledging the vote, said the Shareholders might rest assured that the Directors would do all they could to protect their interests, and also to promote the interests of the city generally.

The proceedings then terminated.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

The Annual General Meeting of this Company was held on Wednesday, the 16th inst.—Alderman HEDLEY in the chair.

The following report of the Directors was presented:—

The Directors have the pleasure to submit the statement of accounts and their report for the year ending Dec. 31, 1880. It will be seen that the total receipts on revenue account are £121,633 11s. 4d., and the expenditure £76,618 11s. 6d., leaving a balance of £45,014 16s. 10d. to the credit of profit and loss account, which they recommend shall be appropriated as follows:—

To the payment of interest on debentures and loans . . .	£4,805 10 3
To meet the intermediate dividend of 3½ per cent. paid on the 21st of August last . . .	16,875 0 0
To the payment, on the 23rd of February inst., of a second half year's dividend of 4 per cent. . .	18,000 0 0
To the credit of renewal fund (making this fund £17,500) . . .	5,000 0 0
Balance	3,334 6 7
	£48,014 16 10
Balance brought down	£3,334 6 7
To which add balance from last year	15,785 0 6
	£19,119 7 1

Making together
To be carried to the credit of next year's account.

Notwithstanding the reduction of 3d. per 1000 cubic feet in the price of gas made in January, 1880, the balance of revenue account from all sources this year is £2364 9s. 3d. more than for the year ending June, 1879, which was the last time when a full year's account was rendered; and the Directors have decided that a further reduction of 3d. per 1000 cubic feet be made, to take effect from the 1st of January this year, making the price of gas in the two boroughs of Newcastle and Gateshead 2s. 3d. per 1000 cubic feet, less the usual discount of 10 per cent., or only a small fraction over 2s. per 1000 cubic feet net.

During the year there have been laid, in extensions and renewals, 11½ miles of pipes of all sizes; 987 new branches have been laid, and 1374 old ones renewed; 2084 meters have been repaired, tested, and re-fixed; and 131 new lamps have been erected.

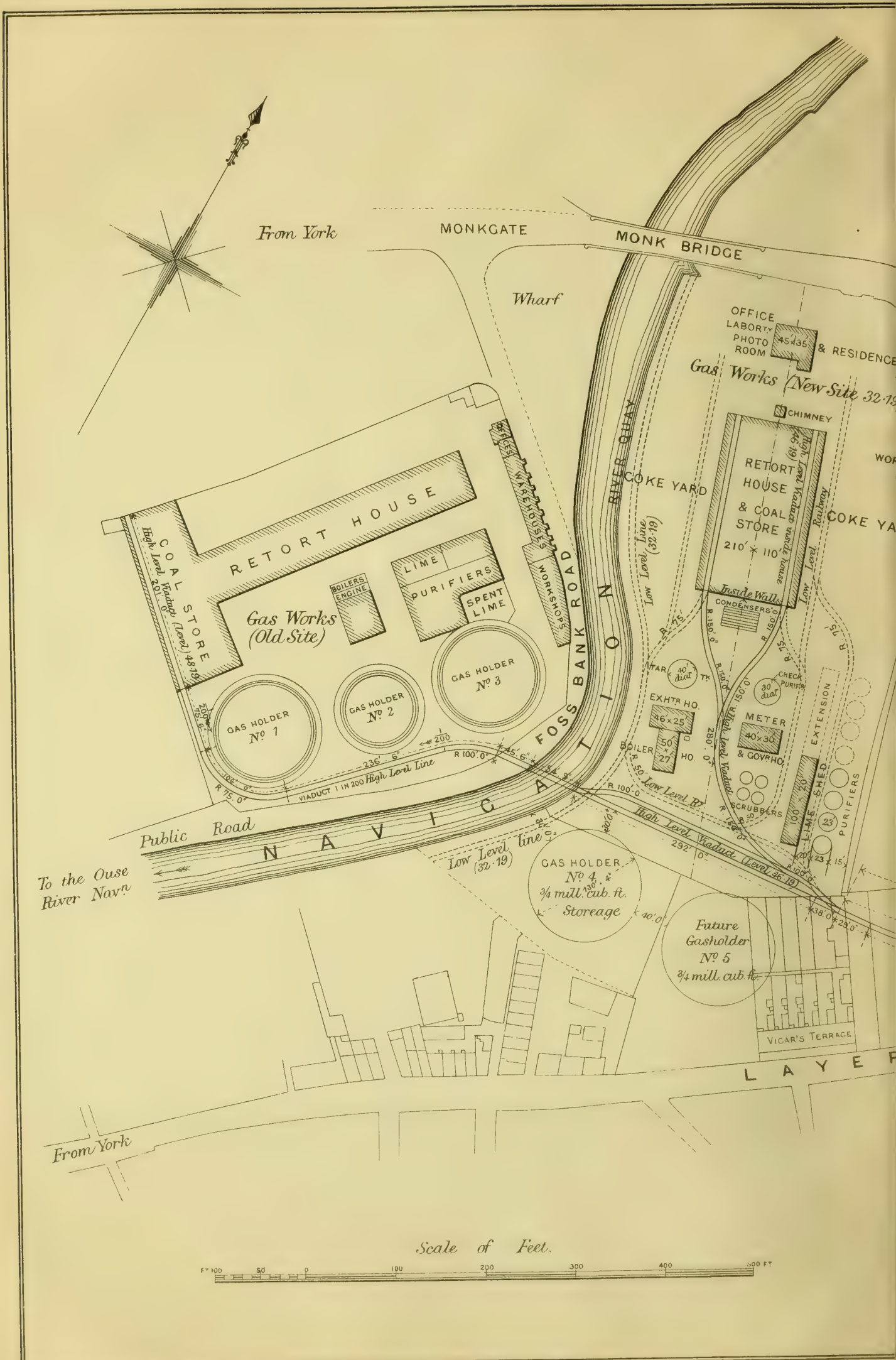
The building of No. 2 retort-house at Redheugh has been nearly completed. The fitting up of the same, and the other works required, will be continued during the present year.

The great increase in the Company's business having necessitated an extension of office room, the Directors have, since the last meeting, purchased a site in Grainger Street West with that object, the cost of which, and of the additional works at Redheugh, may require the whole or a portion of the £50,000 additional capital which the Directors were authorized to raise at the last general meeting.

The three Directors who retire by rotation are Mr. W. Brown, Mr. T. Hedley, and Mr. B. Plummer; but they are eligible for re-election, and offer themselves accordingly. The Auditors—Mr. J. H. Richardson and Mr. R. Y. Green—also retire, but offer themselves for re-election.

Mr. F. R. Goddard was named by the Company at the last annual meeting as Public Auditor, and his nomination met with the approval of the Corporations of Newcastle and Gateshead.

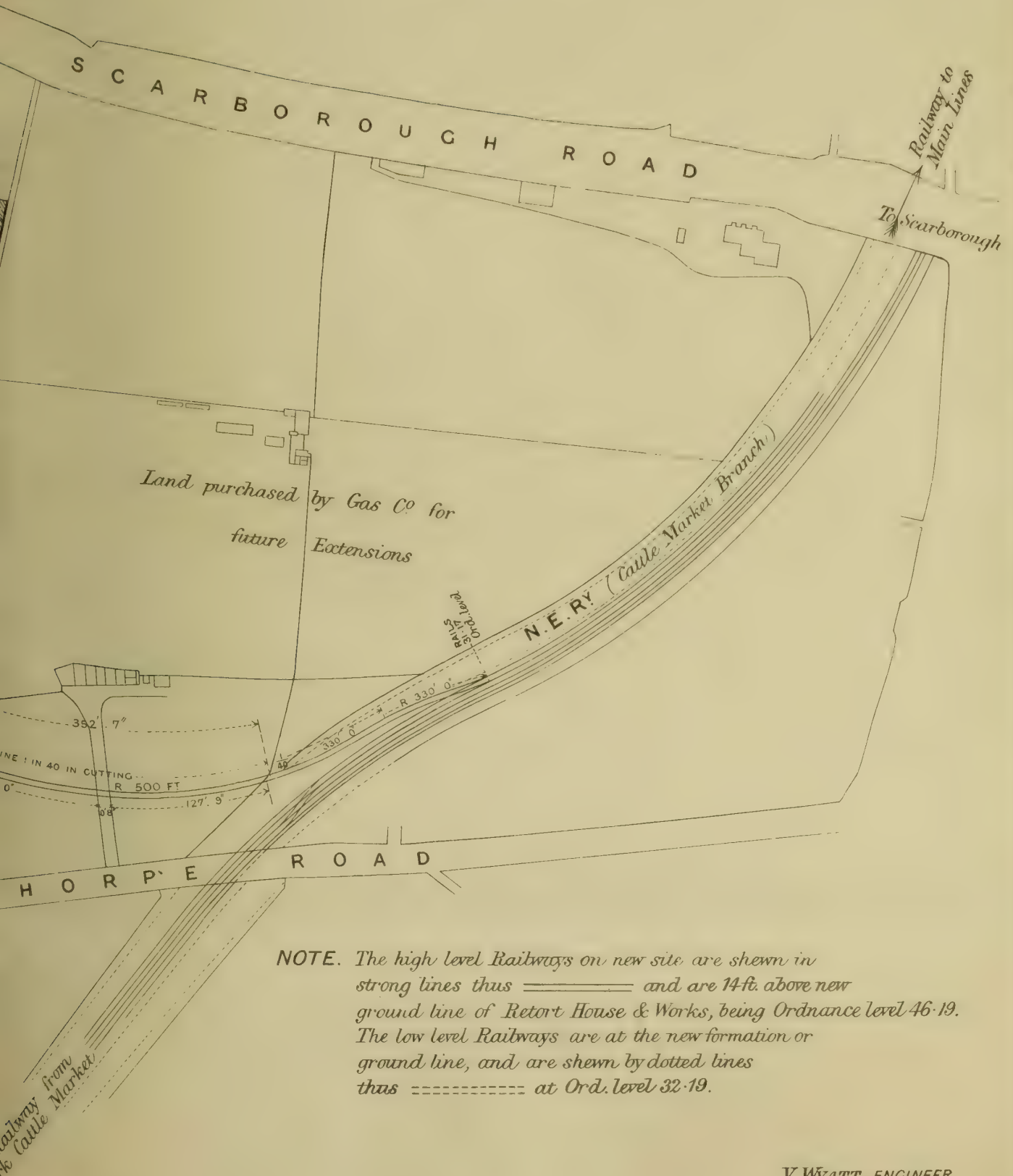
The CHAIRMAN said he had to congratulate the Shareholders on the



YORK UNITED GAS COMPANY.

GENERAL PLAN SHEWING OLD & NEW WORKS.

1881.



V. WYATT, ENGINEER.

Jan^y 1881.

very satisfactory position of the Company financially. The works at Elswick had been generally overhauled, and this had contributed to the sending out of better gas. During the last six months a large condenser had been erected, which would also assist in further improving the gas at Elswick. At Redheugh the new retort-house had been kept nearly in full work during the past three months, owing to the great demand for gas. There was not, however, last year, so large an increase in the demand for gas as had been witnessed in many previous years—the 8 or 10 per cent. increase which they had been accustomed to had not occurred. In fact, 675 tons less coal had been carbonized than in the full year ending June 30, 1879. But notwithstanding they had carbonized so much less coal, they had made 25 million cubic feet more gas, and sold 20 million cubic feet more than in the last full year referred to. Out of a smaller quantity of coal they had obtained a larger quantity of gas than formerly. During the year, 10,363 feet of gas had been made from each ton of coal, which was much larger than had been made in any previous year; and the Directors attributed this result very much to the Redheugh works, and the improvement in the Elswick works. They had sold during the year ending the 31st of December last, 881 million cubic feet of gas, and it was the largest quantity ever sold by the Company in a similar period. On referring to the capital account, the Shareholders would find that they had spent during the past year, for land and other expenses for new offices, £7436. He expected they would be able to meet in these larger offices at their second succeeding annual meeting. The Directors had been compelled to obtain new premises in consequence of the increase in the Company's business. In the capital expenditure the Shareholders would also find £13,000 laid out upon the new retort-house they were now busy with at Redheugh. It would probably require the whole of the coming summer and a portion of the next to complete, and by this time probably it would be available for the enlarged requirements of the Company. Coming to the revenue account, the price of gas had been reduced 3d. per 1000 feet. The reduction to a similar extent last year had been equivalent to a surrender of annual income to the amount of £9000, yet the quantity of gas sold during the year made the receipts only £2500 less than they were in the previous year. There had been received £2000 more for coke and £600 more for tar, so that the Company's total income was £124,000 this year against £125,000 last. The working expenses for 1880 were £3300 less than they were for the year ending June, 1879. This very favourable statement enabled the Directors to bring forward a balance of £48,014 as the profit on the year, before making any payments whatever. Out of this sum loans and debentures to the amount of £4805 had to be paid, as well as the full 7 per cent. dividends, and the Directors were also able to pay out of the balance 15s. per cent., or 5s. for each penny reduction in the price from that of last year. In addition to this they were able to appropriate £5000 to the credit of the renewal fund, making £17,500 to add to the balance. They had therefore to their credit in the books £36,000, or quite a full year's dividend. With regard to the current year, it had opened exceedingly well. Their contracts were very favourable, and there was a considerable increase in the price of coke. The tar contract was quite 1s. per ton increase on the former price. These items would throw a large sum into the Directors' hands. After careful consideration they had come to the conclusion that they might risk another reduction in the price of 3d. per 1000 feet from the 1st of January this year, which would reduce it from 2s. 6d. to 2s. 3d., less 10 per cent., making the net price 2s. 0.3d. to the consumers. The Directors hoped they had not done wrong in this. They had a good balance in hand, and the extra price they were getting for their coke and tar would be a great help to them, while the very low price of the gas would tend to increase its consumption for heating and other purposes. Since 1874 they had reduced the price of gas from 4s. to 2s. 3d., but as 3s. 4d. was their normal price, the consumers were reaping a benefit to the extent of 1s. per 1000 feet. As to the electric light, the Shareholders would all have noticed the great advance that had been made in it during the past year, and particularly by a talented townsman of their own, Mr. J. W. Swan. They would also have noticed that a local Company had been launched within the last few days in connection with it. What the result might be they could not say. They, as Directors, had no fear whatever that the electric light would do the Company any harm. They thought there was plenty of room for both. The only effect they thought it was likely to have upon them was to check the constant increase in the demand for gas. During the 25 years he had been connected with the Company everything they had had been doubled about four times. The Company was in an excellent position; and even supposing the electric light should come more into use than was contemplated, they had the power to raise the price of gas from its present rate to 3s. 4d., which, on their current consumption, would make a difference in income of £35,000. This meant that the Company at present gave the consumers—in other words the rate-payers—of the two boroughs the sum of £35,000 a year. He did not think, however, that the need would come for raising their price in such a manner, supposing they could buy their coal at the present rates. In conclusion, he moved that the report of the Directors be adopted, and that a dividend of 4 per cent., free of income-tax, be declared for the half year ending the 31st of December last.

Alderman PLUMMER seconded the motion, and it was carried unanimously.

The retiring Directors and Auditors having been re-elected,

Mr. G. TWEDDELL moved—"That the Shareholders of this Company take this favourable opportunity of expressing their sincere thanks to the Board of Directors for the very substantial increase in the dividend, brought about by the good management and enterprise exercised by the Chairman and his colleagues, and that the sum of £150 be taken from the revenue account for the purchase of a piece of plate, which shall, at the next Shareholders' meeting, be presented to Mr. Alderman Hedley, the Chairman of this Company, in appreciation of his past great commercial foresight and valuable services."

Mr. LEADBITTER seconded the motion.

The resolution was unanimously adopted, and a Committee appointed to carry out the details of the presentation.

Mr. LEADBITTER proposed that the Directors should take into consideration the services rendered to the Company by Mr. W. Hardie, the Secretary. Although, he said, the Shareholders very justly gave great credit to their Chairman and the Board of Directors, they should not lose sight of the fact that in Mr. Hardie they had one of the best of secretaries—one who had thrown his whole heart and soul into his work; and he hoped there would be no difference of opinion as to this being a suitable time for them to recognize the work he had done. He (Mr. Leadbitter) would therefore submit that the Directors should be authorized to put aside the sum of 50 guineas, to be presented to Mr. Hardie in whatever form might be thought fitting.

Mr. GRACE seconded, and Mr. HOGG supported the motion.

The CHAIRMAN concurred with the motion, and said the Directors knew Mr. Hardie's qualities, and appreciated them. They were glad to see this proposal emanating spontaneously from the Shareholders.

The motion having been carried unanimously, the proceedings terminated.

PETERBOROUGH GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Tuesday, when the following report was presented and adopted; the recommendation in it, in regard to dividend, being unanimously agreed to:—

The balance of the profit and loss account—including £87 4s. 9d., brought forward from the last half year's account—is £2836 1s. 3d. Out of this sum, after providing for the payment of the preferential dividend on the 5 per cent. new preference "A" shares, the Directors recommend the payment of the maximum dividend for the half year on the remaining share capital of the Company, and a back dividend at the rate of 1 per cent. per annum, or 1s. per share, on the ordinary shares of the Company, for the half year ending March 31, 1874 (which completes the payment of back dividends), free from income-tax.

The payment of such dividends will absorb the sum of £2375 5s., leaving a balance of £460 16s. 3d., which your Directors recommend shall be applied as follows:—viz., that £200 be placed to the credit of the contingent fund, £100 to the reserve fund, and the balance—amounting to £160 16s. 3d.—be carried forward to next half year's account.

During the past half year there has been a very fair increase in the consumption of gas, and this, together with the exercise of economy in the working expenses, has produced the favourable results shown by the accounts.

In concluding this report, the Directors have much pleasure in recording their satisfaction of the efficient condition of the works, and the thorough state of repair in which they are maintained by the Engineer and Managers—Mr. G. Ernest Stevenson.

The Company's capital consists of £20,000 of original, and £10,000 of new ordinary £10 shares; £19,650 of new "A" ordinary, and £9500 of new "A" preference £10 shares; besides which there has been raised on mortgage £6446 10s. The whole of this amount of £65,596 10s. has been expended on works and plant except £352 13s. Revenue account shows sales of gas during the past six months to have realized £5383 12s. 3d.; meter-rents, £119 1s. 9d.; residuals, £1221 17s. 5d.; fittings and sundries, £75 14s. 6d. Manufacturing charges amounted to £2491 10s. 9d.; repairs and maintenance to £336 16s. 10d.; sundry charges, &c., &c., to £1147 1s. 9d.; and interest, bad debts, and allowances to £179 3s. 7d. These figures, after making due allowance for the difference in the stocks in hand on June 30 and Dec. 31, left a balance of £2748 16s. 6d. to carry to profit and loss account. The contingent and reserve funds together amount to £2057 0s. 10d. During last half year the make of gas, per ton of coal carbonized, averaged 10,850 feet.

BURY ST. EDMUND'S GAS COMPANY.

The Sixty-third Half-Yearly General Meeting of this Company was held on Friday, the 11th inst.—Mr. G. THOMPSON in the chair.

The following report of the Directors was presented:—

The Directors congratulate the Shareholders upon the present position of the Company. The good results of the late enlargement and improvement of the works are now apparent, and except for the late attack upon the Company, the Directors would, from the 1st of January inst., have reduced the price of gas to the general consumer; but until it is seen what legal and other expenses the Company may be put to, the Directors consider it more prudent to postpone any immediate alteration in the price. The Directors will, however, urge a settlement of the question raised by Mr. Beard by the mode pointed out by our original Act, without any further delay, and that question disposed of, we shall, we hope, be enabled, from the 1st of April next, to reduce the price of gas from 4s. 2d. to 3s. 10d., which will then justify the payment of a further dividend of 1 per cent. upon each class of shares.

The Directors will recommend the payment of a dividend for the past half year of 11s. per share on the 1849 capital, 8s. 6d. per share on the 1859 capital, and 8s. per share on the 1879 capital.

[The accounts to Dec. 31, 1880, presented with the report, showed receipts from the sale of gas and the rental of meters, £2102 5s. 3d.; coke, tar, and ammoniacal liquor, £625 16s. 6d.; fittings and sundries, £167 3s. 7d.; balance brought forward, £3338 13s.—total, £6233 18s. 4d. From this amount were deducted the accounts uncollected on July 1, 1880, £1387 18s. 1d., leaving £4846 0s. 3d.; adding to this the arrears due on Sept. 30, and the accounts due to Dec. 31, and then uncollected, brought the total to £4830 18s. 6d., to which was added the surplus stock applicable to dividend, £361 18s. 5d., making a grand total of £5692 16s. 11d. The disbursements were—Coke, £1338 11s. 4d.; salaries and wages, £974 13s. 2d.; rates and taxes, £71 14s. 4d.; meters, £99 14s. 11d.; repairs, £184 14s. 3d.; the miscellaneous items making up a total of £2769 5s. 2d.; the unclaimed dividends and those due on Jan. 1, 1881, amounted to £1463 18s. 10d.; leaving a balance to be carried forward of £4459 12s. 11d. There had been received on capital account (share and loan) £33,500, of which there had been expended to June 30, 1880, £33,350 7s. 10d.; expended since, £41 18s. 6d.; leaving a balance of £107 13s. 8d. The reserve fund account amounted to £3619 2s. 6d. At the end of the last half year it amounted to £3538 12s. 2d. The account of the premium fund on the sale of the 1879 capital showed that on Aug. 16 the receipts amounted to £952 12s. 3d. The additional receipts had been invested in Consols.]

The CHAIRMAN, in moving the adoption of the report, said the Company had passed through some trouble, but he hoped they were now in a position to satisfy the public by giving them a good light, and at the same time to deal justly with the Shareholders by giving them better dividends. He trusted the accounts placed before them would be deemed to be satisfactory. The past winter had been an exceptional one, and no doubt many of their friends had suffered great inconvenience at times from want of light; but this had not arisen from any lack of care on the part of the Manager, who, in common with all his men, had striven to the utmost to remedy the inconvenience. The wages were less than they had been in the corresponding half of last year, and he trusted the Directors conducted the Company's business in the most economical manner consistent with the interests of the Shareholders and commercial integrity. Their coals were all paid for up to Dec. 31, and he was glad to say that they would reduce the price of gas from the 1st of April. He felt sure that before they parted they would express their thanks to their Manager, Mr. John McCrae, who was leaving them. He (the Chairman) regretted this very much. He did not like to lose an old friend at any time; but Mr. McCrae had been with them under peculiar circumstances, and he trusted they would tender him the thanks he so richly deserved.

Mr. BURROUGHS seconded the motion, and it was carried.

The retiring Directors (Messrs. Burroughs and Portway) and Auditor (Mr. J. Thompson) were then severally re-elected, and each briefly returned thanks.

A vote of thanks was, on the motion of Mr. T. RIDLEY, seconded by Mr. PORTWAY, accorded to the Chairman, for his services to the Company, and in responding,

Mr. THOMPSON proposed that a similar compliment should be paid to the Secretary (Mr. W. Salmon).

This motion was seconded by Mr. HOY, and carried.

The SECRETARY, in acknowledging the vote, thanked the Shareholders for the confidence they placed in him. The Chairman had, he said, wisely refrained from discussing recent experiences, and he (Mr. Salmon) intended to follow his example. Referring to the statement in the report as to the reduction in the price of gas, he said that when it was uncertain whether or not the Company would have to spend large sums of money in law costs, the Directors wisely determined to hold their hands; but now that all differences had been settled there was ground for generous action, and the price of gas would be reduced from 4s. 2d. to 3s. 10d. per 1000 feet. This was due to the general consumers, because they had not given the Company any trouble, or made any complaint; indeed, he did not think there had been reason for complaint, because even before the Company's new Act came into force the Directors had been anxious to reduce the price of gas whenever they could. It was desirable for the Shareholders that they should understand their position. A reduction in price brought an increased dividend, but only on one condition—viz., that the Company

earned enough profit to pay it. A reduction in the price of gas to the amount proposed meant a loss of £500 a year with the same consumption, and there was this sum to come off the receipts in 1881. Previous reductions had been followed, however, by an increase in the consumption, and he hoped this would be the case again. The past few years had been very prosperous ones, and to this various causes had contributed. To a large extent their prosperity might be traced to their able Manager, for everything that brought profit or loss came within his jurisdiction. The prospects of the Company in the future were none the less bright, and he hoped that of those present some would live to see the building sites in the town occupied and extended, and the use of gas increasing similarly. To their 1800 general consumers the reduction announced would be an important consideration during these hard times; and with respect to the Shareholders, the additional 1 per cent. must be earned before it was paid. He wanted to have this distinctly understood, so that no misunderstanding might arise. The reduction in price was a necessary preliminary to an increase of dividend, but if the money was not earned the increased dividend could not be paid; at least he did not think the meeting would wish the reserve fund to be drawn upon to pay any increased dividend, for let them once affect this important fund and their £10 shares would not fetch £23. He again thanked the meeting for their kindness, and said he hoped he should be able to discharge his duties in the future as he had done during the past 30 years.

A vote of thanks having been passed to the Auditors,

The SECRETARY submitted to the meeting the following motion:—"That while this meeting cannot otherwise than offer its congratulations to Mr. M'Crae on his appointment as Manager of the Dundee Gas-Works, it at the same time feels deep regret at the loss of his services as Manager of the Bury St. Edmund's Gas-Works, and this being the last time he will attend, it offers him its best thanks for his very valuable past services to the Company." In doing so he said he felt certain that with the first part of the resolution all would agree, and they would offer to Mr. M'Crae their most hearty congratulations upon his appointment to Dundee. Mr. M'Crae went from a small town and small works to one of the largest works in the kingdom, where he would have under his charge some 300 men. The meeting would thus understand the amount of responsibility that would devolve upon him. There were at Dundee lots of people who were against Mr. M'Crae's appointment, because they thought he was too young. The wise men, however, knew that they had appointed a man with the right stuff in him, and he would live to overcome his youth. During Mr. M'Crae's term of office the Company had had large and most important works executed. They had not called in an engineer, nor had they called in any special aid; but their Manager had restored the works, and had added the largest gasholder the Company had ever had, the work being carried out in the most masterly way. The result of the labours of their Manager had been one unbroken success. He (Mr. Salmon) had worked with Mr. M'Crae for several years, and did not remember to have had one solitary jar, a single difference, or a disagreeable word. He did not like to lose Mr. M'Crae, and so, in order to see his face amongst them he had a suggestion to make which he hoped would be agreed to. It was that Mr. M'Crae be appointed Consulting Engineer to the Company, at a fixed salary of £10 10s. a year. They would then be enabled to have Mr. M'Crae amongst them once a year. He would go over the works, and they would have the benefit of his advice. The works had cost over £80,000, and were well worth this extra charge.

The CHAIRMAN said he seconded the motion with the greatest pleasure.

Mr. HOOPER suggested whether appointing Mr. M'Crae the Company's Consulting Engineer did not tend to show that the man they were going to employ was not equal to the work.

The SECRETARY said they did not want a Consulting Engineer so far as their new Manager was concerned, for he was quite competent to manage the works. The appointment was more of an honorary character, to enable Mr. M'Crae to come down to see the works he had made so prosperous—works that were worth £60,000.

After a short conversation, the motion was carried with acclamation.

Mr. M'CRAE, in responding, said he must tender both the meeting and Mr. Salmon his most sincere thanks. He felt he did not deserve such expressions as had been used towards him, and when he had only tried to do his duty there was not much to thank him for. He accepted their proposition, but he could not accept the £10 10s. At the same time he hoped to be with them once a year.

Mr. SALMON (interrupting) said the motion was carried, and could not be altered.

Mr. M'CRAE said the Company could be justly proud of their works, for they were in a first-class condition. Their business had been conducted in an upright and straightforward manner. The consumers had cause for congratulation in the fact that they would henceforth be burning gas at the cost of 3s. 10d. per 1000 feet; which they must think was cheap gas. Mr. Salmon was quite right in saying they had never had a jar; he did not think they ever had. The Company had an excellent Secretary, and with regard to their new Manager, he could say with confidence that he was a first-rate man and a good gas manager. He had been well trained, and had had large experience, so that they need not fear for their works. If an alteration were made, he hoped it would be an improvement, and that the new-comer would be a better Manager than he (Mr. M'Crae) had been. He left Bury St. Edmund's much against his will, so far as the people were concerned; but circumstances rendered it desirable.

A vote of thanks was then passed to the Chairman, and the proceedings terminated.

CITY OF POTSDAM WATER-WORKS COMPANY, LIMITED.

The Sixth Annual General Meeting of this Company was held at the London Offices, Queen Victoria Street, E.C., on Friday, the 11th inst.—Mr. F. BENNOCH in the chair.

The SECRETARY (Mr. H. R. Duke) having read the notice convening the meeting,

The CHAIRMAN, in moving the adoption of the report and accounts, said they indicated such steady progress as to give the Directors full faith and confidence in the future of the Company. They had frequently visited the works, and had come to the conclusion that in the future they would have a Company not surpassed by any in regard to substantiality of structure, the quality of the article they supplied, or in regard to the probable profit that would hereafter be realized. They had stood in need of some further capital, and through their friend, Mr. Conrad, the Superintendent at the works, they had obtained an advance of £5000 from the Municipality of Potsdam. This was not only a satisfactory operation in a financial sense, but, in addition, it exhibited on the part of the Municipality the kindest interest in the Company's affairs, and showed that they were satisfied with what had been done. The Company had now a cash balance and sundry debtors amounting to £3923—in fact, they were financially perfectly at ease; and in all probability they had ample means to carry them on until the ordinary income of the Company sufficed to meet the whole of their present engagements, including all current expenses and debenture interest. The total of their indebtedness was expressed in the amount they owed to the Municipality. The revenue account naturally was not

satisfactory, for it still showed a deficiency of £2374 to be added to the profit and loss of 1879 (increasing this amount to £2820). They had increased the number of their consumers by 96 in the past year, but the present year opened more satisfactorily, and the people generally were fast recognizing the importance of having a reliable supply of pure water. After referring to the decision taken by the Directors to reduce their fees by one-half—viz., to £400—until the Company could meet their expenses and debenture interest, he alluded to the probability of a large additional amount of water being required, owing to the extension of the sewerage system. The completion of the drainage of the city had been resolved upon by the Municipality, and this would greatly improve their position. He next referred to the continued purity of the water, and to there being an inexhaustible supply. Their machinery was so powerful that by the use of one engine for each alternate day they raised into the reservoir enough water to supply the whole of their customers, so that if they had two engines going at full work they could supply a population five or six times larger than they had at present. The population was now given at 50,000, not including the army population—about another 10,000. They had received a most satisfactory report from Mr. Duke and Mr. Scott on the condition of the works, after the visit of these gentlemen last year. Since their last meeting Lord Hotham and Mr. Tucker had resigned their seats at the Board, and in their places the Directors had elected Mr. Hildyard and Mr. Barker, with whose appointments he expressed great satisfaction. The Directors were pressing more and more on the authorities of Potsdam the necessity of having water from the Company's works, and the sooner the people understood that the best preventive of certain periodical epidemics was a plentiful supply of pure water, the better it would be for them and the Company.

Mr. HILDYARD seconded the motion, and it was carried unanimously.

The retiring Director (Mr. Bennoch) and the Auditor (Mr. Frederick Latreille) having been unanimously re-elected,

A hearty vote of thanks was passed to Messrs. Duke and Conrad, on the motion of the CHAIRMAN, seconded by Sir STEPHEN WALCOTT.

In reply to a question, the CHAIRMAN expressed his belief that one-half of the entire canalization or drainage of Potsdam was virtually completed, and it was fully expected that by the end of 1882 the whole would be finished.

On the motion of Captain WICKHAM, seconded by Mr. E. J. BARTLETT, a vote of thanks was passed to the Chairman and Directors, and the meeting separated.

SOCIETY OF ENGINEERS.

As briefly noticed last week, the Annual Meeting of this Society was held on the 7th inst., on which occasion the President for this year (Mr. Charles Horsley, Assoc. M. Inst. C.E., F.G.S.), in the course of his Inaugural Address, touched upon various topics of special interest to the gas profession. We, therefore, have pleasure in reproducing the following portions of the address:—

One of the most prominent features of the past year, scientifically speaking, has been the great advance made in electric lighting; and it may perhaps prove interesting if I not only give a few particulars respecting this advance, but also briefly notice the various systems of electric lighting which have led to it. One of the earliest systems in the field was undoubtedly the Jablochhoff, with which we have all been familiar for the past two years on the Thames Embankment, the second year of its adoption there having been completed on the 13th of December last. This system consists of what is known as a "candle," which is composed of two carbon rods united side by side by means of kaolin. The current is generated by Gramme machines, the arrangement usually being to have one producing a continuous current, and connected with it a second and larger machine producing an alternating current, and excited by the first one. The notable example of public lighting by this system on the Embankment is too well known to need comment here. Suffice it to state that on the 13th of December, 1878, 20 lights were started on that portion of the Embankment between Westminster and Waterloo Bridges. On the 10th of May, 1879, the lighting was extended eastward from Waterloo Bridge to that of Blackfriars, 20 lights being added to the 20 already working. A further extension of the system was effected on the 10th of October, 1879, when 10 more lights were placed on Waterloo Bridge, bringing the total number of public lights in that locality to 50. Later on, 10 more lights were supplied from the plant and machinery at Charing Cross, which was originally laid down for 20 lights only, the further extension being the lighting of the Victoria Station of the Metropolitan District Railway. The whole of the machines for these 60 lights are driven by one of Messrs. Ransomes, Sims, and Head's semi-fixed engines of 20 nominal horse power, there being three pairs of Gramme machines. This development of electric lighting means something more than that 60 lights are successfully maintained from an engine of 20-horse power nominal. It means that very considerable distances have been bridged over, and that, other things being equal, electricity can be applied for illuminating purposes at distances from the source of power which appeared incredible a couple of years ago. In the case under notice, there is a light-producing centre at Charing Cross, and the last electric lamp at Blackfriars Bridge is one mile from that centre. The extreme lamp at the Victoria Station, however, is 1.65 miles from the centre, the range of frontage thus actually covered being 2.65 miles. With regard to cost, I may observe that the price paid by the Metropolitan Board of Works under their first contract was 6d. per light per hour, the lamps being kept lighted for six hours every evening. Upon the Board increasing the number of lights to 40, the price was reduced to 5d. per light per hour; a further reduction to 3d. being made when the number was increased to 50, and the contract renewed for six months. The contract for the year ending the 10th of next April was taken at 2½d. per light per hour. The Jablochhoff system of electric lighting is now in operation not only in public thoroughfares, notably in Paris, but in a great number of works and private establishments, as well as in those of public resort. In common with two other systems it has been selected by the Corporation of London for the illumination of a portion of the City.

One of the other two systems to which I have just alluded is that of Messrs. Siemens Brothers, which has been in operation for some years past for lighthouse illumination and for other purposes, including interior lighting. An excellent example of its application in this latter respect is to be seen at the British Museum, the reading-room of which was first thus lighted in October, 1879. Eleven lights in all were fitted up, four being in the reading-room, four in other parts of the Museum, two in the courtyard, and one at the rear of the building. The four lamps in the reading-room are supplied with continuous currents, each from its own Siemens dynamo-electric machine. The other 7 lights are supplied from one Siemens machine, producing an alternating or dividing current, two different systems thus being used. The motive power for driving the machines, which are six in number (the sixth being an excitor for the other five), is afforded by two 8-horse semi-fixed engines by Messrs. Wallis and Stevens. The most recent, as well as the most extensive, example of outdoor lighting on the Siemens system is that at the Royal Albert Docks

at Silvertown. The entrance dock is 700 feet in length, and opens into a tidal basin having a water area of 12 acres. This basin again opens into the main basin, which is 6500 feet in length, 500 feet in width, and has a water area of 72 acres. Connected with the main basin are two graving docks, one 410 feet, and the other 500 feet in length. The whole of this extensive area, which is about $1\frac{1}{4}$ miles in length, is electrically lighted by 26 Siemens lamps. There are four generating stations, in each of which is a 20-horse power horizontal engine, by Messrs. Marshall, Sons, and Co., driving seven Siemens dynamo machines, which act as light-producers, and an eighth machine of the same kind, which is used as an exciter. Each lamp is placed on a wrought-iron latticed standard 80 feet high. The stations have been arranged with a view to the further extension of the light space, power being reserved for supplying a total number of 24 lights from each station, or 192 lights in all.

The third system of electric lighting selected for the illumination of a portion of the City is the Brush system, which at the close of 1879 was introduced into England from the United States, where it was then in very extensive use, its adoption having since largely increased. This light is particularly well suited for interior illumination, for which purpose it has come into considerable use since its introduction in our own country. It is the invention of Mr. C. F. Brush, and it consists of a dynamo-electric machine of special construction. The lamps, or regulators, hold the carbon rods in a vertical position, and contain no clockwork or other mechanism, and no regulation or adjustment of any kind is required beyond that of renewing the carbons when consumed. An outdoor example of illumination by means of the Brush light is to be seen at the Liverpool Street Station of the Great Eastern Railway, and it has also been applied at the Houses of Parliament.

There are several other systems of electric lighting which are more or less prominently before the public, but which do not appear to have made such advances as those to which I have already referred. I cannot, however, pass them over without notice, as they each possess merit, and some of them may eventually come well to the front. The first of these is the Rapiëff light, which was brought out in June, 1878, and has since been adopted in the composing and printing rooms at *The Times* office, but I am not aware of its adoption elsewhere. The current is supplied from a Gramme machine, and the light produced is a very good one for interior illumination. The Wallace electric lamp was introduced in October, 1878. The light is produced in it along the edges of two carbon plates placed one over the other, edge to edge. The electrical current is generated by one of the Farmer-Wallace dynamo-magneto electric machines. Although this system promised well when tried experimentally, I am not aware that it has been adopted in practice anywhere in this country. The Werdermann electric light, which was introduced in November, 1878, differs from most other systems, inasmuch as it is a light of incandescence, the others having the voltaic arc. In the Werdermann system the carbons impinge upon each other—that is, they make contact; whilst in most other cases a definite space is preserved between the carbons—that of the voltaic arc. In the Werdermann lamp a carbon disc and a carbon rod were formerly used, but the carbon disc has since been replaced by one of copper. The current is supplied by a Gramme continuous machine, and the lamp is gradually coming into use for interior illumination, for which purpose it appears to be well adapted. The only other systems remaining for notice are the Wilde, the Jamin, and the Mackenzie. The Wilde electric light apparatus consists of an electro-magnetic induction machine, producing alternating currents, and a carbon-holder or lamp of simple construction. It was brought before the public in December, 1878, but I have not observed any record of its application, although, being a system which at its introduction promised well, it should, and doubtless has, met with some degree of success. The Jamin light consists of three electric candles, each candle being composed of two parallel carbon rods. The candles are burned, one at a time, point downwards, and the current is produced by a Gramme dynamo-electric machine. The new Royal Panorama in Leicester Square is to be lighted by this system, which is also being applied in a mercantile establishment on Ludgate Hill. Lastly, there is the Mackenzie electric lamp, which is about the latest addition to the list, having been introduced to public notice so recently as October last. The light is produced between the points of two carbon rods placed vertically one over the other, the consumption being followed up by means of an electro-magnetic arrangement. The current is produced either by a Siemens or a Gramme machine. The lamp worked satisfactorily for three weeks at the Exhibition of the Philosophical Society of Glasgow in October last, but I have not yet met with it in practice. As an indication of the progress made in electric lighting, I may mention that two Companies, which at the commencement of the year were simply companies for experiment and development, have recently found it necessary to undergo reconstitution as companies for the practical working of the systems they respectively represent. These systems are the Jablockhoff and the Brush.

It will thus be seen that there are nine different systems which have been brought more or less prominently before the public, although there are but three of which it may be said that they are fairly in the field as illuminating agents. These are the three to which I first directed attention. With regard to cost, there is little or nothing known generally.

There can be little doubt that for certain purposes, and under certain conditions, electricity is desirable as an illuminating agent. Its costly, delicate, and in some cases complex arrangements, and comparative uncertainty, however, will long prevent its adoption becoming general, much less universal; but where expense is no object, users can avail themselves of its advantage. I must not leave this subject without referring to the endeavours of Mr. Edison, that American genius, to perfect the electric light. All the patience, toil, perseverance, and remarkable intelligence of Mr. Edison have, however, not yet been rewarded with success, the promise of a couple of years ago remaining unfulfilled to this day. Nor can I see, after all that has been said about and for him and his electrical productions, that he is one whit more forward in the practical application of the electric light than we are here in England, if, indeed, he is so far advanced. Mr. Edison has done much good for electric telegraphy and electrical science generally, for which he has earned the gratitude of the world; but Mr. Edison's friends have done him and his credit much harm in the matter of electric lighting, for which they have earned the contempt of every disinterested and thinking person.

The appearance of the electric light in some of the streets and establishments of London about two years ago, was the signal for what at the time was known as the "gas scare." Many foolishly imagined that the reign of gas was at an end, and that it would be superseded within a very short period. Those, however, who took the trouble to think about the matter, saw that not only would gas still hold its place for general purposes of illumination, but that its use would actually increase. They remembered the predictions which were rife half a century ago upon the advent of railways, to the effect that horses would be rapidly superseded by locomotives, and they reflected upon the present high price and enormous demand for these animals. They remembered, too, how, upon the introduction of gas, it was said that candles would become a curiosity in a year or two, and oil go a-begging, and they called to mind the extensive

candle factories which are now to be seen in and about London and the provinces. Inspired by the partisans of Mr. Edison, some of the more garrulous of our daily papers helped to fan the flame, which, however, in course of time, became extinguished, as common sense began to regain its sway. There was, however, some show of reason at the bottom of the panic, for the public had been accustomed to such a miserable show of dingy yellow gas spots in our thoroughfares, that, dazzled by the new light, they could not conceive that gas illumination could be improved except at a prohibitory increase in cost. That the deficiencies of our street illumination are not due to the impossibility of obtaining a better light by the aid of gas except at a prohibitory cost was amply proved in three instances on a large scale during 1879. These three instances were so many practical answers to the doubts raised upon the subject, and they were conclusive answers too. These were, firstly, the special lighting of a portion of the Waterloo Bridge Road in January, 1879, by the then Phoenix Gaslight Company; secondly, the special lighting of Waterloo Place and a part of Regent Street by The Gaslight and Coke Company in the following month; and, thirdly, the special lighting of a portion of Queen Victoria Street by the same Company. In each instance Sugg's "London" Argand burners were used, the lanterns being also specially designed by Mr. Sugg. The burners ranged from 15 to 200 candles, according to position and other attendant circumstances; the larger burners being placed on refuges and at the intersections of roads. In each case a generous but not an extravagant display of gaslighting was afforded, and the immediate result of the experiments was to demonstrate most conclusively that in order to obtain a good light the conditions of illumination must be considerably modified and the cost somewhat increased, but not to anything like the prohibitory extent imagined by some. The practical outcome of these experimental displays, by which the gas companies showed what they could do if required, has been the adoption in many parts of London and the suburbs, and in many of our provincial towns, of the methods of illumination then employed by Mr. Sugg, who in each case carried out the views of the gas companies most creditably.

Not only did the advances made by the electric light warm into action the gas companies, but it also aroused gas engineers and those engaged in the manufacture of gas apparatus, so that in a short time there were several systems of improved gas illumination to make choice of. Amongst others, the Bray burner has been adopted in some parts of London and in some parts of the provinces as a special illuminator. The arrangement consists of a cluster of flat-flame burners of large capacity placed in a lantern similar in design to Sugg's. It is claimed for Bray's burners that they yield 20 per cent. more light with the same consumption of gas than those used in ordinary street-lamps. The "Phare" gas-burner is another flat-flame burner, and consists of a circle of gas-jets in combination with an arrangement for supplying the necessary quantity of air, the whole being contained within a special lantern. It is the invention of M. Phare, a French gas engineer, and a number of them are in use in the Rue du Quatre Septembre, Paris, where they are reported to be giving satisfactory results. For three months in the beginning of last year one of these lamps was to be seen in front of the Mansion House, London, and I believe there is one on the Old Steyne at Brighton.

Of a somewhat similar character to the "Phare" lamp, but giving inferior results, is the Mallett burner, which also hails from France, but which, as far as I am aware, has not gone beyond experimental trial in this country. The Wigham lantern and burner, the former being of hideous proportions, were in use for a short time towards the close of 1879 on the refuge at the top of the Victoria Embankment, by Westminster Bridge, where four lamps were placed. The burners were similar to those used in lighthouses and also for the signal light on the Clock Tower of the Houses of Parliament. This burner consists of 23 fishtail jets placed close together in a group, and surrounded by a sheet-metal cone, through which the air is conducted to the burners. Over the burners is a tubular flue for drawing the air over the tops of the flames in order to effect a more thorough combustion of the gas than would otherwise occur, the lantern being surmounted by a ventilating cowl. Those who saw the light will doubtless agree with me that there was a great blaze of gas, which, however, did not appear to be so economically used as it might have been. It will thus be seen that there are several systems of improved gas illuminations which offer themselves for choice, the advance of the electric light having caused a corresponding development in the direction of gas lighting.

The electric light has, however, done much more to increase the consumption of gas in another direction—namely, that of producing motive power. The application of the electric light has largely increased the manufacture of gas-engines for driving the machinery for producing the current for interior illumination, and there can be no doubt that a good gas-engine—and I advisedly say a good one—is a most useful motor for electrical purposes on a small or even a moderate scale of lighting; that is, for interior illumination. Besides this, the advantages possessed by the gas-engine over steam, and the perfection to which it has been brought, have rendered it available for numerous other purposes where only small powers are required, and where the use of steam is prohibited. Then, again, the use of gas for heating and cooking purposes is also making steady progress, if one may judge from the number of useful arrangements for the purposes which are before the public, and to which additions are occasionally being made. For heating rooms, conservatories, and baths by means of gas, special arrangements are continually being devised, with the view of minimizing the consumption of gas in detail, but thereby increasing the demand for it in the aggregate. For cooking purposes, the use of gas appears to be largely on the increase, and with a properly designed apparatus nothing can be more desirable on the score of cleanliness and economy. There is, however, one condition which must steadily be observed in whatever way or for whatever purpose gas is used, and this is, that it must be burned upon scientific principles, and not in a hap-hazard or rule-of-thumb manner, regardless of proper control. The exercise of a controlling power over gas during burning has formed one of the chief studies of gas engineers ever since the first practical introduction of gas lighting, and it continues to do so, notwithstanding the great advances that have been made in the science of gas lighting in recent times. The power of control is the key to the efficient and economical use of gas—that is, the production of a good light at a low cost. As an illustration of what I mean, I may mention that with the old Argand and fishtail burners, the gas issued from the small holes at the point of ignition with a velocity of from 60 to 90 miles an hour. With the best known modern burner, Sugg's "London" Argand, the gas issues from holes with a velocity of only a little over 1 mile per hour. This forcibly illustrates the necessity for a governing power being exercised. It is a singular but well-known fact that the highest results in illuminating power are attained when the gas issues from the burner with the lowest velocity. To sum up, I consider it to be highly probable that, irrespectively of what I may term its subsidiary uses, coal gas has a future of considerable promise before it as an illuminating agent. The electric light is far from being capable of universal application at present, but the progress made in its development demonstrates its usefulness in many important respects. Its special appli-

cation will only engender a desire for better illumination in directions where electricity is not yet available for use, and here the improved system of gas lighting should come in. Notwithstanding all that has been done of late years towards introducing scientific principles in the burning of gas, there is still room for improvement. A careful study and correct appreciation of the laws which govern the scientific use of gas will lead to conclusions which, if acted upon, will conduce no less to the benefit of the consumer than to that of the producer.

Before quitting the subject of gas illumination, I may perhaps refer to coal gas as an illuminator for railway carriages. It is in use on one of the Metropolitan lines of railway, and to a certain extent it answers the purpose, although there is the objection that the reservoirs on the carriages have to be replenished many times during the day. This renders ordinary coal gas unfit for lighting carriages for long journeys. Attempts have been made, and still are being made, to enrich ordinary coal gas, and to burn it under pressure in the carriages, and early in the past year such a system was under trial on the Great Northern Railway, but, as far as I am aware, it has not yet been adopted in practice on that line, although at the time trains were successfully run to the North and back. Another system of carriage lighting with gas is gradually coming into use, the results being very marked, both as regards economy in cost, steadiness of light, and high illuminating power. This is Pintsch's system, in which the illuminating agent is oil gas, which is produced mainly from shale-oil refuse. The refuse is distilled in retorts, in which it is completely decomposed, the gas being conducted from the retorts to the condensers, after which it passes through a washer and two purifiers to a meter, where the quantity produced is registered on its way to a gasholder in which it is temporarily stored. From the holder the gas is forced by a compressing engine into iron store-tanks, where it is stored for use under a pressure of 150 lbs. per square inch. For delivering the gas to the carriages, which are fitted with wrought-iron receivers, a number of filling-posts are fixed at intervals on a gas-distributing main laid in the ground in any convenient part of the station or at a siding. To supply the carriage receivers, a flexible hose is slipped on to the filling-post, and connected with the receiver on the carriage, the gas being admitted into and stored in the receiver at a normal pressure of 90 lbs. per square inch. The most recent example of the adoption of this system is that in connection with the London and South-Western Railway, the oil-gas works being situate at Clapham Junction. Similar works are to be found at the Mansion House Station, in connection with the District Railway; at Stratford, on the Great Eastern Railway; at Baker Street and Hammersmith, on the Metropolitan Railway; and on the South-Eastern Railway. It is in extensive use on the Continent, and its adoption on the South-Eastern line renders it possible for passengers to run from London to St. Petersburg—saving the Channel passage—in trains lighted on Pintsch's system. As a matter of fact, 19 per cent. of the passenger carriages on the German railways have already been fitted with this light, while in England the carriages running and in course of being fitted upon Pintsch's system amount to considerably over 1000.

On the subject of preserving iron from corrosion, the President remarked: An important and beautiful process for preserving iron surfaces from rust has been perfected and brought into commercial and practical working order during the past year. This is a process invented by Mr. George Bower, of St. Neots, and in which he obtains by means of air, but in a superior manner as regards appearances, the same result as Professor Barff does by means of water. It will doubtless be known to you all that Professor Barff, some three years ago, succeeded in applying in practice the well-known principle of exposing iron to the action of superheated steam, whereby it acquires a tenaciously adherent coating of magnetic oxide. This process most effectually protects the surface of the metal from becoming rusted, the iron after treatment assuming a dark greyish, glazed appearance. For long past this process has been in practical use for a variety of purposes, with success. Mr. Bower's process consists in exposing the iron to the action of heated air and the gaseous products of combustion, by which he obtains the necessary coating of magnetic oxide with the advantage of an improved appearance in the articles treated. The apparatus by means of which these results are obtained consists, in the first place, of a set of three small gas furnaces for the production of carbonic oxide. These are constructed by the side of a chamber for holding the articles to be treated. Beneath the chamber is a series of pipes, in which, before entering the chamber, the air is heated by means of the waste heat from the furnaces. The process, as conducted in this furnace, consists in alternately oxidizing and de-oxidizing the iron. The articles are heated by burning the gaseous fuel inside the closed chamber. Heated air, in excess of the quantity necessary for the perfect combustion of the gas, is made to enter along with the fuel, and this, together with one of the products of combustion—carbonic acid gas—produces next the metal magnetic oxide, and on the top of this a film of sesquioxide, which is reduced to magnetic oxide by shutting off the supply of air, and applying for a short time carbonic oxide only. The time required for the treatment of a charge of about a ton of small articles varies from three to six hours, and on withdrawing them they are found to be covered with a protective coating of magnetic oxide, which renders them proof against atmospheric influences and the action of moisture. This, however, is not all, as I have already pointed out, for the process gives a new and distinct appearance to the articles. On leaving the heating chamber they are of a dull cherry-red heat, but upon cooling they assume a beautiful French-grey tint, which, like the coating, is permanent. For decorative purposes, when the tint suits, this obviates the necessity for painting the iron. Should, however, the colour not be suitable, from an artistic point of view, the iron can, of course, be painted, and with the certainty that no rust can ever form underneath the paint to throw it off, as in case of ordinary iron.

In regard to the vacation visits of the Society, Mr. Horsley said: During the vacation, visits of a very interesting nature were made to various engineering establishments. The first of these was to the South Metropolitan Gas-Works in the Old Kent Road, the Crystal Palace District Gas Company's works at Lower Sydenham being also visited on the same day. At the South Metropolitan works we were cordially received by the Engineer to the Company, Mr. George Livesey, who, with his brother and Mr. Somerville, showed us over their extensive establishment. The most striking feature there was the new gasholder which was in course of construction, and which, when complete, will be the largest in the world. This holder is 214 feet in diameter, in three lifts of 54 feet each, and will contain 5,680,000 cubic feet of gas. The wall of the tank is of concrete, and the cone is covered with 1 foot thick of concrete. The holder is on the non-trussed principle, but having a strong steel crown curb, composed of 6-inch by 1-inch angle steel, rolled to an angle of 105°. I believe this is the first time steel has been used in gasholder construction. It was designed by Mr. Livesey, and involves a new and important structural feature, which is that the holder is surrounded by a perfect network of bracing, that affords great stability under wind pressure. From the South Metropolitan works we proceeded to those of the Crystal Palace Company, where we were welcomed by Mr. Charles Gandon, who

is one of our Council Members. This Company was established in 1854, for supplying the Crystal Palace and the district with gas. The increase of the population has led to great improvement in the Company's revenue, which has been increased from £10,000 in 1855 to nearly ten times the amount, as at the present time. The plant and apparatus are equal to a daily production of 4 million cubic feet of gas, the present daily consumption being about 2½ millions, which is stored in six gasholders, varying in size up to 150 feet in diameter.

MIDLAND GAS MANAGERS' ASSOCIATION.

The Fourth Annual Meeting of this Association was held at the Midland Hotel, Birmingham, on Thursday, the 3rd inst.—Mr. R. O. PATERSON, of Cheltenham (the President), in the chair.

The HONORARY SECRETARY (Mr. W. North, of Stourbridge) read the report and accounts for the past year, which were as follows:—

In presenting their third annual report, your Committee wish to express their pleasure at the continued progress of the Association. The total number of members on the books is now 48 against 37 last year, showing an increase of 11 in the year.

During the year 1880 three ordinary meetings were held, with an average attendance of 19 members.

At the January meeting, the President (Mr. Simpson) delivered an able and practical inaugural address, after which the Secretary read a short paper descriptive of "Ker's Washer."

At the second meeting, held in April, the ex-President (Mr. Hunt) gave the members the results of some experiments with lanterns of various shapes, and large burners, illustrated by diagrams. The members present were deeply interested in the subject, and were highly pleased with the kindness of the ex-President in taking so much pains to bring the subject before the Association so elaborately; also for his reception of the members at an exhibition of these lanterns, &c., at the Windsor Street Gas-Works.

At the third meeting, held in October, the scheme put forth by the ex-President, having for its object the raising of a fund sufficient for the endowment of a Gold Medal, to be called the "Birmingham Medal," to be presented by the Parent Association for the encouragement of original research in gas manufacture, having been recommended by your Committee, was adopted, and we may add that the appeal has been liberally responded to, about £370 having been promised.

Mr. Hunt then made a few remarks illustrated by diagrams on "The Comparative Diffusive Powers of Square and Circular Lanterns." The practical result of these experiments may be seen in the vastly improved illumination of a portion of the streets of Birmingham, notably the vicinity of the Town Hall and municipal buildings.

Mr. G. E. Stevenson (Peterborough) then read a most valuable and interesting paper on "The Manufacture of Sulphate of Ammonia," accompanied by illustrations of apparatus used therein. This being a subject of great pecuniary interest to all gas managers, it was keenly criticized and discussed, and elicited offers from other members to give their experience in the manufacture, in further papers.

Mr. H. Woodall (Leeds) followed with an important paper on "Meter-Rents," and this being a question of great importance in the economy of gas management, a very animated and profitable discussion followed.

Votes of thanks were then passed to the retiring officers, and new officers elected for the ensuing year. The members dined together, and afterwards proceeded by train to the new gas-works recently erected at Albion by the West Bromwich Improvement Commissioners, which, by the kindness and courtesy of the Gas Committee and their Manager (Mr. Littlewood), they were permitted to inspect, and all seemed highly pleased with their visit.

Statement of Accounts for the Year ending Dec. 31, 1880.

Dr.		Cr.	
Balance brought forward . . .	£12 13 10	Printing, stationery, postage, and reporting . . .	£11 13 9
Subscriptions received during the year	18 7 6	Incidental expenses	0 5 0
			£11 18 9
		Balance in Treasurer's hands .	19 2 7
	£31 1 4		£31 1 4

Examined and found correct,

JOHN TINDALL, Treasurer.

JOHN STORER, } Auditors.
WILLIAM CROSS, }

On the motion of the PRESIDENT, seconded by Mr. HUNT, the report and accounts were unanimously adopted.

NEW MEMBERS.

Mr. NORTH read the names of the following candidates recommended by the Committee for admission as members:—Mr. Charles Stafford Ellery, Gas-Works, Bath; Mr. Edward John Lloyd, Gas-Works, Dudley.

Both gentlemen were unanimously elected.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following Inaugural Address:—

Gentlemen,—It becomes me on this, the first opportunity at my disposal, very heartily to thank you for the high honour you have done me in electing me to fill the presidential chair of your Association. It is almost idle to say that the honour you have conferred upon me is proudly appreciated, and it will be my earnest endeavour to conduct the business of the chair and of the Association with all the dignity at my command, and to uphold, as far as I possibly can, the distinguished position your Association has attained, under the able leadership of your past Presidents, Mr. Charles Hunt and Mr. T. Simpson.

The position of President of an Association such as this has become one of some difficulty. Custom requires that each new occupant of the chair should inaugurate his year of office by delivering an address. In the face of so many addresses, year after year, by able men both in this country and abroad, it becomes a matter of anxiety to know what to say of interest to the members that has not been already, and, at least in my own case, more ably said.

The past year has seen our Association steadily growing in solid prosperity. The membership has satisfactorily increased, and from the amount and character of the work done I think I may congratulate you on having attained an honourable position amongst the many societies throughout the world, which have for their object the dissemination and study of practical science. The profession of gas engineering is every year becoming more and more a deeply scientific study; and the proceedings of the various Associations bear evidence from time to time of the thoughtful work and careful research that are inspiring the members of the profession generally to investigate old, and explore the many new and interesting fields of practice and science that are still lying fallow, ready to yield to the patient, intelligent student a rich harvest of results.

In our associated as well as in our individual capacity the need for inquiry into the many questions relating to the science and practice of the manufacture and distribution of gas, and cognate subjects, has been, and is now deeply felt. As an Association we have not yet attained to that degree of strength necessary to enable us to originate and carry out a systematic course of experimental investigations, and it is questionable whether this will ever become our duty; but we can point with some pride to the researches of Mr. Hunt, in connection with the relative value of different forms of street lanterns, as being an original and useful investigation into a subject which has been greatly neglected and much misunderstood. But second only to the satisfaction of doing this most necessary work ourselves, is the honour of endeavouring to assist and encourage others in it, and this I congratulate you as an Association on having done thoroughly. The gold medal you contemplate presenting to the British Association of Gas Managers, at their meeting at Birmingham this year, for the encouragement of original research, will form a lasting

memorial of the desire of the Midland Association to further the best interests of the gas industry throughout the world.

You are aware that the scheme for endowing a gold medal originated with Mr. Hunt, and to his exertions you are greatly indebted; but before passing from this subject, I think it would only be expressing your feelings if I here take the opportunity of cordially thanking those gentlemen who, unconnected with ourselves, but deeply interested in all that concerns the progress of science generally, have liberally subscribed to the fund. To the Committee of the Gas Department of the Corporation of Birmingham and to the Secretary, Mr. E. Smith, our very warmest thanks are also due for the liberal and hearty support they have extended to the scheme throughout. While expressing our thanks to those who have appreciated and supported the project, I feel that a tinge of regret is present in the mind. It was thought, and properly so, that as this was a matter which had for its object the advancement of the science of gas lighting, for the benefit of all in any way connected with it, the Gas Companies in the Midland district would appreciate the scheme, and as far as lay in their power aid in maturing it. The result of an appeal to them has been far from successful, only a few Companies appearing on the list of subscribers. Had this supineness proved fatal to the success of the scheme it would have been a matter of deep regret; as it is, our feelings are more of sorrow. As gas engineers and managers of gas-works, we had no personal object to gain. Our earnest wish was to do something which it is believed must stimulate to inquiry, discovery, and invention, and which must ultimately improve, solidify, and more firmly establish on a truer scientific and commercial basis the great industry with which we are connected; and in seeking to do this we are in the highest sense advancing the interests of gas proprietors.

The year 1880 was one of tranquil prosperity. Nothing of a strikingly novel or startling character occurred, either to disturb us in our possession or to raise our hopes to still greater achievements; but on all hands we hear of efforts being put forth to more securely establish and develop the inheritance which has been ours for over half a century—namely, the supply of the best, cheapest, and safest artificial light ever discovered. In the earlier days of gas lighting, it was not considered a part of the duty of gas companies to trouble themselves in any way in disseminating an intelligent knowledge of the value and uses of the article they supplied. It was generally sufficient to lay on a supply of gas to a customer's premises, and leave him to fight the rest of the battle himself. The ancient system of charging a fixed sum for each light removed every spark of incentive to economy on the part of the consumer, and drugged the sensibility of the gas company to its own true interests. It is probable that if a correctly registering consumer's meter had been invented and universally introduced at the earliest stages of gas lighting, companies as well as consumers would have been more alive to their interests, and probably not a tithe of the complaints we have heard in the past of bad gas and extortionate dealing, would ever have existed. And when, through mutual jealousies and strenuous demands for justice and fair dealing, the old style of things came to be amended, and meters were insisted on, both companies and consumers felt the change. But, in the meantime, the companies had permitted the opportunity to pass away without having fully occupied the field, and instead of being looked upon as the friends and advisers of their customers, they found the current of popular feeling against them; and it has been an uphill process to soothe the ruffled feelings of a public, jealous of the vested interests which were growing up in their midst. Within the last few years, however, I think the tide has turned. There is, on the one hand, an energetic desire on the part of gas officials, whether under corporations or companies, to advise and assist consumers; and, on the other hand, we have the public generally looking for, and in most cases ready to adopt our advice, and anxious to have our assistance. It may easily be conceived that many causes have been at work to bring about this change, and no doubt the luxurious tendency of the age has been working its effects on this as well as on many other social questions, exciting the community to aspire to greater ease and comfort, both in the domestic and the business relations of life. But perhaps more than in anything else the cause is to be found in the thorough and hearty appreciation which all gas suppliers throughout the country now display in considering the wants of the community, evincing, by their anxious efforts, a desire to act towards them in a spirit of liberality; fulfilling, at the same time, not only the letter, but the spirit of their legal obligations.

Notwithstanding all that has been done in recent years to popularize the use of gas, by educating the community to a knowledge of its advantages as a means of light, heat, and motive power, there is still a vast unoccupied field to be taken possession of. And the practical question with us still is—How can this be best accomplished? While it is to the advantage of gas authorities to extend as much as possible the use of gas, it may be assumed that, for the purpose of light at least, every householder, from the occupier of a mansion to the humble tenant of a one-roomed cottage, would prefer gas to any other means of illumination. Except in the cases of the poorer class of houses, gas is at the present time almost universally used in the large centres of population; while to the vast number of smaller houses in the lanes and alleys and bye-streets it has scarcely yet found an entrance. Were Parliament to leave us the freer exercise of a commercial spirit, I see no difficulty in introducing the blessing of a cheerful and socializing gas-jet to the kitchen of every cottage and tenement. But the power to provide the necessary fittings on hire is wanting; and it is feared this class of the community can never be reached until the power is put into our hands. One cannot help reflecting, even at this comparatively remote period, how much the early promoters of gas lighting lost to both suppliers and the public, in not securing, as no doubt they might have done, the supply, supervision, and control of internal gas-fittings. Nothing is more painful to the sympathizing gas official than to witness the distress and annoyance, not to say cost, to which gas consumers are subject, from the bad and insufficient character of the piping and fittings that have been furnished to them—it may be at a price such as should have secured the best goods in the trade. It must not be supposed that I am condemning all gas-fitters, and that they are all guilty of acting unfairly to their customers; for there are many who, to my own knowledge, make excellent work, and do it at only reasonably remunerative prices. The gas-fitting trade has, however, fallen largely into the hands of people unacquainted with the nature of the business. Timmen, blacksmiths, plumbers, and, in fact, almost any kind of mechanic may now be found ready to fix and advise in the matter of gas-fittings. If gas authorities had the power of inspecting and regulating the sizes, &c., of internal gas-fittings—a power similar to those possessed by water companies—the evils now complained of might be minimized, to the manifest advantage of all concerned. It may, perhaps, be Quixotic to hope of ever getting such powers from Parliament now-a-days; but the granting of them would show the wisdom of our legislators; and, in face of the expressed wish of members of the community, supported as it has been by the Press, I do not see the smallest reason for refusing them to us. The benefits gas suppliers would derive from such powers would be nothing compared with the comfort and saving that would result to the general public.

Much has been done in some districts to cultivate a knowledge of the

use of gas for the purposes of heating and cooking, and this is well worth attention. When the time comes, which I am bound to say is as far off now as ever it was, for us to yield up to the cold, cheerless, incandescent electrode, the field we have so long held as our own, our refuge will be in the domain of heat and motive power. The exhibitions of gas appliances which have taken place in various parts of the country have, I believe, been the means of extending the use of gas for these purposes. It is not, however, in the power of all gas authorities throughout the country to get up such displays, and perhaps there are some reasons that might be urged against them. They are not an unmitigated good. Being transient in their character, it is just possible that a good deal of the beneficial effect felt from them at the time may prove transient too. They are apt to raise excited hopes of economy, only to be dispelled by an unusually large quarter's gas bill, leaving behind an unpleasant impression that there was at the back of the exhibition a good deal more of self-interest than at first sight appeared. I am convinced that it would prove much more advantageous, and be more useful to the public, if a sufficiently commodious room were fitted up, with examples of the best of every kind of gas appliances, whether for the purpose of lighting, heating, cooking, or motive power, as a theatre for practical demonstrations, and permanently maintained. Manufacturers would probably be glad to lend examples of their different classes of goods for this purpose, where the purchase of them by the corporation or gas company might be undesirable. In cases where the gas authorities neither sold nor hired apparatus themselves, it would simply be necessary to supply, to all parties wishing to purchase, prospectuses of the firm whose apparatus they preferred, leaving them to get it through their own tradesman in the usual way. The public would thus have the benefit of the advice of those who are best able to test the intrinsic merits of the different kinds of apparatus, and would be protected from having thrust upon them inferior and wasteful articles, which besides prejudicing the public mind against them, bring infinite trouble and annoyance to gas officials.

In the midst of our efforts to extend the uses of gas we must, however, be careful to guard ourselves from the danger of forgetting that, more than in anything else, the stability of our position is to be secured, and our domain extended by affording a regular and plentiful supply of pure and cheap gas, and of as nearly as possible a uniform quality. The public are becoming keenly alive to the advantages to be derived from the use of good burners. For this gas managers have to be thankful to the "Christiania" type of burner, with its host of imitations, more or less successful. Whatever may be the advantages derived from good burners—and we know how speedily complaints of the quality of the gas will disappear when good burners are substituted for bad ones—there is another question more intimately connected with ourselves which should not be lost sight of—namely, uniformity of illuminating power. I do not mean simply that the gas should never fall below the parliamentary minimum—this is an obligation from which we have, or should have, no escape. I mean that it should not vary in its candle power either above or below a fixed limit, this being necessarily at least a candle above the parliamentary minimum. To consumers nothing can be more confusing and irritating than to find that, independently of anything they may do, the degree of their light varies night after night. It is not to be supposed that the gas manager will have complaints of the gas being too good, but he may have complaints that it is bad when it is really up to the standard, owing to the consumers putting it in contrast with the over generous quality supplied, possibly only the previous night. I am aware that it is impossible to ensure a constant supply of gas of an absolutely uniform quality; but the variations may be limited to about three-quarters of a candle either way, and with this the public would know no difference from night to night. In my visits to many gas-works it has often been a matter of surprise to me that there were no means of ascertaining the quality of the gas till it reached the gasholder. A jet photometer, fixed between the purifier and the gasholder, continuously burning a portion of the gas being made, should be an indispensable piece of apparatus in every gas-works, for by its aid the quality of the gas may be placed under control.

The ten years 1870-80 will be referred to by future historians as the most active of any period since the earliest introduction of gas. While on all hands the general trade of the country has been in a depressed state, gas-works never, on the whole, grew more rapidly than they have in the past ten years, and never before was the average price of gas so low as it is now. The coal famine, in the early years of the past decade, was the indirect means of giving an enormous impetus to the search after improvements in manufacture and economy in production. The efforts then put forth brought about a great improvement in the carbonizing plant, resulting in a larger production of gas from the coal, and greater economy in working; and although we felt the strain at the time, I believe nothing ever acted more beneficially on the future of the gas industry.

While, however, those influences have passed away, at least for a period, the efforts of inventors and improvers have by no means ceased to carry forward the good work. In the department of carbonization, for instance, there never was a more active spirit of inquiry than at the present time; and improved forms of settings and furnaces are to be met with on all hands. In the mode of setting retorts no striking alterations have been made, and unless the entire system be altered there is little scope in this direction. The improvements have consisted chiefly in the construction of better furnaces, ensuring a higher heat on the retorts, with economy of fuel. It used to be an axiom with all gas makers—and for my part I confess my faith in it to be as strong as ever, notwithstanding all that has recently been said against it—that high heats are the best for the economical distillation of coal; and absolutely all the benefits derived in the past from better and more economical working are directly traceable to high heats, and, speaking generally, the measure of success is simply the measure of the improvements in the heats. It is, perhaps, true that the temptation to show superior carbonizing results has, in some cases, led to an extravagant consumption of fuel, and consequent heavy wear and tear of plant. It must always be remembered that we have three objects to keep in view. It is not sufficient simply to get high heats, but we must do it with an ordinary expenditure of fuel, and at a moderate cost for wear and tear, or the advantage derived on the one hand may, on the other, be counterbalanced by additional expense. The papers read at the last meeting of the Parent Association, in London, by Mr. F. Livesey and our respected fellow-member, Mr. G. E. Stevenson, on "Retort Furnaces," and the discussion following, in which the illustrious inventor of the regenerative gas furnace—Dr. Siemens—took part, afforded us some useful and important information on this question. It is quite possible—indeed, I would say it is a fact, that with a properly constructed furnace, even of the ordinary type, a measure of economy in fuel may be effected compared with the consumption in the straight-sided, shallow furnaces generally to be found in use at the present time; but the full measure of economy can never be reached until the entire regenerative system of Dr. Siemens is brought into use. The furnaces referred to in the papers of which I have spoken, appear to answer well the purpose for which they are intended—namely, the production of combustible gases—and by their use a better heat may be maintained on the retorts, with a diminution in the quantity of fuel burned. But although they are a great

advance on the old method of firing, they must be looked upon only as furnaces in which the complete combustion of the fuel is removed from the region of the furnace itself to where it is required, and that is in the chamber containing the retorts.

Commendable as the efforts are which have succeeded in accomplishing this improvement, it would be unfortunate if their success in any way deterred other investigators from prosecuting their efforts to secure the full advantages of the regenerative system. The furnaces of Liegel and Livesey do not reduce the temperature of the gases at the point of their exit from the retort-bench, but probably rather increase it; and, therefore, whatever is lost, under the old style of firing, from the high temperature of the gases at the flue or chimney, is perpetuated in these systems. But it is just at this point that the adoption of the regenerative process operates with such economy, bringing back to the retort-chamber the heat necessarily allowed to pass off from it in the first instance, to aid in the distillation of the coal, instead of its being lost in the air. Seeing the undoubted economy to be derived from this process, it is a matter of surprise that the regenerative system has never found its way into any of our large gas-works. The comparative cheapness of coke in most English towns may, to some extent, have influenced the question; but I apprehend that, had there been a few years back the same appreciation of the value of gas generator furnaces that we now find to prevail, the regenerative system would doubtless have been introduced ere this. The complication of the reciprocating process of Dr. Siemens undoubtedly presents some drawbacks; but it is by no means certain that the regenerating principle is dependent upon the reciprocating arrangements when applied to gas retorts. The design of Dr. Schilling, of Munich, discards the reciprocating arrangement, and by a system of flues, simple enough in themselves, although perhaps somewhat complicated as a whole, he obtains remarkably good results, reducing the temperature of the waste gases from 2280° Fahr. as they leave the retort chamber, to 930° Fahr. at the main flue to the chimney; thus practically returning to the furnace, in the air required for the final combustion, 60 per cent. of the heat which must otherwise have been lost.* Experience will probably show that the greatest economy is not to be arrived at by the plan of having a distinct furnace to each setting of retorts. I am strongly inclined to believe that the ultimate result will be the adoption of a large central gas generator furnace, from which a supply of gaseous fuel, capable of heating a number of settings, can be obtained, in conjunction with a regenerative arrangement of the type in use at Munich. The consumption of fuel in Dr. Schilling's furnaces is given as being equal to from 21·5 to 20·25 per cent. of the coke made from each ton of coal, or say 1 ton of coke carbonizes 7·6 tons of coal.† Compared with the ordinary working in this country, where the fuel account may be safely put at 30 per cent. of the coke produced, or say 1 ton of coke carbonizes 5 tons of coal, we have reason to feel that our search after economy is not yet ended. Nor have I over-estimated our fuel account; on the contrary, I am satisfied that it is considerably under-stated.

It has often been a matter of surprise to me that in the best regenerative furnaces the saving in fuel does not appear to be so great as might be expected, when contrasted with our ordinary defective furnaces. Judging from the trials made with Dr. Schilling's arrangement, it appears that the consumption of fuel was arrived at by weighing the quantity of hot coke actually put into the furnace, which is certainly the correct way of getting at the amount—a method altogether different from the rough-and-ready way into which we have fallen of estimating it in this country, where we set the quantity of coke sold against the previously ascertained weight of dry coke obtained from the ton of any given coal by analysis, and put down the difference as the percentage of fuel used for heating the retorts. I need hardly point out that, where the coke is sold by weight, this method of calculation is fallacious. To arrive at a correct percentage the coke made from a ton of coal should be estimated not as dry but as wet coke, which may be safely taken as from 8 to 10 per cent. heavier; otherwise the furnace will have the credit of the water which was necessarily weighed and sold with the coke, and to this extent cause the actual amount burned, out of the total quantity made, to appear less than it really is. Should my remarks on this subject have proved wearisome I must ask you to bear with me, because it is one of the foremost questions of the day; and if I have succeeded in any way in inducing you to determine on making a personal investigation of the matter, I feel sure the time has been well spent.

The line of demarcation between retort furnaces and the distillation of coal is one not easily traced; but at the same time the subjects require separate consideration. The yield of gas from the coal no doubt depends largely upon the efficiency or otherwise of the furnace, and next to a good heat, the shape and size of the retort, and the weight and duration of the charge, are questions affecting economy in the results. The query put by Mr. G. Livesey, in an article he recently communicated to the JOURNAL:—"Is a High Yield of Gas per Ton of Coal Carbonized an Infallible Test of Good Management?"—brought forth some useful information bearing more or less directly on this subject. You must all feel, however, that the result of the correspondence was unsatisfactory; and the question, in its broadest sense, remains unanswered; nor is it my intention, even had I the ability, to meet it here. For practical purposes I would rather consider the subject under another aspect—namely, What are the conditions necessary to ensure the greatest economy in the distillation of coal? As I previously said, next to a proper heat, the size and shape of the retort, and the weight and duration of the charge, are important factors.

The change from the round retorts to the D-shaped, which is a striking feature in many of the London works within the last few years, offers perhaps the strongest evidence that this form is the best; and it appears also to be now pretty generally adopted throughout the provinces. But on the question of size there is much diversity of practice, as, indeed, there must necessarily be. The size of the retort is a matter that must be largely controlled by purely individual circumstances—such as the width of the bench, &c., and it need not necessarily be a matter of consequence; whereas the shape affects the character of the work to be performed, and there can be no doubt the D-shaped retort effects the distillation of the coal most uniformly throughout the mass, and this has been shown repeatedly to be of the utmost importance. The weight and duration of the charge, whether the heats are what are called high or otherwise, will largely control the quantity and quality of the gas produced from the coal. It may seem perhaps somewhat strange to you that I advocate most strongly the advantages of light and short charges. From a considerable experience of ovens with heavy and long charges, the conclusion in my mind is that light, short charges are preferable. I am the more forcibly led to this expression of opinion, because I am anxious to counteract an idea which has a tendency to spread—namely, that the good carbonizing results produced at Cheltenham are due to the use of ovens. Whatever may be the measure of success we have achieved in this direction, the cause is to be found, not in the use of ovens, as has

been proved after some years' working with retorts and ovens combined, but in dispensing with the dip-pipe and the hydraulic main.

It was my intention, when commencing to write this address, to dwell shortly upon the advantages to be derived from the abolition of the dip-pipe, and the conditions necessary to be observed in order to obtain the fullest measure of success under the process; but since then our friend Mr. Cross has promised to open a discussion to-day on the inexpediency of dispensing with the dip-pipe, and anything further I may have to say on this matter had better be deferred until then. But if I have not occupied too much time already, I would ask your indulgence while I make a few remarks on the treatment of the gases and condensed products after they leave the hydraulic main, or, in cases where there is no such main, the ascension-pipe. A few years ago it was almost the universal practice to convey the gas and condensed products together in one pipe from the retort-house—a plan which was considered an improvement on the earlier custom of separating the tar and liquor from the gas at the hydraulic main. Some confusion seems to have arisen as to the reason for this change of practice; but whatever may have prompted it, it is a singular coincidence that modern thought seems drifting back strongly in the direction of the old method. I believe it was a generally received opinion that wherever the gas and tar were drawn off and kept together for a length of time before reaching the condensers, the trouble from naphthalene deposits in the mains and services was less than where the separation took place in the retort-house. If the new process was adopted with the intention, as no doubt it was, of allowing the tar to retain the naphthalene, or some of it, instead of sending it forward in the gas, have we any practical or experimental evidence that the trouble formerly experienced in the formation of naphthalene will be less now than in the days before the mode of working was altered? If the whole of the naphthalene produced in the carbonization of coal could be retained in the gas and sent to the consumers' burners, an undoubted economy and advantage would be derived; and the idea of the present change of practice, in separating the tar from the gas, is to endeavour to secure this result. As gas managers, it is our duty, and I will add our pride, to keep well abreast with the advancement both of the science and practice of our profession, which is not an altogether easy matter in these pushing times. In considering this subject I have not been able to satisfy myself that the modern idea is correct, neither is there any evidence that it has been proved so, and I have not seen my way to adopt it. Assuming that the change from the old plan to the practice prevailing a few years ago resulted in a diminution of naphthalene difficulties, is it not to be expected that the aggravated troubles will again appear with the re-adoption of the discarded plan? It is, no doubt, quite true that if coal gas is retained in contact with tar, the latter will dissolve some of the hydrocarbons, notably naphthalene, which might otherwise be carried forward in the gas to increase its illuminating power; but to gas managers this is only a part of the question. If the retention of this light-giving constituent, or a larger proportion of it, is to cause a recurrence of greater troubles in the shape of stopped mains and services, it is a matter for consideration whether it is wise to attempt it by simply reverting to the old plan of separating the tar from the gas, as formerly, at the hydraulic main. My opinion is—and I express it more than anything else for the purpose of exciting you to investigate the subject—that the new theory goes too far on the one hand, and not far enough on the other. So far as I can see, with the present information on the subject, no mere improvement in the mode of conducting the work of condensation or cooling, whichever term may be most applicable, will result in much practical good, unless it is accompanied by a process for the partial distillation of the tar; as practised at Rochdale, for instance, with the St. John apparatus, or as proposed by the plan of Messrs. Aitken and Young. Neither of these inventions has been tried in England with common coal gas, and it is problematical how far they might prove successful; but they appear to offer a not inconsiderable prospect of success.

Gentlemen, I have confined myself to only a few of the subjects which are agitating the professional mind at the present time; but although I have not travelled over the whole of the wide field of our practice, you will probably agree with me that there are no subjects of greater importance than those I have had the honour of presenting to your notice to-day.

Mr. J. ANNAN (Wolverhampton) proposed a vote of thanks to the President for his very interesting address, which, he said, was full of information. He had not been quite able to follow it right through, but all the members would be able to consider it better when it was printed.

Mr. J. TINDALL (Walsall) seconded the motion, saying it was a great advantage to the Association, as to kindred ones, when gentlemen of ability came forward once a year to give their experience on the most important matters in connection with the manufacture of gas. He had listened to the whole of Mr. Paterson's address with pleasure and profit; but especially that portion in connection with retort settings and the construction of furnaces. When the address was printed he was sure it would be read with pleasure by every member of the Association.

The resolution was then put, and carried unanimously.

The President said he was exceedingly obliged to the members for their kind appreciation of his little effort. He could only say he was dissatisfied with himself that he had not been able to do more to advance the interests of the Association; but this must be put down to the want of the necessary time.

Mr. W. CROSS (Leamington) then read a paper on "The Inexpediency of Doing away with the Hydraulic Dip." Pressure on our space to-day, however, compels us to defer till next week the publication of it, and the very interesting discussion that followed its reading.

APPOINTMENT OF AUDITORS.

Mr. HUNT moved that the best thanks of the members be given to the Auditors—Mr. Storer and Mr. Cross—for their services, and that they be re-elected Auditors for the ensuing year.

Mr. DARWIN seconded the motion, which was carried.

Mr. CROSS: I thank you on behalf of my colleague and myself for our re-election.

VOTE OF THANKS TO THE PRESIDENT.

Mr. HUNT moved a vote of thanks to the President for the excellent manner in which he had presided over the meeting.

Mr. COLLETT seconded the resolution; and it was put, and carried with applause.

The President: Gentlemen, I am exceedingly glad the meeting has been so successful. I thank you for having received me so kindly, and for having given me so hearty a support.

The proceedings then terminated.

THE WATER SUPPLY OF SHREWSBURY.—At the meeting of the Shrewsbury Town Council on the 14th inst., it was announced by the Water Committee that they would in a very few weeks be in a position to supply the town with pure water from a spring recently discovered on an island in the River Severn.

* Dr. Siemens, by his process, reduces to 170° C. or 338° Fahr.

† See JOURNAL, Vol. XXXVI., p. 174.

‡ See JOURNAL, Vol. XXXVI., p. 567.

LEEDS CORPORATION GAS AND WATER SUPPLY.

The abstract of accounts for the borough of Leeds for the year ending Aug. 31, 1880, has just been issued by Mr. Derry, the Borough Accountant. From them the following items in reference to the gas and water supply are taken:—

Gas-Works.—The debtor side of the capital account, under the head of loans shows the following totals:—On mortgages, £551,163 1s. 4d.; on Old Gas Company's debenture stock, £9000; on New Company's debenture stock, £57,765; on funded debt, £34,923 15s. 8d.; on annuity certificates, £51,100; on consolidated debenture stock, £336,900—total, £1,040,851 17s. On the creditor side:—Outlay on works to June, 30, 1879, £820,129 5s. 3d.; do. on meters, £106,346 0s. 3d.; additional outlay, £12,917 19s. 8d.; making a total of £939,393 5s. 2d., and leaving a balance of £101,458 11s. 10d. The revenue account on the debtor side shows the following:—Gas manufacture (including £52,675 0s. 4d. for cannel and coal, and £21,324 15s. 6d. as wages), £75,821 18s.; repairs, £19,281 0s. 8d.; charges, £15,427 18s. 9d.; relaying mains and services, £5496 19s. 7d.; renewal fund, £7110 14s.; rents, leakage, £1500; interests, £38,719 14s. 7d.; making a total of £163,355 6s. 7d. There was a balance of £15,305 11s. 10d., of which sum £10,408 10s. 4d. was applied to the sinking fund set apart for the redemption of debt, leaving still a balance of £4897 1s. 6d. The creditor side of the account shows that the amount received for gas and meter rents was £132,996 16s. 1d.; residual products produced £44,798 3s. 5d.—including coke, £9882 19s. 10d.; tar, £19,685 14s.; ammoniacal liquor, £10,966 3s. 11d.; sulphate of ammonia, £3743 1s. 7d.; and spent oxide, £520 4s. 1d. Old metal produced £464 3s. 3d., and rents of property £404 14s. 8d., making the total £178,663 17s. 5d.

Water-Works.—The capital account on the debtor side shows loans on mortgage amounting to £772,060 19s. 11d.; on annuity certificates, £136,150; on consolidated debenture stock, £523,000—total, £1,431,210 19s. 11d. On the creditor side are shown the amounts expended on the various works of the department previous to Aug. 31, 1879, and also the amounts expended during the past year. The amount expended on land, compensation, &c., in connection with the Eccup extension to the end of the year was £43,295 12s. 1d. The amount expended during the past year upon "construction account" was £19,728 15s. 8d. On the Bramley reservoir there was expended during the year £3673 11s. 2d.; and on the Wortley reservoir, £3767 18s. 4d. The total on the creditor side of the account is £1,395,454 3s. 3d., leaving a balance of £35,756 16s. 8d. The revenue account on the debtor side shows a total of £72,260 6s. 4d., which includes £55,079 0s. 5d. on interest account. A sum of £13,942 has been set apart for the sinking fund for the redemption of debt. On the creditor side, among other items, is that of £69,138 14s. 7d. for water-rents.

MUNICIPAL CORPORATIONS AND THE BOROUGH FUNDS ACT.

The Eighth Annual Meeting of the Association of Municipal Corporations was held at the Westminster Palace Hotel the week before last—Mr. E. WHITLEY, M.P., presiding—when the report of the Council was presented. This stated, among other things, that at the previous annual meeting of the Association a resolution was passed affirming that the provisions of the Municipal Corporations (Borough Funds) Act, requiring an appeal from the representatives of the ratepayers to their constituents by a *plebiscitum*, were inconsistent with the principles of due representation. Sir Joseph Heron and the Secretary of the Association (Mr. Goring Pritchard) had been before the Home Secretary last year to endeavour to persuade him to bring in a Bill to remedy this evil, but Sir William Harcourt had not been able to find an opportunity to do so.

The CHAIRMAN, in the course of his speech when moving the adoption of the report, said that the last parliamentary session was a very short one, and few Acts were passed which pressed much upon the attention of local bodies; and he was afraid that during the present session no new measures of importance to them would be introduced. But there were one or two measures which were of very great moment, and deserved consideration and attention. One of those was the Municipal Corporations (Borough Funds) Act. There were several objections to this Act; and during the last Parliament the late Home Secretary (Sir Richard Cross), who was waited upon by a deputation in regard to it, admitted that the present position of affairs was unsatisfactory, and one which ought to be altered. They were still in the same position, however, as they were then, but he did hope that by bringing some pressure to bear on the Home Secretary, they might induce the present Parliament to take up the case, and see if they could not have some modification of the terms imposed upon them in the Act.

The motion for the adoption of the report was carried; and, at a subsequent stage of the proceedings,

The TOWN CLERK of EXETER moved—"That it be referred to the Council to consider whether it may not be desirable to suggest, for the consideration of the Government, some alternative for that appeal to the owners and ratepayers of a district which is the really irksome provision of the Municipal Corporations (Borough Funds) Act; and, if so determined by them, to recommend to the Association what that alternative should be."

The TOWN CLERK of LEEDS seconded the motion. He said that within the last 18 months there had been a poll of the owners and ratepayers of Leeds with reference to a common. The poll cost the borough £1000, and there was a large majority in favour of the Council. He hoped the Association would move for a repeal of the Act, and that the result would be the substitution of a more equitable measure. The motion was agreed to, and the Association proceeded to other business.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, Feb. 19, 1881.

Tar—no change; 40s. per ton.
Ammonia liquor (sp. gr. 1.035), 22s. per ton, no change.
" sulphate (white), £20 to £20 10s. per ton.
" (good grey), £20 per ton.
" muriate (white), about £36 per ton.
" (grey), £30 per ton.
" (brown), £26 per ton.
" (sal ammoniac), £44 per ton.
Muriatic acid, £1 5s. to £1 10s. per ton.
Sulphuric acid, £2 19s. to £3 per ton.

LECTURE ON "COAL GAS" at DUMBARTON.—On the evening of last Thursday week, Mr. J. M'Gilchrist, Engineer of the Dumbarton Corporation Gas-Works, delivered a lecture on the above subject before the Dumbarton Mechanics' Institution, illustrating his subject by means of a small model of a gas-works and plant. He traced the manufacture of gas from the retorts to the consumers' meters, every point of the process being graphically described; and subsequently dwelt upon the secondary products obtained. A professional cook was engaged during the evening with some stoves on exhibition; and, at the close of the lecture, Mr. M'Gilchrist invited the audience to test for themselves the result of cooking by gas.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

After reading the communication by "Lex," in the last number of the JOURNAL, relative to the stamping of gas-meters, I was somewhat staggered by the statements advanced, and charitably thinking that I had omitted to notice in the Sale of Gas Act the important points on which he bases his letter, I procured my copy and scanned its various clauses in order that I might have a keener appreciation of their meaning. But the trouble which I thus imposed upon myself has been without reward, unless, indeed, the correction of "Lex" can be regarded in such a light. He quite accurately states that the Act of Parliament was passed in the year 1859, but I should not like to hazard the same opinion about most of his other statements. "Lex" describes the powers which are conferred upon magistrates with respect to model gasholders, and the "places" where they and the stamps are to be deposited, as also the appointment of inspectors, and then he goes on to say: "London, Bristol, Birmingham, Liverpool, Manchester, Salford, Leeds, Nottingham, Bradford, York, Newcastle, Glasgow, Greenock, Dundee, Aberdeen, and all considerable towns, have faithfully carried out the provisions of the Act; but Edinburgh is the only exception." This is a sweeping charge against Edinburgh; and I will examine how far there is any foundation for it. It is necessary, in order to do this, to discover the specific thing which the Act enjoins to be done, but which has not been done by Edinburgh. It has not carried out "the portion of the Act enjoining the provision of a suitable testing office, which, in large cities, it is recommended should be placed in some central situation for the public convenience." Perhaps "Lex" would favour the readers of the JOURNAL, and myself, with a reference to the clause containing this recommendation. All that I can find is that the magistrates "shall fix places at which such copies and stamps shall be deposited." This the Magistrates have done here. In the town buildings a place is set apart for one or more of the inspectors, and there all the necessary appliances are at hand for testing as many meters as the makers or the public of Edinburgh care to send. I am informed that the inspectors could yet overtake a good deal more work, and if makers in London, or any other "considerable town," are in arrears, these may be speedily swept away by sending all unstamped meters to this city. But the Magistrates have done more than this. They have established testing offices at most of the meter-works, and this is found to be a great convenience to the trade, because meters can be tested without the trouble, delay, and expense of packing and unpacking. An insinuation is thrown out that this is not a sufficient security for the public. Now, I know that in one or two instances an entrance separate from the works is provided to these offices, and I doubt not that if this should be insisted on, the other firms would make a similar provision, but I do not see the necessity for it. This office is solely for the accommodation of the inspector, who has a key for the door, and keeps it locked during his absence from the works. The insinuation of "Lex" is a direct reflection upon the honesty of the inspectors, which is not very commendable. He seems to think they should be under the eye of the "chief inspector," who, according to "Lex," "is alone responsible for the testing and stamping of meters," and he also labours under the impression that the official stamps are removed from his custody when his assistants are in the workshops of the meter makers. I shall be glad to obtain a reference to the clause in the Act where a *chief inspector* and *assistants* are spoken of. So far as I can make out, the Act says the magistrates "shall appoint a sufficient number of inspectors of meters for the safe custody of such copies and stamps." The Act evidently contemplates that all the inspectors shall be upon the same platform, and the day may be therefore not far distant when some budding reformer may interdict the magistrates from calling any one of the number of inspectors appointed "chief," or from giving to him a higher salary than that given to the other members of the corps. The statement that there is general dissatisfaction in Edinburgh regarding gas measurement has, I am inclined to think, about as much foundation to support it as the assumed quotations "Lex" makes from the Sale of Gas Act. So far from finding fault with Edinburgh, I think her example ought to be imitated elsewhere, and this might be done with great advantage to the meter trade.

The announcement made in the last number of the JOURNAL as to the proposed amendment of the Sale of Gas Act has created quite a flutter of excitement amongst meter manufacturers here. The desirableness of having meter indices tested is generally admitted; but it would be well if some system for doing this should be sanctioned and made known as early as possible, for the obvious reason that many gas engineers will, no doubt, be busy at work devising and perfecting, probably at great expense, delicate apparatus, which, unless there is the necessary influence to bring the inventions under the eye of the proper authorities, may never be heard of beyond a very limited circle indeed. *A propos* of this question, I may mention that while it was necessary to allow a percentage of error in meters at the time when the Act became law, no such necessity now prevails, unless, indeed, it is for the encouragement of bad workmanship. Meters ought to be tested, and only passed if measuring correctly. There are some meters which do not require a range of error, and in addition to this there are other meters known as "compensating," which by no means require such a range as 5 per cent. I do not see why with the accumulated experience of so many years, with the application of the best intellect, and with the possession of the most perfect machinery, makers should not turn out a machine capable of doing its duty without any percentage of error; and if this is possible, there is no good reason why it should not become law. Certainly dry meter makers could not complain of the introduction of such a clause, because their manufactures are supposed to register without error. But however perfect such meters may be, a day usually comes when readjustment is necessary, and it might be advisable, in order to secure absolute freedom from error, that they should be readjusted every three years.

At the usual meeting of the Edinburgh Town Council on Tuesday last, Mr. Macdougald called attention to the nature of the gas which was being supplied to the city. The usual report on the subject showed that on the 25th ult. the gas supplied by the Edinburgh Company had an illuminating power of 23.50 candles, while that of the Leith Company only reached the standard of 21.60 candles. He pronounced it disgraceful that Edinburgh should be giving so large a price for gas of such inferior quality. These, of course, are comparative statements, and, as compared with many other places, the price is neither high, nor the quality of the gas, upon the figures above mentioned, very much to be deplored; but from inquiries I have been making I have discovered that tests made by other parties on the same date as above, bring up the average of the Edinburgh Company to at least three candles more than they get credit for.

At a recent meeting of the Gas Commissioners of Dumfries, it was reported that there was at the debit of the bank account £2031 14. With the view of correcting a wrong impression which had become valent through the publication of the fact of an overdraft, Tre Lennox stated that there were three collections in the year; that from October to January was the largest; and that the sum yet collected, added to the value of the coals in hand (£430), represented to the amount of £3155, against £2632 of liabilities, including a

over £600 about to be paid in connection with the works. Consequently the Commissioners had actually £500 to the good. This speaks volumes for the energy and tact which have been displayed by all connected with the gas-works. Two years ago a very different story could have been told. At the same meeting a Committee obtained powers to deal with the offers for building new retorts.

In Inverness, as I mentioned in the JOURNAL for the 7th of December last, there have been sad complaints that although the price of gas has been reduced from 7s. 6d. to 6s. 8d. per 1000 cubic feet, the gas accounts were heavier than ever. To ascertain whether there was any foundation for these complaints, the Police Commissioners appointed a Committee to investigate and report. The result of their labours has now been embodied in a report which has been adopted by the Committee. They state in this report that they visited the gas-works, and found the apparatus efficient and in good working order, and the general conclusion at which they arrive is that the consumers have received the full benefit of the reduction. The increase, in every case where there was complaint, arose from the meters indicating larger consumption. The following quotation I make from the report itself:—"Going back to the years 1877 and 1878, and comparing them with the years 1879 and 1880, the Sub-Committee find that the consumption of gas by the consumers generally was considerably less in 1877 and 1878 than in the two following years, and consequently there is an increase in the charge for gas supplied. The Manager explains that prior to the completion of the large new gasholder in October, 1878, the storage capacity at his disposal was much too small to enable him to apply the pressure which was made compulsory on the Commissioners by their Act of Parliament—viz., 'such pressure as to balance a column of water from midnight to sunset not less than 6-10ths of an inch, and from sunset to midnight not less than 8-10ths of an inch in height at the main, as near as may be to the junction therewith of the service-pipe supplying such consumer.' The consequence was that with gas-meters turned full on, and gas-jets at full burning capacity, much less gas was consumed before October, 1878, than has been consumed since the full statutory pressure was applied. The Commissioners cannot reduce the present pressure without infringing their Act of Parliament, and exposing themselves to penalties under the Gas-Works Clauses Act of 1871. Every consumer, however, can regulate the pressure for himself at his own meter, and this is the only means which the Sub-Committee have been able to discover of counteracting the inevitable result of the application of the amount of pressure prescribed by the statute." The other portion of the report contains certain well-known information as to increased consumption with increase of pressure, but I fail to see in the report any reference to the illuminating power of the gas when the higher figure was charged, and after the price had been reduced. Increase of pressure, no doubt, accounts for a good deal of the extra consumption, but if the richness of the gas has also been reduced, then the reason for bills being heavier is perfectly obvious, because a person accustomed to a good light will have it, even if he should require to use a greater number of burners. I should mention that one member of the Committee dissented from the adoption of the report, on the ground that it did not go sufficiently into the question.

The Banff authorities are not altogether satisfied with the way in which they are treated by the Gas Company. In this, as in many other country towns, the lamps are only lighted when, according to the almanac, the moon does not favour the earth with silvery beams. Such an arrangement is necessarily imperfect, because it frequently occurs that on evenings when the moon ought to "put in an appearance," her pale face is obscured by dense clouds, and pedestrians have, on such occasions, to comfort themselves with the reflection that they are the victims of meteorological conditions not recognized by gas companies. In the case of Banff, however, complaint has been made that the lamps had not been lighted on the fourth day after the moon. Perhaps, as there has been a very heavy fall of snow in the town and neighbourhood, the Company were of opinion that the contrast would not be favourable to gas, and they therefore refrained from competing. On the suggestion of the Provost, the Clerk has been instructed to get a general statement as to the terms of agreement between the Company and the Commission, and as to the precise terms for the lighting and extinguishing of the lamps.

Such has been the intensity of frost all over the country, that inhabitants of towns have been put to considerable inconvenience. In Inverness whole streets have been without water for three weeks, and even the mains in some cases have been frozen. In like manner the supply of gas has been interrupted, but I have not heard of any case there similar to one which occurred not far from Edinburgh, where there was a burst of both gas and water, the mains lying close together. When the householders in the district went to turn on their gas, they were not a little astonished to find that they had an abundant supply of water instead of the usual light-giving hydrocarbons.

A memorial was submitted to a meeting of the Dunfermline Town Council on Monday from the inhabitants of Townhill, requesting that steps should be taken to have the Townhill Road and the main street of the village lighted with gas. The expense of such a project, it was pointed out, would not be very great, seeing that the main gas-pipe is carried along the tract required, and the light would be a great convenience to the many travellers who daily pass along the road to and from Dunfermline. After some discussion, consideration of the memorial was delayed till June.

The Stromn is Gas Company have now for the first time in their history, which dates back for several years, declared a dividend. The amount is 4 per cent.

The offer of Mr. Shanks to drain the extended burgh of Kirkcaldy at an expense of about £8000 has been accepted.

Mr. G. Mackay, of Barnhill, is the successful contractor for the construction of the Brax Water-Works to supply the village of Carnoustie. His estimate, £5000, falls short of the Engineer's estimate by £1000.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The little town of Moffat, an inland health resort in the Dumfriesshire Highlands, has a most successful gas supply undertaking. At their annual general meeting recently held, the Shareholders, adopting a recommendation of the Directors of the Company, declared a dividend of 10 per cent. on the past year's profits; and, notwithstanding this fact, they were likewise able to reduce the price of gas from 6s. 8d. to 5s. 10d. per 1000 cubic feet.

It may not account for much, but the Directors of the Ayr Gas Company are certainly making some effort to give a little occasional consolation to Provost Steele and other municipal dignitaries in "Auld Ayr." They still show no sign in the way of meeting the Provost's views as to the mode of dealing with the local gas supply and the charges to the Police Commissioners for street lighting purposes, nor have they yet offered to negotiations for the sale of their works and rights and privileges; evidently they are quite willing to make a periodical return in regard to the quality of the gas they supply to the consumers. At the last meeting of the Commissioners the average illuminating power of the gas used during the month of January was formally reported to be equal standard candles.

The Police Commissioners of Gourrock have under consideration the desirability of adopting the Burghs Gas Supply (Scotland) Act. In the meantime the question is in the hands of a Committee, to whom has been remitted the duty of obtaining all the necessary information to enable the Commissioners to take such action as may be deemed proper under the circumstances.

Since sending my last budget of "Notes," I have learned that an amended offer has been made to the Watching and Lighting Committee of this city by Messrs. R. E. Crompton and Co., with the view of having a trial of the electric light in George Square. I do not know the exact terms of the new offer, but it is certain that they are on a much more moderate scale than those of the first offer. It remains to be seen whether or not anything will arise out of the negotiations.

At the engine shed and laboratory from which they work the electric lights in the General Post Office in this city, Messrs. Crompton and Co. have been giving, during the past few nights, private exhibitions of a number of Swan's electric lamps. Amongst the numerous visitors that have seen them, including Sir William Thomson and various other scientific people, there have been a certain number who have not hesitated to express their doubts as to the possibility of such lights being worked economically as compared with gas lighting in its most improved phases. On the other hand the lamps have called forth much admiration.

Referring to my remarks in the last issue of the JOURNAL as to the cost of street lighting at Bathgate, I must make a little correction. It seems that the charge of £2 10s. applies only to one lamp, which is placed over a fountain recently erected in the town. The annual charge made by the Gas Company for the other lamps is only 7s. 6d. per lamp, which is certainly a very small charge when it is considered that each lamp is allowed to burn, on an average, 12 hours per day all the year round, and that the price of gas is 5s. per 1000 cubic feet.

There is a serious misunderstanding between the Municipal Authorities of Kilmarnock and many of the townspeople, on the one hand, and the Kilmarnock Water Company on the other. Perhaps it would be more correct to say the Chairman of the Company, Mr. Ritchie; for certainly very strong things are being said of him as the representative of the Company, on account of an alleged non-fulfilment of the contract made with the public to give them a constant water supply throughout the town. A correspondent, in a local newspaper, rather chides the Municipal Authorities for not having agreed to purchase the water supply works when they were offered to them, as he says, many years ago, at £11 10s. per share; and he hopes that the present agitation will not pass away without some effort being made to bring about an amicable purchase of the undertaking. There is no mistaking the fact that the community is roused, from which it may be inferred that there is something wrong on the part of the Water Company.

The pig iron market has been dull during the past week, and the closing price yesterday was 50s. 6½d. cash, and 50s. 9d. one month.

A fair amount of activity is reported in the coal trade, and in some districts the activity is great.

THE MANUFACTURE OF GAS FROM WOOD.

At the Annual Meeting of the American Chemical Society, on Dec. 2, a paper on "Wilkinson's Process for the Manufacture of Illuminating Gas from Wood," was read by Dr. C. A. Darems, Adjunct Professor of Chemistry at the Bellevue Hospital Medical College, New York.

The author said that in carrying out this process, instead of coal heated to yield 15,000 cubic feet of gas of low illuminating power, Virginia pine wood of 3300 lbs. to the cord, costing 5-25 dols. delivered at and piled in the sheds, is heated in through retorts. After the first charge the resulting charcoal is pushed back in the retort, and the gas made from the second charge is therefore obliged to traverse this bed of red-hot coal. Carbonic dioxide is changed to carbon monoxide, the water in the wood reacts to form water gas, and a gas results free from tar, acids, &c., and having a composition of:—

	Per Cent.
Hydrogen	5.40
Marsh gas	44.16
Carbon monoxide	33.75
Illuminants	—
Carbon dioxide	10.50
Nitrogen	6.00
Oxygen	0.25
Ammonia	—
Sulphuretted hydrogen	—
	100.00

The above is the composition of the crude gas after cooling, but before purification.

The average yield during six months was 53,892 cubic feet to the cord. The coke supply for firing being deficient, the furnaces were changed so as to burn "pea" anthracite. This was accomplished by using a jet of superheated steam, the superheater being an iron tube running into the fire-pot, and having a central tube to convey the steam to its blind end. The returning steam found its exit through an injector into the fire. An intense heat (capable, however, of the nicest regulation) was hereby attained. The air supply is obtained from an iron tube, 2 feet in diameter, open at both ends, and placed above the furnace stacks. The heated air is drawn down to the fire by the steam injector. A saving of 1 dol. per fire per day is thus effected. Besides these advantages, the wood gas needs very little purification; the spent lime can be re-burnt at the works; the number of hands is largely diminished; and the cleanliness of the process is a notable feature.

To give the wood gas the requisite illuminating power, it is carburetted according to the "binary" process adopted at Buffalo in 1872. The gas flows into an apparatus provided with shelves, heated by steam-pipes, and meets a sheet of naphtha vapourized by the steam. The mixed gas flows from the carburetter to the "fixing retorts" and a superheater together. The resulting gas needs only to be sent through a bed of charcoal to cool it and remove some little tar, and is then distributed as commercial gas. The New York Mutual Gas Company now manufacture poor coal gas and wood gas thus carburetted. The commercial gas is composed of:—

	Per Cent.
Hydrogen and }	56.75
Marsh gas	
Carbon monoxide	11.25
Illuminants	15.25
Carbonic dioxide	1.00
Nitrogen	15.00
Oxygen	0.75
Ammonia	—
Sulphuretted hydrogen	—
	100.00

21 volumes of wood gas, 37.4 of coal gas, and 41.6 of naphtha gas make

100 of commercial gas; 4·5 gallons of naphtha are required to every 1000 cubic feet of commercial gas. This gas has an illuminating power of 26·53 candles, a gravity of 0·703 to 0·808, contains 7·28 grains of sulphur per 100 cubic feet (mostly CS_2), and 0·82 grain of ammonia per 100 cubic feet. The analyses were made according to Wilkinson's process, with a modification for determining the nitrogen, hydrogen, and marsh gas; as by this method even hourly variations in the composition of gas can be detected. It is, therefore, most suitable and convenient for technical purposes. The presence of nitrogen to the amount of 15 per cent, together with a light of 26·53 candles, is anomalous; yet the fact is certainly indisputable. The nitrogen gets access from the clay retorts from the fires, as well as by leakage. The retorts are always under exhaust to increase the yield of gas. Poor coal gas costs 20 cents (counting the drawbacks) per 1000 feet, while wood gas only costs 9·9 cents. The Mutual Company send out about 3 million feet of commercial gas daily, 15 per cent. being nitrogen, or 450,000 cubic feet at 2·25 dols. per 1000 feet (now the ruling price in all New York Companies), or 1012·50 dols. profit on nitrogen per diem. The gas does not smoke, is nearly white, is of high gravity, and is constantly increasing in favour.

METROPOLIS WATER SUPPLY.

THE METROPOLITAN BOARD OF WORKS AND THE EAST LONDON WATER COMPANY'S BILL.

At last Friday's meeting of the Board, the Parliamentary Committee, in the course of their report, stated that they had considered what course should be taken with reference to the East London Water Company's Bill, and in connection therewith had had before them the letter from the Home Department in reply to a letter which had been addressed to them (see ante, p. 224), in which it was stated that the Secretary of State would endeavour to assist the Board in obtaining from Parliament an indemnity against any personal liability on the part of the members for any expenses which the Board might incur in opposing the Bill. In view of this communication the Committee thought it desirable that the Board's petition against the Bill should be strongly supported, and they recommended that the Solicitor be instructed to retain the services of three Counsel for this purpose.

A motion for the adoption of the report was, after some opposition, carried.

The Registrar-General publishes the following returns—furnished to him by the London Water Companies—of the average daily quantity of water supplied to the Metropolis during last month. From these it will be seen that 136,008,422 gallons, or 617,949 cubic metres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 226 gallons (102·7 decalitres), rather more than a *ton* by weight, to each house, and 31·9 gallons (14·5 decalitres) to each person, against 33·4 gallons during January, 1880:—

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons during	
	Jan., 1880.	Jan., 1881.	Jan., 1880.	Jan., 1881.
Total supply	576,694	600,817	136,937,666	136,008,422
From Thames	275,469	288,618	67,813,589	65,257,092
„ Lea and other Sources . .	301,225	312,199	69,124,077	70,751,330
THAMES.				
Chelsea	29,945	30,600	7,888,000	7,497,100
West Middlesex	53,622	56,302	10,573,737	10,015,773
Southwark and Vauxhall . .	88,636	92,461	24,322,990	21,925,172
Grand Junction	40,285	43,095	11,729,662	11,274,547
Lambeth	62,981	66,160	13,299,200	14,644,500
LEA AND OTHER SOURCES.				
New River	129,683	132,665	27,186,000	24,948,000
East London	122,746	127,810	33,599,000	37,394,500
Kent	48,796	51,724	8,339,077	8,408,830

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for January, 1881, as compared with that for the corresponding month of 1880, shows an increase of 24,123 houses, and a decrease of 929,244 gallons of water supplied daily.

Dr. Frankland's analyses of the waters supplied last month to the inner, and portions of the outer circle of the Metropolis, showed the following results expressed in parts per 100,000:—

Companies or Local Authorities.	Total Solid Matter.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames								
Chelsea	30·90	·335	·064	0	·219	·283	1·4	20·3
West Middlesex	31·68	·295	·052	0	·243	·300	1·5	20·3
Southwark	33·02	·303	·042	0	·299	·341	1·5	20·9
Grand Junction	32·76	·226	·050	0	·300	·350	1·4	21·5
Lambeth	33·96	·241	·031	0	·318	·349	1·6	21·8
Lea—								
New River	31·70	·222	·044	0	·276	·320	1·6	20·3
East London	36·46	·273	·032	0	·270	·302	1·8	23·6
Deep wells—Kent . . .	39·56	·098	·016	·004	·393	·412	2·5	27·2
Outer Circle.								
Colne Valley	15·20	·085	·006	0	·394	·400	1·5	6·1
Tottenham	39·90	·139	·021	·086	0	·092	3·0	24·3

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

ST. MARY CHURCH LOCAL BOARD GAS-WORKS.—At the last meeting of the St. Mary Church Local Board, it was unanimously resolved, in consequence of the satisfactory manner in which the gas-works have been managed during the last four years by Mr. Thomas Evans, to increase his salary by £20 per annum from Christmas last. Mr. Evans briefly thanked the Board for their kindness, and said he would endeavour to do his best in the future as he had in the past.

NEWPORT (MON.) GAS-WORKS BENEFIT SOCIETY.—The sixth annual dinner of this Society was recently held—Mr. Thomas Canning, Engineer and Manager of the Newport (Mon.) Gas Company, presiding. A very pleasant evening was spent by a large number of the members and their friends. The Secretary of the Society (Mr. J. Whitefield), who occupied the vice-chair, in responding to the toast of the evening, gave some statis-

tics of their present position and last year's working of the Society which showed that, after providing for all liabilities, there remained a balance in hand on Dec. 30, 1880, of £5 14s. 8d.

PRESENTATION TO MR. JOHN M'CRAE.—Last Friday evening the *employés*, at the Bury St. Edmund's Gas-Works presented Mr. M'Crae with a handsome silver salver, as a token of their goodwill on his leaving Bury St. Edmund's for Dundee. Mr. King made the presentation, expressing the disappointment and regret the men felt at the loss of their esteemed Manager. Mr. M'Crae, having expressed his thanks to the men, encouraged them to continue in the path of duty, making every effort to maintain the efficient state of the works, and never to lose sight of the fact that unity was the secret of success in any undertaking.

EXHIBITION OF GAS APPARATUS AT SOUTHPORT.—On Thursday last an exhibition of gas cooking and heating apparatus, burners, &c., was opened in the Cambridge Hall, Southport, by the Mayor (Alderman Sutton). The exhibition was initiated by the Gas Committee of the Corporation with the object of affording the inhabitants of the town an opportunity of examining the latest inventions and appliances for the economic use of gas for domestic and manufacturing purposes, and their endeavours have been seconded by most of the well-known makers of gas-cooking appliances, whose exhibits have been effectively arranged under the superintendence of the Corporation Gas Manager (Mr. J. Booth). Following the example set by other Corporations, a lady (Mrs. Thwaites) from the Liverpool High School of Cookery has been engaged to give daily lectures on high-class and economical cookery, thus demonstrating the practical applicability of the various appliances for the purposes intended. The exhibition, as at present arranged, will remain open till the 24th inst., and it is to be hoped will be as successful as those held in other parts of the country.

PRESTON GAS COMPANY.—The annual general meeting of this Company was held on Monday, the 14th inst.—Lieut.-Col. Mounsey in the chair. The Directors in their report stated that the balance of profits enabled them to declare the usual dividends of 10 and 7 per cent. on the "A" and "B" stocks respectively. They also reported that they had secured a contract for the whole of their supplies of cannel and coal for five years. This arrangement they considered a satisfactory one, and such as would enable the Proprietors to look without anxiety upon any material rise which might take place in the prices of these articles during that period. The contract for tar would expire during the present year; but a further contract at an enhanced price had, they said, been entered into with the gentleman who during the last ten years had contracted for the tar produced at their works. Accompanying the report was the statement of accounts for the year ended Dec. 31 last. It showed that of the "A" stock there had been issued the total amount authorized—viz., £120,000—and of "B" stock, £112,300; leaving £7700 yet to be paid up on the amount authorized on this stock. The Company had £59,029 8s. 6d. on loan at 4 per cent. The capital account showed that the expenditure up to Dec. 31, 1879, had been £292,987 4s. 2d., and since that date there had been expended £8697 19s. 10½d., making a total of £301,685 4s. 0½d. The revenue account showed that the cost of manufacturing gas had been £33,524 19s.; distribution, £2309 14s. 6d.; rents, rates, and taxes, £1881 17s. 8d.; management, £1269 7s. 5d.; law charges, £130 12s. 10d.; bad debts, £210 15s. 4½d.; and the balance carried to profit and loss account was £23,465 18s. 3d. The receipts were—Private consumption of 287,417,500 cubic feet of gas, £45,237 19s. 2½d.; public lamps, 15,869,900 cubic feet, £2390 7s. 8d.; rental of meters, £3276 9s. 11d.; residual products, £11,638 14s. 7d.; rents, £204 13s. 2d.—total, £62,793 4s. 6½d. The reserve fund account stood at £29,045 3s. 7½d. The report was adopted, and the dividends recommended were declared. The retiring Directors and Auditor were re-elected, and the proceedings closed with a vote of thanks to the Chairman and Directors for their services during the past year.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 265.—DARLING, J., and MURDOCH, R., Glasgow, "New or improved apparatus and means for turning on gas jets and for igniting the same." Jan. 21, 1881.
- 305.—HENDERSON, A. C., Southampton Buildings, London, "Improvements in gas-stoves for heating purposes." A communication. Jan. 24, 1881.
- 320.—SOMBART, C. M., Magdeburg, Germany, "Improvements in gas-engines." Jan. 25, 1881.
- 335.—FLETCHER, T., Warrington, Lancs, "Improvements in gas-stoves for heating purposes." Jan. 25, 1881.
- 357.—HALDANE, W., Edinburgh, "Improvements in the construction of dry gas-meters." Jan. 27, 1881.
- 368.—HOLMAN, S., Queen Victoria Street, London, "Improvements in apparatus employed in the manufacture of gas." Jan. 27, 1881.
- 370.—HOLT, H. P., Leeds, Yorks, and CROSSLEY, F. W., Manchester, "Improvements in connection with gas motor engines, and locomotives worked thereby." Jan. 27, 1881.
- 394.—WYNNE, W. W., Chancery Lane, London, "Pressure regulating gas-burners." A communication. (Complete specification.) Jan. 28, 1881.
- 441.—FAIRFAX, J. S., St. Paul's Road, London, "Improvements in joints for pipes and apparatus connected therewith." A communication. Feb. 2, 1881.
- 457.—MILLS, B. J. B., Southampton Buildings, London, "Improvements in steam-boiler and other furnaces for burning gas." A communication. Feb. 3, 1881.
- 532.—FIELDING, J., Gloucester, "Improvements in gas motor engines." Feb. 8, 1881.
- 535.—MORRIS, F., Brentford, and CUTLER, S., Millwall, London, "Improvements in gas condensers." Feb. 8, 1881.
- 565.—ALLCOCK, A. T., Newark-on-Trent, Nottingham, "Improvements in gas-engines." Feb. 9, 1881.
- 582.—SHERWOOD, I., Birmingham, "Improvements in the galleries or glass holders of gasaliers and lamps." Feb. 10, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3107.—NAWROCKI, G. W. von, Berlin, "Improvements connected with the hydraulic main used in the distillation of gas." A communication. July 28, 1880.
- 3182.—TURNER, F. W., St. Albans, Hertford, "Improvements in gas motor engines." Aug. 3, 1880.
- 3203.—FLETCHER, T., Warrington, Lancs, "Improvements in gas-burners for heating purposes." Aug. 5, 1880.
- 3225.—GROTH, L. A., Finsbury Pavement, London, "An improved construction of meter for water and other fluids." A communication. Aug. 6, 1880.
- 3267.—WHITELEY, J., and PICKLES, R., Bradford, Yorks, "Improvements in gas-purifiers or scrubbers." Aug. 10, 1880.
- 3288.—IRELAND, J., Plymouth, "Improvements in methods or means for

enriching or purifying illuminating gas, and in apparatus therefor." Aug. 12, 1880.
3512.—AYLESBURY, H., Bristol, "Improvements in gas engines or motors." Aug. 30, 1880.
4683.—SIEMENS, C. W., Westminster, "Improvements in gas-lamps." Nov. 13, 1880.

PATENTS WHICH HAVE BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
216.—WRIGHT, F., "An improved governor for gas-burners." Jan. 17, 1878-
260.—CLARK, A. M., "Improvements in wet gas-meters." Jan. 19, 1878.

314.—WILSON, W. V., "Improvements in the manufacture of cyanogen products from gas residues." Jan. 24, 1878.
382.—WIGHAM, J. R., "Improvements in apparatus for producing or enriching combustible gas for illuminating purposes, more particularly applicable for illuminating lighthouses." Jan. 30, 1878.
422.—EASTMURE, D. G., "Improvements in apparatus to regulate the flow of water." Feb. 1, 1878.

PATENT WHICH HAS BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.
251.—ABRAHAM, A., "Improvements applicable to gas and other lamps." Jan. 20, 1874.

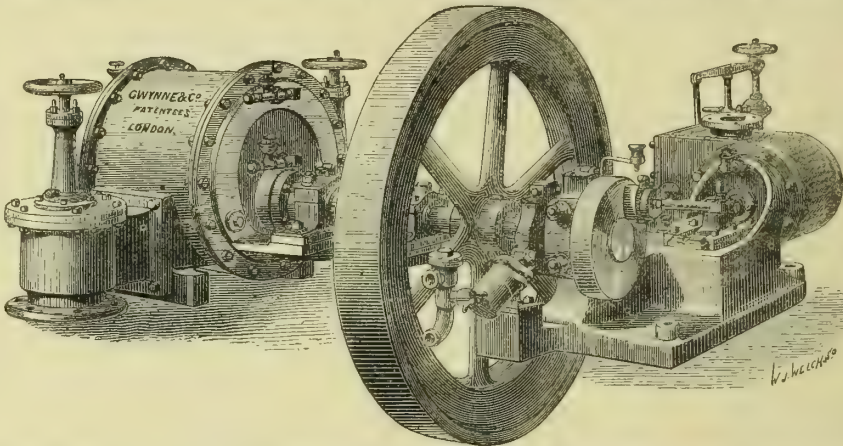
RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Feb. 16, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company .	Notting Hill				Station	closed	for	repairs				
	Camden Town	18.3	16.6	17.6	14.2	11.1	12.5	0.0	0.0	0.0	None.	In excess.
	Dalston	17.8	16.8	17.3	14.7	11.2	12.9	0.2	0.0	0.0	"	"
	Bow	17.2	16.4	16.8	12.9	10.1	11.1	0.7	0.4	0.5	"	"
	Chelsea	17.5	16.6	17.0	15.6	12.4	14.6	0.5	0.0	0.2	"	"
	Kingsland Road	18.1	16.2	17.1	17.3	13.0	15.4	0.3	0.0	0.2	"	"
South Metropolitan Gas Company .	Westminster (cannel gas) . .	21.7	20.7	21.2	19.3	10.9	15.0	1.0	0.6	0.8	"	"
	Peckham	17.5	16.6	17.1	14.4	7.0	11.8	0.4	0.0	0.3	"	"
Commercial Gas Company	Old Ford	17.8	16.8	17.2	18.6	13.2	16.3	0.4	0.0	0.1	"	"
	St. George-in-the-East . .	17.6	16.8	17.2	12.4	8.9	10.6	0.4	0.3	0.3	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.
Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

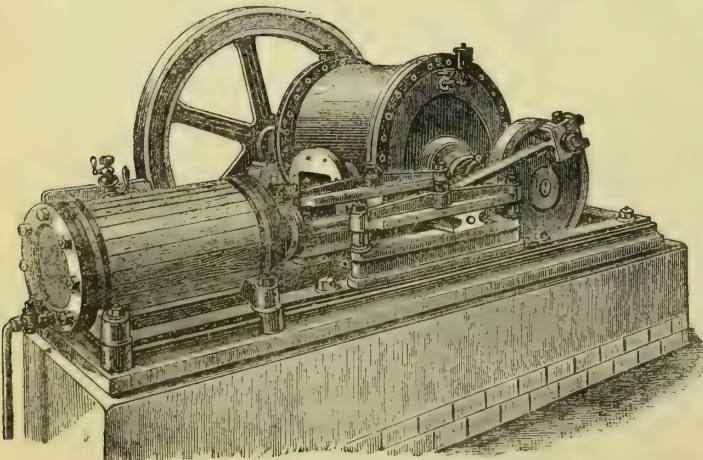


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Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.
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Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.
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INVENTED SPECIALLY TO REDUCE OSCILLATION, FRICTION, AND POWER.
TO WORK BY BELT OR WITH
ENGINE COMBINED.

GEORGE WALLER & CO.,
Makers of **BEALE'S EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, SELF-ACTING BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.**

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PHOENIX ENGINEERING WORKS:
HOLLAND STREET, SOUTHWARK, S.E.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

J. T.—It is somewhat difficult to estimate the loss from condensation apart from that by leakage. So much depends on local circumstances, of which you must be the best judge. You might take the proportionate loss on the probable quantity to be delivered through the pipe from the average of the district.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 1, 1881.

THE SOUTH METROPOLITAN GAS COMPANY'S MEETING.

THE half-yearly general meeting of the South Metropolitan Gas Company was held on Wednesday last, when the Directors' report and the statement of accounts, which will be found in another column, were taken as read, and adopted. Dividends after the rate of twelve per cent. per annum on the "A" stock, and eleven and a quarter per cent. per annum on the "B" stock, were declared, and the surplus of divisible profits was added to the reserve fund. The Chairman, Captain Thomas B. Heathorn, R.A., spoke very briefly in moving the adoption of the report and accounts, partly, no doubt, because he is a believer in the eloquence of brevity on such occasions; but also, in all probability, because anything like an historic parallel between the working of the past half year and any preceding similar period is impracticable. Under these circumstances, the positive facts of profits made and distributed must be permitted to speak largely for themselves. However brought about, they are happily sturdy

realities, and as such they must be accepted. We know as a general truth that the abnormal proceedings of the Company, during the past year or two, have resulted in large economies of working, and also in increased stability; but it would be manifestly impossible to separate and trace out all those benefits to their proximate sources.

The accounts were not allowed to pass altogether without criticism. Mr. E. Horner—who, it may be remembered, was Chairman of the Phoenix Company for many years previously to the amalgamation of that Company with the South Metropolitan—sharply criticized the working results of gas made per ton of coal carbonized, and the consumption of coke for fuel, shown in the statement of the Company's manufacturing operations. With respect to these points, it will be readily conceded by our professional readers that the Secretary and Engineer, Mr. George Livesey, is quite able to defend his own practice in these two particulars, whenever an opportunity is afforded of fairly discussing such matters of detail. It is, however, not too much to say that a heterogeneous gathering of gas shareholders is not the best occasion for ventilating theories of carbonization. And this particular meeting seemed to feel the truth of their incompetency to express any opinion upon moot points of management, for the Proprietors declined to take fire even at Mr. Horner's startling statistics of the many thousands of pounds which he suggested were wasted every year, in consequence of Mr. Livesey's deliberate choice of a medium instead of a high yield of gas from the coal carbonized. Mr. Livesey's answer to this impeachment does not require strengthening, especially after the long discussion on this very matter which has been so recently carried on by himself and others in our columns. Mr. Livesey was not able to flash such dazzling considerations before his hearers as had been brought forward by Mr. Horner; but although his argument was necessarily somewhat technical, it clearly showed to the mind of the most inexperienced person present at the time, that that gentleman's assumption, that the extra yield of gas which he so much admired could be obtained without extra expense, was a fallacy. More than this a mixed audience could hardly be expected to grasp, and it was sufficient enlightenment for them; the exact proportion of the additional expense to the increased yield might, as far as they were concerned, be left to be determined by more experienced judges. Mr. Horner was not immediately convinced by the precise data brought forward by Mr. Livesey in support of his argument—we allude to his statement of the comparative cost of coal to The Gaslight and Coke Company and to his own Company—by which he sought to prove that the former Company, with their high production of gas, use an excessive quantity of high-priced coal; the inference being, of course, that the lower cost of coal to make the same quality of gas was synonymous with the better system of carbonization.

We are not at all disposed to exalt the working of one Company at the expense of the other, for comparisons in this respect may easily be pushed to extremes; but it is fair to test the value of Mr. Horner's objection to Mr. Livesey's figures, supported as it was by Mr. J. Orwell Phillips, to the effect that the apparently higher cost of the Chartered Company's coal is due to the fact that they supply a large proportion of gas made from a costly cannel alone. On examination of the accounts of The Gaslight and Coke Company for the past half year, it will be found that they sold cannel gas in the proportion of but 4·48 per cent. to their sale of common gas. Yet their consumption of cannel was 8·37 per cent. of the common coal, while the South Metropolitan Company consumed only 2·65 per cent. of cannel, the difference between the two rates of consumption of cannel being thus 5·72 per cent. against the former Company. Now, if cannel coal produced only an equal quantity of gas with common coal, the additional 4·48 per cent. of gas would consume for its production an equal proportionate addition to the weight of coal. This would leave the proportion of cannel used for enriching the common gas at 3·89 per cent., or nearly half as much again as the consumption of the same material, presumably of equal quality, by the South Metropolitan Company. Hence there is a great deal of truth in Mr. Livesey's contention in respect of this matter. We have given the preceding considerations in the interests of gas manufacturers in general, for in setting the administration of the two greatest Metropolitan Gas Companies in strong contrast with each other, we have no other desire than that of bringing to light principles which may be of universal application. With respect to the consumption of coke for fuel, the figures representing this, are, as Mr. Livesey says, very generally a matter of estimate.

It must, however, be admitted that 27 per cent. is a high rate, which Mr. Livesey is probably more anxious than any one to see reduced—not merely as a matter of account, but in actual practice. By the adoption of gas generator furnaces, Mr. Livesey has shown in the most practical way that he is not only fully alive to the importance of economy in fuel, but is also taking the best known means of effecting it. The remaining incidents of the ordinary meeting do not call for comment.

At the subsequent special meeting the Company's Bill now before Parliament was read, and its promotion sanctioned by the Proprietors. In the course of the somewhat desultory discussion which followed, it was announced that the Company had unreservedly withdrawn from the Bill the clause having reference to the purchase of residual products from other Gas Companies, which, as we stated last week, had aroused the opposition of the Metropolitan Board of Works. It was an ill-omened clause from the first, and the Bill would have been all the lighter if it had never been inserted, as the new principle it involved was evidently one which would arouse suspicion or hostility, and it has done both. A passing reference to the reported vacillation of the Board of Trade in regard to the sliding scale was the only other debateable subject mentioned; and the meeting terminated with the usual complimentary vote of thanks to the officers and staff, which have seldom been better deserved by the recipients.

THE LIGHTING OF THE CITY OF LONDON STREETS.

The report of the Engineer and Surveyor to the Commissioners of Sewers of the City of London on the works executed during the past year shows, among other things, how the lighting of the City streets and thoroughfares is carried out by The Gaslight and Coke Company. The Company's present prices for supplying and maintaining ordinary street lamps, consuming five cubic feet of gas per hour, are £4 9s. 8d. for square, and £4 13s. 11d. per annum for globular-shaped lanterns. During three years ending 1879 the prices were £4 13s. 3d. and £4 17s. 6d. respectively. The difference in the rates shows the additional expense incurred in cleaning and maintaining the circular lanterns; against which, according to Mr. Hunt's experiments at Birmingham, some set-off of higher efficiency must be allowed. The report is unable to allege anything against the manner in which the Company fulfil their engagement with the Commission, although there are thirty-six meter-lamps in various parts of the City. The report notifies that only three improved lamps of the larger sort have been set up in the whole of the City area during the past year, and two of these have been erected opposite the Mansion House, where countless other devices, by way of reflecting lanterns, &c., have, at one time or another, appeared. These lamps, we suppose, are destined to pass through a period of suspended animation, so soon as the electric lighting experiment puts in an appearance. One of Messrs. Siemens Brothers mast-head lights, with a lantern eighty feet above the pavement, will probably be erected somewhere about this spot, and it will soon after be seen whether the radiance from this skyed luminary will be as useful on the ground level as it may possibly be to the denizens of the top floors of some of the lofty houses in the neighbourhood, who may find a saving in bedroom candles from living in a locality where there is always a full moon just in front of their windows.

THE IPSWICH GAS COMPANY AND MR. E. GODDARD.

THE annual meeting of the Ipswich Gas Company, which has just been held, was not more remarkable, from a business point of view, than that of any other undertaking whereof the Proprietors receive full dividends. In a sense more personally interesting to many of our readers, the meeting deserves notice. Mr. E. Goddard, the Company's Secretary and Engineer, in acknowledging a vote of thanks for his continued services, and of confidence in his management of the undertaking, took the opportunity of remarking that he has now been connected with the Company for thirty-nine years, and that if he is enabled to complete his fortieth year of honourable service to the Company and the public, he will then seek permission to retire. Such veterans as Mr. Goddard are uncommon even in the ranks of a profession the members of which frequently preserve their individual activities to an advanced age, and he will be widely regretted when he at length gives place to a younger man. Men of Mr. Goddard's prolonged experience are peculiarly valuable to those who are enabled to consult them. How many schemes for superseding gas lighting has Mr. Goddard seen brought forward with much blowing of trumpets—to vanish

into thin air one after another! Hydrocarbon lights, electro-magnetic lights, petroleum gas, *et hoc genus omne*, have arisen, attained to portentous importance, and disappeared, while Mr. Goddard was quietly working away at Ipswich; and he is there yet. When he goes, a wider circle than the municipal borough of Ipswich holds, will remark the formal demission of a man who, in his time, has not been idle.

AN AMERICAN FORM OF GENERATOR FURNACE.

WONDERFUL things are spoken of the Dieterich furnace, as adopted in the gas-works of Baltimore, Maryland; and we have pleasure in being able to lay before our readers in another column the very complete report on the arrangement furnished by our American correspondent. It will be observed that there is a strong family likeness between the Dieterich and some of the German patterns of generators. It cannot be said that the American arrangement for clinkering is of the most improved type—the device of introducing a supplementary grate to sustain the fuel reminds us of Dr. Schilling's early practice. It would seem that a better way to deal with clinker would be to prevent its formation in the first place, in which there is no difficulty. The sand-lute, too, is a somewhat clumsy way of closing the feeding-door, and it might be advantageously dispensed with by Mr. Dieterich, as it has been by Herr Hasse and others. It may also be said that many experienced carbonizers, whose word is worthy of regard, are very doubtful as to the great amount of profit sometimes said to be derived from the practice of stoking with hot coke, to which Mr. Dieterich attaches great value; and the point cannot be considered satisfactorily settled either way. The great heat at which the Dieterich generator is worked seems to suggest that it is almost as much a direct-acting as a gas-generating furnace, and it is difficult to imagine that no serious loss by radiation is thereby caused. The actual working results appear to be good, although it is hard to understand our correspondent's statement that he suffered no inconvenience when his hand was over the exit of the flues. It of course depends upon the height at which he was placed in reference to the said flues; but this would have been easily found if we knew the absolute temperature marked by a thermometer in the flue itself. The entire communication is, however, of great interest, as showing the important efforts that are now being made in America, as elsewhere, to economize fuel and improve the method of carbonizing coal.

Water and Sanitary Affairs.

WE believe that Lieut.-Col. Bolton's report for the month of January, on the subject of the Metropolitan Water Supply, will be found to contain a large amount of interesting information as to the consequences of the late severe frost, both as affecting the consumers and the Water Companies. It is expected that the cost incurred by the latter in connection with the stand-pipes will be shown to have amounted to some few thousand pounds. The completion of these details, and the necessary change in the composition of the report, probably account for the circumstance that the document is a few days later than usual in making its appearance.

The second monthly report on the London Water Supply, addressed to the President of the Local Government Board by Mr. Crookes, Dr. Odling, and Dr. Tidy, has just been issued. It comes down to the 19th ult., and, like its predecessor, only deals with the Metropolitan Water Companies drawing their supply from the Thames and the Lea. The samples taken amount to 157, distributed over the entire month, instead of being limited to one for each Company, all taken on one day, as in the reports of Dr. Frankland. The results are stated in grains per gallon, and in the case of the organic carbon and nitrogen in parts per 100,000 also. On the present occasion we are able, in one instance, to make a direct comparison between the results obtained by Dr. Frankland, and those which appear in this report. On the 13th of January, Dr. Frankland took a sample of water from the mains of the Southwark and Vauxhall Company, and reported the organic carbon and nitrogen as respectively 0.303 and 0.042 per 100,000. On the same basis, the figures in this report are 0.150 and 0.036. Dr. Frankland's sample was taken from the cab rank in Southwark Street, and the other from the vicinity of St. George's Church, in the Borough. Among the samples recorded in this report, twelve are said to have been turbid, thirty-one slightly turbid, and twenty-three very slightly so, the remainder being clear. In the previous month there was only one turbid sample, and eight slightly turbid. The

unavoidable conditions consequent on the severe frost are considered to account for the turbidity of the water during the past month; but it is explained that the suspended matter is almost entirely of the nature of clay and sand, and on the worst days it did not average more than a grain per gallon. Of course Dr. Frankland is accustomed to disdain anything so small as a gallon of water. He would tell us 100,000 lbs. of the Southwark Company's water contained 1.43 lbs. of suspended matter, besides some other objectionable quantities. But most people can understand a grain per gallon, and when they know that sand and clay to this extent is the worst that befalls them in the most unfavourable weather, they are not likely to be unduly alarmed. In the present report, Mr. Crookes and his colleagues state that these examinations of the water supply are made under instructions from the Companies, who leave the selection of samples, the methods of analysis, and the form of publication, entirely to the discretion of the Analysts, the Companies not taking any part in the matter beyond bearing the expense. It will be observed that the Kent Company are not included in the programme. At the conclusion, the report states that "the water supplied during the past month was wholesome, of good quality, and well oxygenated."

Mr. A. W. Blyth, Dr. Whitmore's successor as Medical Officer of Health at Marylebone, in his sanitary report for the month of January, observes that "the water supply was cut off from thousands of houses by the frost, and the payer of water-rates had, at his own expense, to obtain water from stand-pipes." Mr. Blyth fails to notice that all the "expense" did not fall on the consumer. By far the heavier portion devolved on the Companies, who are in no sense responsible for the fact that their water freezes at 32° Fahrenheit. If the pipes on the premises of the consumers were properly protected, there would be much less inconvenience suffered in time of frost, but the requisite reform is beyond the reach of the Water Companies, much as they may desire to see it carried out. Mr. Blyth also complains that the stand-pipes were "not always placed within a reasonable distance, and not always open at a seasonable time." An army of men and a forest of stand-pipes would probably fail to obviate all objections; but the Companies may at least be credited with an honest and a costly effort to furnish a supply adequate to the wants of the consumer. If the Marylebone Vestry supplied the water, perhaps Mr. Blyth would be more familiar with the difficulties of the case. The water supply was not the only sanitary arrangement disorganized by the extreme cold. Mr. Blyth says: "During this intense frost, and for some little time afterwards, household scavenging was at a standstill—all the available men and carts being engaged in freezing the great arteries of thoroughfares—and dust, animal and vegetable refuse, accumulated." For this part of the disorganization there is nobody to be hanged, seeing that the sovereign power alone is guilty. But at the close of his report, Mr. Blyth performs an act of justice. He gives a well-devised table of analysis in respect to the water supplied by the Grand Junction and the West Middlesex Companies, and declares the supply in each case to be "of excellent purity." So far we are content, and we are also glad to learn that, despite all the discomforts, the health of Marylebone does not seem to have been materially affected by the bitter weather of the month of January.

The Redruth Local Board appear to take a somewhat peculiar view of their duties. It is their good will and pleasure "not to recognize Redruth as a water-closet town." Consequently, when the inhabitants complain that the cisterns of their water-closets run dry, they are told there is plenty of water if they choose to go and fetch it. According to the present state of affairs, it appears that the Local Board profess to supply the town with water, but the method is so peculiar and unsatisfactory that a considerable number of the inhabitants have signed a petition addressed to the Local Government Board, praying that advantage should be taken of an offer from the Camborne Water-Works Company. One of the Board's Inspectors has just visited Redruth, for the purpose of making an inquiry respecting an application from the Local Board for power to acquire certain lands in order to carry out works of sewerage and sewage disposal. Evidence was taken at the same time in reference to the water petition, when it was urged, on behalf of the Local Board of Redruth, that the present supply was ample, and if it were not, they were in a position to enlarge it; but they objected to being put to "the great expense" of providing what they call a "house-to-house supply." There are "public taps" for the supply of water, and it would

seem that the inhabitants are in a great measure dependent on these appliances. The Inspector did not apparently favour the idea of introducing the Camborne Water-Works Company. He held to the principle that it was the duty of the Local Board to supply the town with water, but told the members of that body plainly, in open meeting, that although they were doubtless—as they said—very earnest men, they were "awfully slow." They had been "indulging in a lot of talk for a long time," but they had "done nothing." Finally the Inspector expressed a hope that "some definite action would now be taken." We can only say there seems little prospect of such a result. If Redruth desires improvement, perhaps its inhabitants will begin by improving the constitution of the Local Board.

Lymington, in Hampshire, is in trouble with regard to its water supply. The Local Board have sunk a well, which persists in supplying sand along with the water, and there is fear that there will be a "subsidence" among the adjacent house property. After a long discussion and much advice, the Local Board have resolved to let the well alone for the present. In the meantime, they are going to ask certain firms of engineering celebrity if they will be so good as to propose a plan for supplying the town with water, and state the cost at which they will carry it out. One leading member of the Board has resigned in consequence, as he considers it an act of extravagance not to use the well, which is said to yield 80,000 gallons per twenty-four hours. Another active member previously declared that he should send in his resignation the moment the Board decided to use the well, as he expected that the pumping up of the sand would let down the houses, involving the Board in a pecuniary responsibility which he was not disposed to share. The gentleman who has already resigned pities the poor ratepayer, and states that out of a population of more than four thousand, only about a hundred are well-to-do. The Local Government Board appear in the background, ready to step on the scene, Dr. Airy, the Government Inspector, having already administered "a slight rebuke" to the Local Board for their tardiness. It appears the Board have been "at this question" for five years, and it is predicted that unless some superior power interposes, they will "go on for another five years" in the same way. Like the men at Redruth, referred to in the preceding paragraph, they seem to be "earnest," but "awfully slow."

WATER BILLS FOR 1881.

(Continued from p. 304.)

THE following Bills are promoted by corporate authorities who desire additional powers in respect of water supply:—

The *Aberdeen Corporation Bill* is to enable the Corporation to construct a new pumping-station for their water undertaking, and to borrow for the same purpose, on the security of a water-rate to be legalized by the Bill, the sum of £30,000, to be redeemed by a sinking fund of two per cent. The Corporation also seek power to borrow a certain proportion of cash on short bills.

The *Barrow-in-Furness Corporation Bill* is to extend the period limited by the Act of 1875 for the completion of the water-works authorized by that Act, to a further period of ten years, to enable the Corporation to supply water in bulk beyond the borough, and to make certain alterations in the mode of levying water-rates.

The *Bingley Water and Improvement Bill* is to authorize the Bingley Improvement Commissioners to purchase from the owner certain water rights and works of water supply at present leased by them, and to make additional works, providing compensation water to millowners and occupiers on a tributary of the River Aire, from which they propose to take a portion of the supply. Water-rates for the supply of water for domestic purposes are to be levied at from seven to five per cent. on the annual value of houses, with extras. The Commissioners desire to borrow £65,000 for water purposes, to be repaid within seventy years.

The *Birkenhead Corporation (Gas and Water) Bill* is, in part, to enable the Birkenhead Corporation to extend their water-works by the construction of a well and pumping-station, a reservoir, and two pipe lines, such works to be completed within ten years. The Bill includes clauses to provide for the future purchase by the Corporation of the undertaking of the Wirral Water-Works Company, or any part thereof; and also of any other non-statutory public or private water undertaking within the borough. Saving clauses are also inserted for the protection of certain turnpike roads in the neighbourhood of Birkenhead.

The *Bradford Water and Improvement Bill* is to empower

the Corporation of Bradford to construct and maintain additional water-works, and to enlarge the time for making water-works already authorized. The new works comprise storage and compensation reservoirs to be executed within ten years, and the former powers conferred by the Act of 1875 are to be extended for ten years from the passing of the Bill. The Corporation desire power to acquire private water rights; and they are to be made liable to compensate persons for immediate or consequential damages which may be caused by the bursting or giving way of the water-works. Landowners are also to be protected in respect of water for agricultural and domestic purposes, and rules are to be compiled for the right application of the millowners' compensation water. The Corporation wish to raise £400,000 for water purposes, on terms, as to repayment, similar to those contained in the Act of 1868. The Corporation seek power to issue certificates, payable to bearer, for not less than £5 each.

The *Bray Township Bill* is to enlarge the limits of the township, and to provide for a supply of water within the extended district from the Dublin Corporation works, under the control of the Bray Commissioners.

The *Cheltenham Corporation Water Bill* is chiefly for the purpose of extending the time for the compulsory purchase of lands and for the construction of works authorized by the Act of 1878, and for extending the limits of supply. The specified time for the execution of the authorized works is to be extended to five years from the passing of the Bill. The water supply district is widened to include a number of outparishes. The Corporation also wish to borrow £20,000, and to repay this additional amount within ninety years. Certain provisions of the Act of 1878 as to the application of borrowed money are included in the Bill.

The *Irvine Burgh Bill*, among other things, provides for the vesting in the Corporation of the water-works originally constructed by the Local Authorities of the burgh of Irvine and the parish of Dundonald. The Corporation also desire to construct additional reservoirs, to be completed within ten years. The water district to be conterminous with the limits of the enlarged burgh, but the Corporation to have power to supply water in bulk beyond such limits, and to shipping, at a rate not exceeding 2s. per ton of water so supplied. The Corporation desire to borrow for water purposes the sum of £10,000, to be repaid in seventy years.

The *Kirkcaldy and Dysart Water Bill* is to enable the Commissioners to provide an additional supply of water in those places. The proposed works consist of an impounding reservoir and filter-beds, with the necessary lines of pipe and other arrangements, to be completed within eight years from the passing of the Bill. The Commissioners seek power to supply water in bulk to any public authority in the county of Fife. The Bill also revises the scale of water-rates charged in the district. The Commissioners wish to borrow on mortgage the additional sum of £35,000, and to borrow from bankers a certain amount not exceeding that maximum, on cash account.

The *Paisley Burgh Bill* is to authorize the Paisley Water-Works Commissioners to construct additional works, comprising two impounding reservoirs and subsidiary works; the whole to be completed within fifteen years. Compensation water will have to be provided. The Commissioners seek to borrow £165,000 for the purposes of the Bill, this amount to be paid off in sixty years.

The *Reading Corporation Bill* is intended, among other public purposes, to enable the Corporation to borrow £63,000 for the redemption of the water annuities created by the Act of 1868, and to borrow the additional sum of £9000 for the extension and improvement of their water-works.

The *Stirling Water Bill* is to authorize the Commissioners to make and maintain an additional reservoir and other works, and to extend the supply of water. The Commissioners are to be incorporated, for the better control of their undertaking. The additional works are to be completed within seven years. The Commissioners seek power to borrow £14,000, repayable in fifty years, and also to raise money temporarily by borrowing on bankers' cash account. Power is also desired for the funding of the Commissioners' debt. The Bill further contains clauses relating to the election of Commissioners, and the recovery of debts.

ELECTRIC LIGHTING, ETC., BILLS FOR 1881.

THE following Bills contain provisions with respect to electric lighting, and miscellaneous objects which do not properly come under any of the former headings:—

The *Barrow-in-Furness Corporation Bill* includes a clause

to empower the Corporation to supply light, heat, and power by electricity, during a period of ten years, for public purposes alone; and to borrow £20,000 for such object. The Corporation are not to be exempt from proceedings in respect of nuisance caused in carrying out the provision of this clause.

The *Bingley Water and Improvement Bill* includes a clause to empower the Commissioners to supply to the streets and places of public resort, lighting, heat, and motive power by electricity; such power to extend over a period of ten years. The Commissioners desire to borrow £10,000 for this purpose, and, as usual, are not to be exempted from nuisance.

The *Birkenhead Corporation (Gas and Water) Bill* also includes provisions to empower the Corporation to supply the electric or any artificial light at an agreed rate.

The *Irvine Burgh Bill* contains a clause to authorize the Corporation to supply the electric or other light for any purpose within their new gas district, and the gas-works plant and conveniences are to be employed in connection with such lighting.

The *Stalybridge Extension and Improvement Bill* is a Corporation Bill into which is slipped a clause for prolonging the power in respect of gas-works possessed by the borough authorities by virtue of an Act of 1828, long unacted upon. The same Act is made to find cover for a provision to authorize the Corporation to supply the electric light, or any other illuminating or heating agent.

SOUTH METROPOLITAN GAS-WORKS.

CONTINUING our notice of the improved appliances in use at the Old Kent Road Gas-Works, we now proceed to describe the arrangement of the exhausting machinery. The exhauster-house contains two rotary exhausters, of the same external dimensions, but of widely different construction, each driven by a 30-horse power (nominal) steam-engine. The presence of the two exhausters in the same house, and worked under precisely identical conditions, gives great facility for a comparative examination of their performance, such as we are about to enter upon.

The engines may be first briefly described. They are of Messrs. Bryan Donkin and Co.'s usual horizontal, compound, condensing type, and are highly finished, elegantly-built machines. The low-pressure cylinder is 20 inches in diameter, and is placed behind and on the same axis with the high-pressure cylinder, which is 12 inches in diameter. The stroke is 2 ft. 3 in. The air-pump is situated vertically underneath the connecting-rod, from which it is worked by a link. Ordinary condensers are used. Variable cut-off expansion gear is also provided. The boilers, two in number, one being always in reserve, are of the Lancashire type, each 25 feet long and 6 ft. 6 in. diameter. The flues are 2 ft. 3 in. diameter. Each boiler has 679 square feet of heating surface, of which 504 square feet are effectual. In addition to the work of exhausting, the engines also drive a set of pumps for the service of the works; the power thus abstracted being charged entirely to the work of exhausting.

One exhauster is of the construction known as Beale's 1866 pattern, as made by Messrs. Donkin and Co. This machine need not be described in greater detail than by remarking that in it the four segments employed under the older patent to reciprocate the slide are replaced by two large rings. The exhauster is driven by a belt from an overhead strap, in a similar manner to that by which the other exhauster is operated. The second exhauster is one of J. Beale's new (1877) patented construction, of which the accompanying illustration gives a sectional view.

It will be observed to differ from the solid-slide exhauster chiefly in having a transverse sliding guide in the centre of the main slide. In this guide is a block, working on a fixed steel pin bolted through the end of the case opposite to the driving end. Thus, although the inner cylinder is driven eccentrically, as usual, the main slide really revolves concentrically with the outer cylinder or case of the exhauster. Hence there is only one bearing, properly so called, for the driving spindle; and the truer balance of the working parts, in comparison with the older arrangements thus obtained, results in a great diminution of friction. The lessened friction enables the exhauster to be driven at a higher speed with an expenditure of the same or even of less power than is required for the old style of apparatus; and this again results in an economy of space, it being possible to put an exhauster of greater capacity in the room of an older machine. Or, on the other hand, the size of the driving engine may be reduced for a new exhauster, as compared with an old one of equal power, and economy may be secured in this way. As we have said, the two exhausters at the Old Kent Road works are of equal external dimensions, yet one is able to pass only 150,000 cubic feet of gas per hour, while the other has a capacity of 225,000 cubic feet per hour.

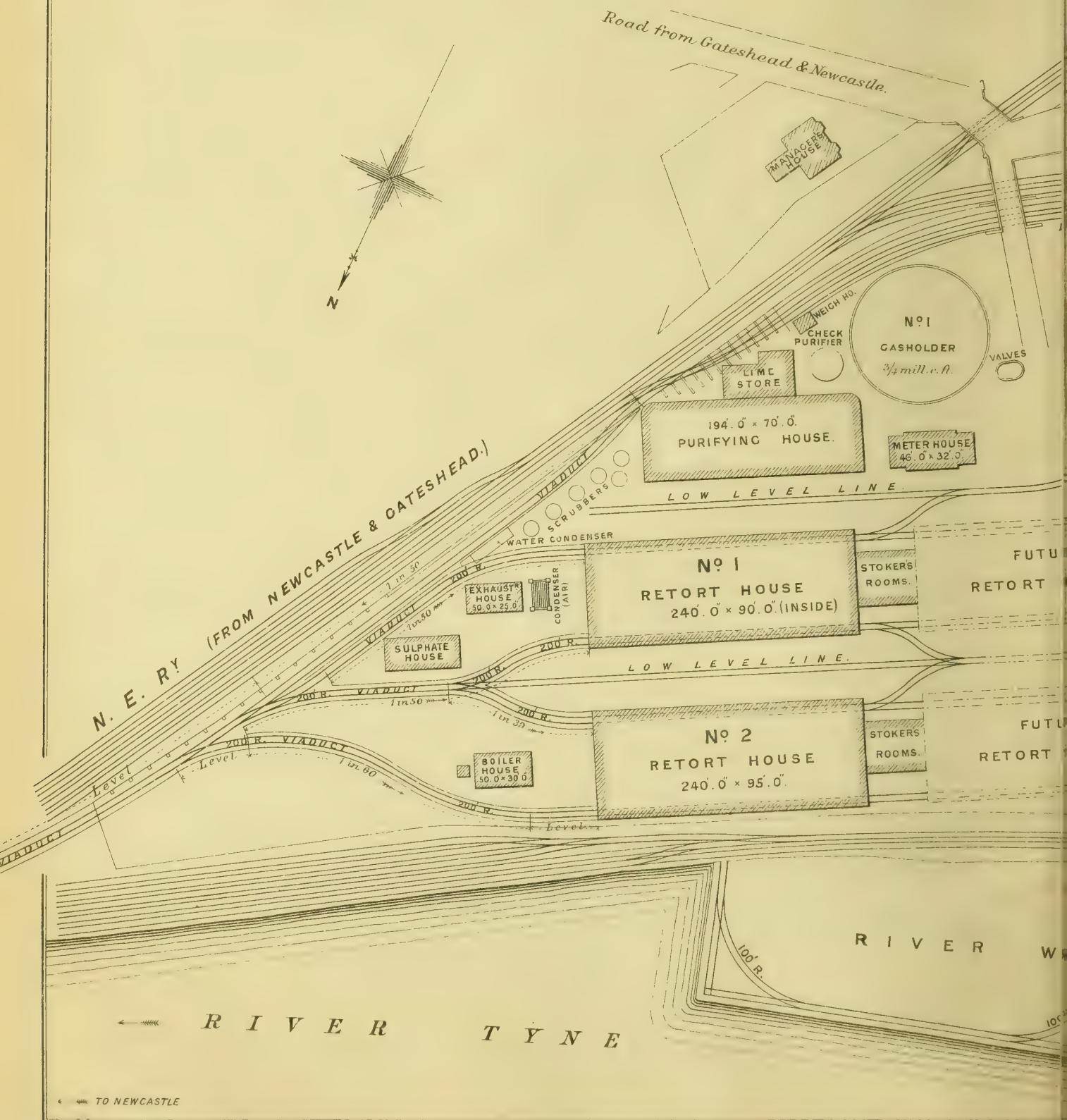
We will now proceed to state the cost of the work done by both machines. From observations taken on the same day—and from which we select a mean result—with a boiler pressure of 46 lbs. per square inch, and the vacuum gauge at 28, the engine made 64 revolutions per minute, indicating 29·10 horse power. The new patent exhauster made 80 revolutions per minute, and passed 220,000 cubic feet of gas per hour against a pressure of 29·75 inches, and with an inlet vacuum of 1·75 inches.

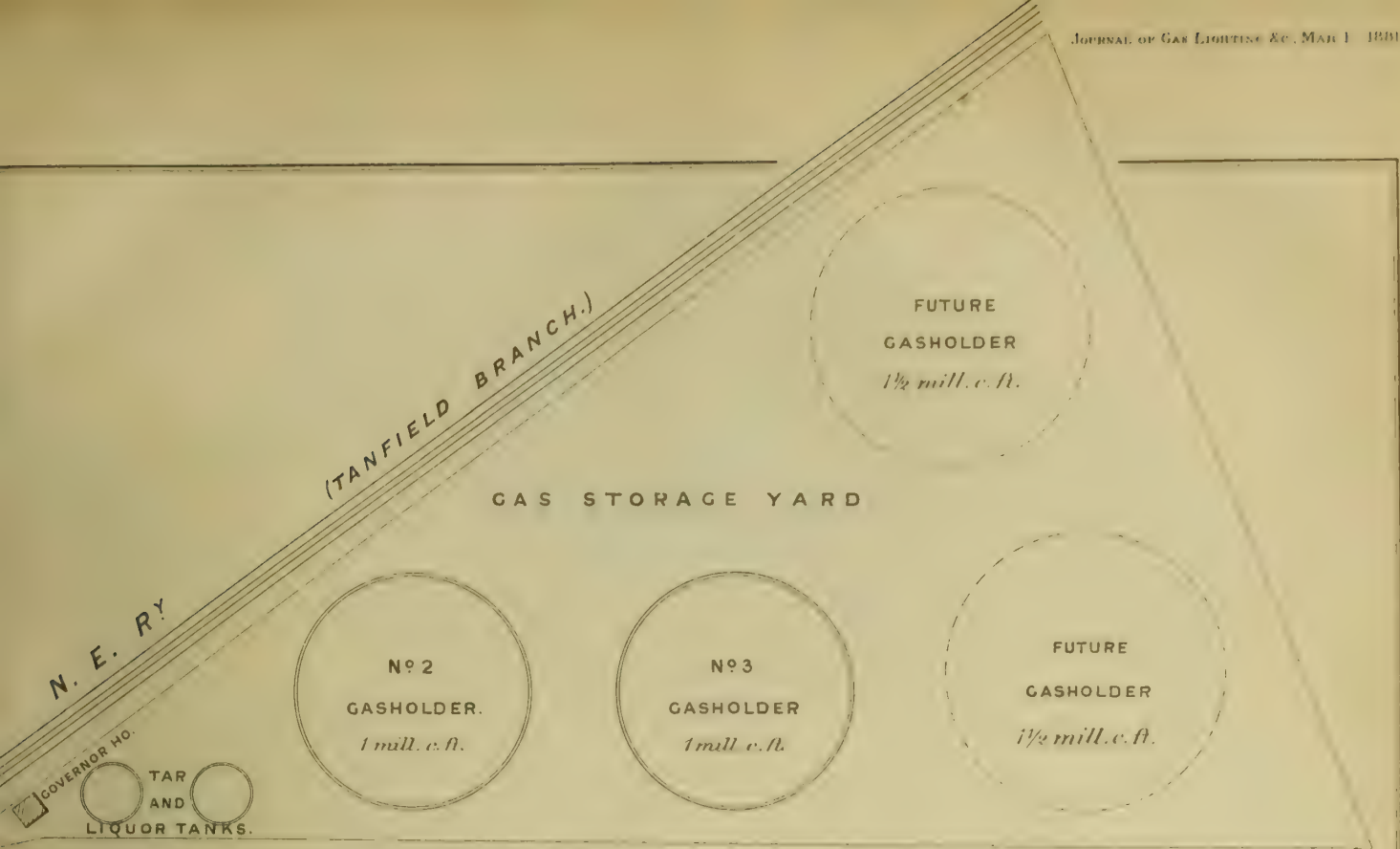
1881.

SCALE.

FEET 10 100 90 80 70 60 50 40 30 20 10 0

100 200 300 400 500 FEET

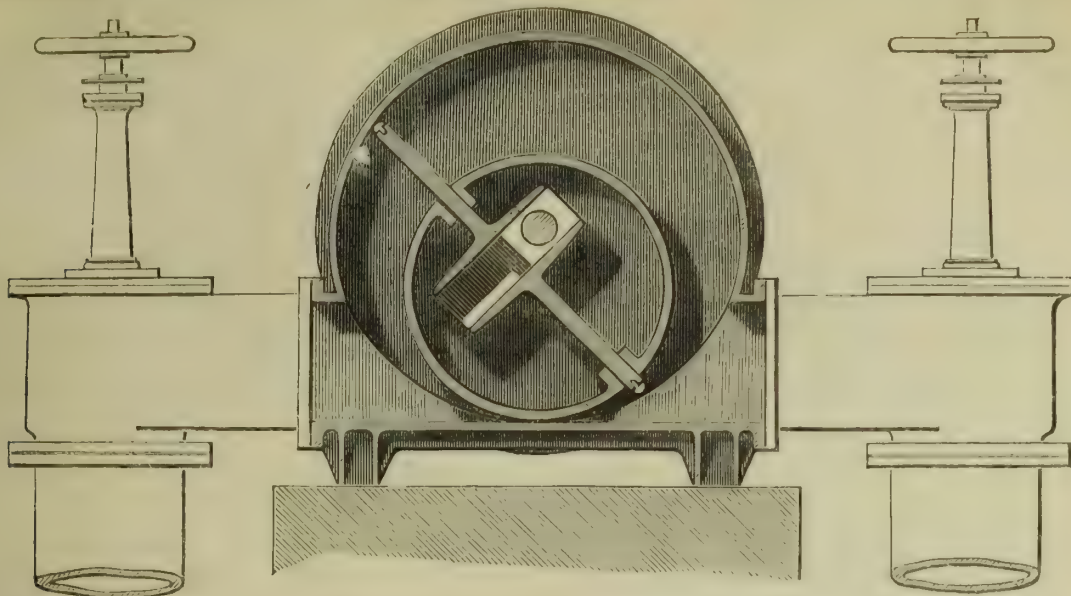




V. WYATT, ENGINEER.
Jan^y 1881.

NOTE—The present works are shewn in strong lines thus ———
The future " " " " dotted " thus - - - - -

The high level Railways are shewn in strong lines thus ———, rising to 22' 0" above H.W. (high water) at entrances to Retort House. The low level Lines are also shewn in strong lines being at H.W. or ground line formation.



Within four hours of this experiment, the 1866 patent exhauster was tested, with the engine indicating 29 horse power, and making 74 revolutions per minute. The exhauster made 62 revolutions per minute, and passed 150,000 cubic feet of gas per hour against the same pressure as before. Hence the same power, within 0·1-horse power, was required to pass the smaller as the larger quantity of gas; or, in other words, the new exhauster performed about 33 per cent. more work than the old one at the same cost for power. It should be stated that the new exhauster keeps a remarkably steady gauge, and works quite silently.

In common practice, the new exhauster at the Old Kent Road passes about 5 million cubic feet of gas per day of 24 hours, and requires the attention of two men and two boys for driving and stoking, at the following cost:—

Wages—2 men, at 5s. 6d.	s. d.	
„ 2 boys, at 3s. 6d.	11 0	
	7 0	£0 18 0
Oil, 1 gallon	0 3 6	
Waste, 5 lbs.	0 1 0	
Total.	£1 2 6	

for 5 million cubic feet, or 0·054d. per 1000 feet. The boiler burns a mixture of coke and breeze, chiefly the latter, of small value, costing 0·0174d. per 1000 feet of gas exhausted; therefore the total cost of exhausting gas by the new system is—

Fuel	0·0174d.
Wages, oil, and waste	0·0540
Total	0·0714d.

per 1000 cubic feet of gas, exclusive of repairs, which will be decidedly less for the new exhauster than for that on the older system, from the friction being so much less. The feed water evaporated is at the rate of about 7·4 lbs. per pound of breeze, and 7·5 lbs. per pound of coke.

It will be seen that the exhausting arrangements at the Old Kent Road are extremely economical, the cost of fuel being reduced to a minimum; while a man and boy by day, and their reliefs for the night, attend to the machinery inside the exhauster-house, and also to the pumps outside, and stoke the boiler as well.

Notes.

THE ABSORPTION OF RADIANT HEAT BY GASES AND VAPOURS.

The power of vapours and gases of different kinds to absorb radiant heat has been lately investigated anew by Professor Tyndall, F.R.S., who read a paper describing his experiments and their results before the Royal Society on Jan 13. Professor Tyndall employed in his last researches a modification of Mr. Graham Bell's photophonic apparatus, consisting of a powerful source of light, the rays from which were thrown by silvered mirrors, in a parallel beam, upon the flask or other receptacle for the gas under examination. A notched and perforated wheel was made to revolve rapidly in the path of the beam, thus causing the light to fall on the object intermittently. When vapours or nascent gases were to be examined, a quantity of the generating liquids was placed in a flask, the upper portion of which was then exposed to the intermittent ray. Gases were submitted to the beam in suitable tubes. The exposure in this way of gases or vapours sensitive to radiant heat gave rise to sounds from the receptacles, more or less powerful according to their relative absorptive power. Dry air is known to be almost unaffected by radiant heat, and it was therefore silent when tested by Professor Tyndall in this novel manner. On the contrary, gaseous ammonia gave a remarkably loud note, as also did aqueous vapour. Coal gas and marsh gas were also found to be noisy; and so delicate is this method of examination that extremely small quantities of either gas mixed with air were observed to give a distinct sound. As an illustration of this, it is stated that a flask filled with coal gas and held bottom upwards in the intermittent beam gave sounds

of a force corresponding to the known absorptive energy of coal gas. The flask was then placed upright, with its mouth open, upon a table, and was permitted to remain there for nearly an hour. On being replaced in the beam, the sounds produced were far louder than those which could be obtained from common air. A delicate test for the pressure of explosive gas in air may, therefore, be arranged upon this principle. The force of some of the sounds produced by the more active vapours may be appreciated from Professor Tyndall's statement that he has heard them distinctly at a distance of 100 feet from the source of rays. It is remarked that, with careful manipulation, tests of this kind may be made with a common candle, or a piece of red-hot coal.

A REGULATOR FOR GAS HEATED BOILERS.

In a recent number of *Nature* an account is given of a steam-pressure regulator for gas-heated boilers, made by M. Wiesnegg for M. D'Arsonval. It is intended to fulfil the following conditions:—To maintain a constant pressure of steam in the boiler, whatever the consumption; to regulate the consumption of gas proportionately to the delivery of steam; and to be absolutely automatic. The apparatus, which is extremely simple, is thus constructed: A leaden pipe from the boiler communicates with an arrangement resembling an ordinary lever safety-valve, except that the valve-plug, instead of fitting in the usual conical seat, rests on a diaphragm of thin india-rubber. This diaphragm rises when the pressure from the boiler exceeds the weight to which the lever is adjusted. The upper part of the balanced valve is connected to a throttle-valve in the gas-supply pipe, and, consequently, any rise in the pressure of steam in the boiler is made to check the flow of gas to the burners. The safety of the arrangement lies in the fact that the supply of gas may be entirely cut off when the steam pressure arrives at any desired maximum. The india-rubber disc is saved from injury by heat, by being so arranged that the steam itself never touches it, but the pressure is transmitted through a syphon full of condensed water. It is claimed that the instantaneous adjustment of the supply of gas to the actual pressure of steam is practically competent to keep the pressure reasonably constant; particularly with a quick steaming boiler, which would generally be used with gas. Three years' experience of the regulator, it is said, leaves nothing to be desired in its performance.

THE ACTION OF CARBONIC ACID UPON LIME.

M. Raoult has been engaged in the study of the action of carbonic acid upon lime. He observes that lime should not contain more than 2 to 3 per cent. of foreign matter, and it is most important that it should not have been burnt at too high a temperature. Lime which has been subjected to the action of a temperature above 2000° Fahr. acts upon carbonic acid only with remarkable slowness. This is proved by the following experiment:—Two pieces of pure lime of equal weight were heated to redness together in a porcelain tube through which passed a slow current of carbonic acid. The only difference between the pieces consisted in the fact that one of them had been subjected for an hour to a white heat in a platinum crucible. After eight days' uninterrupted action, the two pieces of lime were found to have absorbed very different weights of carbonic acid, one being half the weight of the other. The fragment non-calculated had absorbed three-fourths of the equivalent of carbonic acid, while the other had only absorbed two-fifths of its equivalent of the same gas. This difference is not traceable to any inferiority of permeability of the highly calcined lime, for it is observable when the material thus treated has been reduced to powder. Pure lime that has been exposed to an excessively high temperature, such as a white heat, differs in its chemical properties from that which has been subjected to a dull red heat. It appears to have had its molecular structure re-arranged and condensed to some sort of polymeric form by the heat. M. Raoult found that pure dry quicklime, properly burnt, heated to about the melting point of glass, absorbed carbonic acid gas with great energy, soon becoming incandescent.

Communicated Article.

THE TRANSPORT OF MATERIALS FOR GAS-WORKS.

ILLUSTRATED BY THE PLANS OF THE
YORK, NEWCASTLE-ON-TYNE, AND BECKTON GAS-WORKS.

By V. WYATT,

Constructing Engineer to The Gaslight and Coke Company.

THIRD ARTICLE—THE NEWCASTLE AND GATESHEAD GAS-WORKS AT
REDHEUGH.

The plan which accompanies the present article shows generally the arrangement of these new works and their connections with the external railways, river, and roads. The site altogether is a most desirable one for gas-works, and in securing it some years since, the Gas Company displayed more than the usual prescience and boldness belonging to gas enterprises. The entire site gives an area of most valuable land for manufacturing purposes, amounting to about 22 acres. On this site there are already erected two large retort-houses, of the improved "stage" type, 240 feet by 90 feet and 240 feet by 95 feet, inside dimensions, capable of carbonizing about 400 tons of coal, and a make of gas of 4 million cubic feet per diem. Around these retort-houses there are the necessary gasholders, buildings, structures, and plant for the complete equipment and working of a gas factory of the most modern type. There is room still on the ground for four more retort-houses of the same character as those already erected; also for two additional gasholders of the largest make, and additional plant and structures equal to a total consumption of 1200 tons of coals, and a make of gas of 12 million cubic feet per diem for the future requirements of the Company.

The position of these works commands the Tanfield and Blaydon branches of the North-Eastern Railway system, forming a triangular piece of ground between the two lines of railway running south and west from Newcastle and Gateshead, with their numerous sidings and works for the accommodation of an unlimited amount of traffic. The River Tyne runs along the lower or northern boundary of the property, parallel to the Blaydon branch railway, and under which railway there is an access or roadway to carry the Company's low-level line traffic on to the river quay or wharf. Here can be shipped away into and received by river craft the coke, residual products, and materials forming the river traffic of the gas-works. The coals, coke, lime, and other materials, however, are mostly delivered from the railway systems. The point of junction with the North-Eastern Railway system is on the Tanfield branch, the Gas Company's material being received upon a parallel siding, where the trains of 10-ton and other waggons are broken up into convenient sections, weighed, and taken over the Gas Company's viaducts direct into the retort-houses, and also over the low-level sidings to the other parts of the works.

It will be observed, by an inspection of the plan, that the coal waggons are drawn up a single-line viaduct from the North-Eastern Railway siding, on an incline of 1 in 50, to an intermediate level piece of viaduct, where the train is brought to a stand. It is then back-shunted or zig-zagged on to either one of four other lines, or branch viaducts, which lead up to and enter the upper level doorways of Nos. 1 and 2 retort-houses, up inclines of 1 in 39, 1 in 50, and 1 in 60, and over curves of 200 feet radius. The formation or ground line of the gas-works is at high-water level of the River Tyne, and the levels of the upper railways in the retort-houses are 22 feet higher than this datum. The stage levels of the retort-houses, on which the coal is deposited in front of the retorts, are 8 feet and 9 feet respectively above high water; and the coke-holes are exactly at the high-water level of the Tyne.

The low-level lines about the works all run off from the same low-level sidings, adjacent to the North-Eastern Railway, as do the high-level lines compassing the works in all directions, into and out of the coke-holes of the two retort-houses, and under the North-Eastern Railway branch, on to the wharf of the Gas Company, alongside the River Tyne. The high and low level lines are thus in direct communication with each other and with the river, the outside railway system to all parts, and in proximity to the road and highway leading on to the works.

In this example of a gas-works we have free communication with railway, river, and road traffic, and an unlimited amount of business can be transacted upon the site. We have here also an example of how a large gas manufacture can be prosecuted on a moderate area of land. When the site is filled up, there will be, as before stated, a capacity of manufacture and storage of 12 million cubic feet of gas per diem on about 22 acres of land, including the quay area recovered from the Tyne; equal to about $1\frac{3}{4}$ acres of land to a make per diem of a million cubic feet of gas.

Upon these works there are no covered coal stores beyond what is afforded by the roomy stages in front of the retort-benches, which afford room for 6000 tons of coal, being 15 days' full consumption in the two retort-houses already built. The railway communications to the several collieries in the Newcastle district are so direct, proximate, and convenient, that the coal comes in daily, on the shortest possible notice, and fresh hewn from the pits. In fact, the retort-houses themselves stand over the coal measures of the Newcastle and Durham coal-fields; hence the small amount of haulage necessary, and the unlimited coal area from which to draw the supplies, render the situation a most exceptional, economical, and desirable one in all respects for the works of a gas company. The coal delivered into the retort-houses costs only 6s. 3d. per ton, all included. The same economical results follow with the delivery of lime and other materials used about gas-works; and the coke, sulphate of ammonia, &c., are exported by the railway as well as by dock routes to all parts of the world.

The viaducts upon these works are single-line viaducts, and are arranged with openings or bays of 20 feet, carried upon cast-iron columns 1 foot in diameter, the superstructure being composed of wrought-iron main girders placed at 12-foot centres, with wrought-iron rolled joists for the cross girders. On the cross girders, which are placed at 5-foot centres, are laid and secured the wooden longitudinal timbers, carrying the T-rails of 60 lbs. weight per lineal yard of single rail. This weight of rail is about the minimum of weight that should be used on the viaduct and other railway lines where the locomotive is used for haulage purposes. The locomotive used at these works has a cylinder 9 inches in diameter with a stroke of 18 inches, and weighs, with fuel and water, $11\frac{1}{2}$ tons. The wheel base is 5 feet, and it is capable of traversing curves as sharp as 50 feet radius. The long train of 10-ton trucks, as brought on to the site from the North-Eastern Railway, is broken up into convenient sections, to suit the small locomotive, and taken up the inclined viaducts direct to the retort-houses, and placed in front of the retorts as wanted. The viaducts are so arranged that they can be used for the purposes of coal storage in the "open," whenever required—as at the Beckton works. This has not been done up to the present time, as the use of the fresh coal from the adjacent coal-fields forms an important economical item of the Redheugh works.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE PROPOSED AMENDMENT OF THE SALE OF GAS ACT.

SIR,—With your correspondent, Mr. Urquhart, Meter Inspector of Manchester, who writes to you relative to the insufficiency of the fees at present chargeable, under the above-named Act, for testing meters, I can and do feel some sympathy. A testing office ought to pay, if not in a commercial sense, at least such an excess over its expenses as would enable the authorities in their turn to pay—or let me say, with more propriety, adequately reward intelligent, competent inspectors for their services to the authorities and to the public. I hold my own opinions as to the advisability of making a difference in the charges for testing wet and dry gas-meters; but of this I will say nothing. What I will say, however, is this: That I for one should not raise any objection to an increase in the scale of fees, if it be shown, by the returns from authorities who have put the Act into operation, that the present scale of charges does not enable them to pay their officers sufficiently well, and defray the other expenses attendant on the verification of gas-meters. Certainly the verification of indices would add largely to the present returns, for it is not for a moment to be supposed that such verifications would be included in the present fees.

Between Mr. Urquhart and myself there is not a great difference of opinion, but such is far from being the case between me and your Edinburgh correspondent, whose "Notes" appeared in the last number—at least as to the following passage:—

"A propos of this question, I may mention that while it was necessary to allow a percentage of error in meters at the time when the Act became law, no such necessity now prevails, unless, indeed, *it is for the encouragement of bad workmanship* [the italics are mine]. Meters ought to be tested, and only passed if measuring correctly."

This one passage convicts your correspondent of a "want of fullness of knowledge." He surely cannot know that the authorities of the Standards Department of England, with the Astronomer-Royal to assist them, so fully recognized the difficulty of measuring gaseous volumes with absolute exactitude, that they decided to allow a margin of $\frac{1}{2}$ per cent., either way, in the verified instruments (testing gasholders) by which meters in their turn have to be verified; and so, not knowing this, he asks that gas-meters shall be *more perfect* than the instruments by which they are to be tested, which latter may differ among themselves to the legalized extent of 1 per cent. In the Standards Department (governed as it is by gentlemen of high scientific attainments and experience) every care is taken in respect to equality in temperature or in correcting for differences; yet so much of error, as I have stated, has been deemed admissible and necessary. In the comparatively rough testing of meters no such niceties can be practised, or the work would never be got through. Hence, if only such meters could be legally stamped by inspectors as worked "without any percentage of error," at normal temperature, the chances are that every one would be rejected, or that the verification of a single meter might occupy an inspector for a month instead of for an hour of time; while he would be involved in such a mass of calculations as would leave him little or no time for the performance of his more practical and useful duties. Your correspondent, indeed, is asking the equivalent to a mere weighing machine being made to act with the delicacy of an assay balance.

He then goes on to say that "there are some meters which do not require a range of error," and "compensating" meters "which by no means require such a range as 5 per cent." I do not know what meters "do not require a range;" but I do know this, that in our present state of knowledge no gas company with a well-informed and experienced engineer to guide it would willingly consent to such an alteration in the Act as to necessitate the use only of meters which would work "without any percentage of error." The climax is, however, reached when he says: "Certainly dry meter makers could not complain of the introduction of such a clause, because their manufactures are supposed to register without error." I like the word "supposed" in this sentence; but who supposes such an absurdity? Certainly, dry meters cannot for a moment be "supposed," by the properly informed, to "register without error," and I venture to say never will be made to do so for any length of time, unless, perhaps, an entirely different construction be devised. Let me not be misunderstood; the dry meter is a good commercial measurer, and will do its work as well, on the average, as the scales and measures which are commonly used in trade

PROGRESS MADE TO SATURDAY, FEB. 26.

The Company had to make a draw on their reserve fund, to the extent of a trifle over £300, in order to pay the dividends for the first half of last year; and recourse to a smaller extent will again be necessary. Of the £1193 transferred to the profit and loss account, £76 is absorbed for interest, leaving £1117 for dividends, which for the previous six months amounted to £1138; besides which there have since been additional capital receipts £978. The balance of the reserve fund account on Dec. 31 was £1633.

METROPOLIS WATER SUPPLY.

No. II. of the reports by Mr. Crookes, and Drs. Odling and Meymott Tidy, on "The Composition and Quality of Daily Samples of the Water Supplied to London"—embracing the period from Jan. 20 to Feb. 19—has been published; and states that "these examinations have been made under instructions from the Water Companies, the selection of samples, the methods of analysis, and the form of publication have been left entirely to us, the Companies themselves taking no part in the matter beyond bearing the expenses." It then goes on to say that the regularity of the work has been somewhat interfered with by the recent exceptional weather; and that "the turbidity of many of the waters may be accounted

for, at any rate in part, by unavoidable conditions consequent on the severe frost. It is not improbable that it will still be some days before the waters regain their usual condition of clearness. The suspended matter is almost entirely of the nature of clay and sand, and on the worst days did not average more than 1 grain per gallon." After setting out the various appearances of the different Companies' waters, the Analysts state their opinion that, "although many of the samples examined by us were more or less turbid, from finely-suspended clay and sand, nevertheless the water supplied during the past month was wholesome, of good quality, and well oxygenated."

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, London Bridge—Captain THOMAS B. HEATHORN, R.A., in the chair.

The SECRETARY and ENGINEER (Mr. George Livesey, M.I.C.E.) having read the notice convening the meeting and the minutes of the last half-yearly general meeting, which were confirmed, the following report and accounts were taken as read:—

The Directors have the satisfaction to report an increase of business of 4 per cent. over the corresponding period of 1879, notwithstanding the mild and clear weather of the closing months of last year, which might have been expected to prevent any increase in the consumption of gas.

Following the reduction of 4d. per 1000 feet in the late Phoenix district from Midsummer last, the Directors have made a further general reduction of 2d. per 1000 feet, dating from Christmas, 1880. The price now charged by the Company is 2s. 10d. per 1000 feet over the whole united district.

The mains of the late three Companies have been connected at all points of contact, resulting in a more certain and regular supply of gas at a lower initial pressure than was possible under the circumstances preceding the amalgamations. The Directors have made arrangements to ensure an ample supply to those parts of the district where the rapid extension of buildings is causing a greatly increased demand for gas.

Another retort-house is in course of erection at the Old Kent Road, which will be

fully equipped for use before the end of the year. The large gasholder at the same station is also progressing satisfactorily in the hands of the contractors, who, if they do as well in the future as in the past, will finish it some months before the time stipulated for its completion.

A sale by auction of £18,000 of the "B" stock and £12,000 of the new "C" stock of the Company took place on the 7th of January last. The whole was purchased by the public at satisfactory prices.

Notwithstanding the great reduction in the price of gas, the Directors have the pleasure to recommend a dividend at the rate per annum of 12 per cent. on the "A" stock, and 11½ per cent. on the "B" stock, and that the small surplus of divisible profits be added to the reserve fund.

The Directors will submit a resolution authorizing them to sell land and buildings at Kennington, which are of no further use to the Company, and two strips of land at Rotherhithe, which are required for widening Rotherhithe Street.

At the close of the ordinary meeting, the Wharnciffe meeting—of which the Proprietors have already received notice—will be held for the purpose of empowering the Directors to prosecute a Bill in Parliament for the purchase of an eligible site at East Greenwich, opposite Blackwall, with a frontage to the river, for the erection of large gas-works, to meet the constantly increasing demand for gas in South London, to raise additional capital, and for other purposes.

By the scheme of amalgamation and the Company's Act of Incorporation, two Directors retire from office at this meeting, and one Auditor. Captain Heathorn, R.A., and James Shand, Esq., as Directors, and A. Footner, Esq., as Auditor, will therefore retire; but these gentlemen, being eligible, offer themselves for re-election.

No. 1.—STATEMENT OF CAPITAL (STOCK) on Dec. 31, 1880.

Acts of Parliament authorizing the Raising of Capital.	Standard Dividend; the Standard Price being 3s. 6d.	Paid up.	Amount not paid up.	Total Amount Authorized.
South Metropolitan Acts, 1842 and 1869. A	10 per cent.	£500,000 0 0		£500,000 0 0
Surrey Consumers Acts, 1854 and 1863 B	Do.	249,990 0 0	£10 0 0	250,000 0 0
Phoenix Acts, 1824 and 1864 B	Do.	1,082,000 0 0		1,082,000 0 0
South Metropolitan Act, 1876 B	Do.	..	18,000 0 0	18,000 0 0
Do. Do. 1876 C	Do.	..	232,000 0 0	232,000 0 0
		£1,831,990 0 0	£250,010 0 0	£2,082,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL on Dec. 31, 1880.

Acts of Parliament authorizing Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
South Metropolitan Act, 1869	Debenture Stock.	Not exceeding 5 per cent.	£62,500 0 0		£62,500 0 0
Do. do. 1876		Do. 5 do.	Nil.	£187,500 0 0	187,500 0 0
Surrey Consumers Acts, 1854 & 1863	Bonds.	Do. 5 do.	57,000 0 0	3,000 0 0	60,000 0 0
			£119,500 0 0	£190,500 0 0	£310,000 0 0

No. 3.—CAPITAL ACCOUNT.

Dr.			Description of Capital.	Certified to June 30, 1880.	Received since that Date.	Total to Dec. 31, 1880.
To Expenditure to June 30, 1880.	£1,845,893 9 7					
Expenditure during half year to Dec. 31, 1880, viz.—						
New buildings and machinery in extension of works	£31,884 1 1		By A stock	£500,000 0 0		£500,000 0 0
New and additional mains and services	6,330 11 11		B stock	1,331,932 0 0	44 0 0	1,331,996 0 0
New and additional meters	3,185 3 8		Debenture stock	58,868 10 0	£3,631 10 0	62,500 0 0
		41,399 16 8	Bonds	59,500 0 0	..	57,000 0 0
Total expenditure	£1,887,293 6 3		Less bonds paid off.		£3,675 10 0	..
Less by conversion under scheme	6 0 0				2,500 0 0	..
	£1,887,287 6 3			£1,950,320 10 0	£1,175 10 0	£1,951,496 0 0
Balance	64,202 13 9		Less by conversion under scheme			6 0 0
	£1,951,490 0 6					£1,951,490 0 0

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—		By Sale of gas—	
Coals, including dues, carriage, unloading, and trimming. (See Account No. 9)	£132,984 10 11	Common gas (per meter)—	
Purification, including £2508 14s. 1d. for labour	5,556 2 3	at 3s. per 1000 cubic feet	£247,786 4 8
Salaries of Engineer, Superintendent, and Officers at works	3,615 10 5	Public lighting and under contracts (see Statement No. 11)	24,796 7 2
Wages (carbonizing)	28,369 11 3		£272,582 11 10
Repairs and maintenance of works and plant, materials, and labour, less £468 0s. 2d. received for old materials.	34,255 13 10	Rental of meters.	5,715 15 2
	£204,811 8 8	Residual products—	
Distribution of gas—		Coke, less £5785 12s. 6d. for labour and cartage	£55,296 1 1
Repair, maintenance, and renewal of mains and service-pipes, including labour	£7,149 9 6	Breeze, less £934 1s. 4d. for labour and cartage.	389 16 5
Salaries and wages of Officers (including Rental Clerks)	3,757 11 8	Tar	19,758 15 10
Repairing and renewals of meters	5,297 16 9	Ammoniacal liquor	22,402 19 0
	16,174 17 11		97,847 12 4
Public lamps—Lighting and repairing	5,550 5 11	Rents receivable	1,528 2 2
Rents, rates, and taxes—		Transfer fees	24 12 6
Rents payable	£1,020 19 2		
Rates and taxes	9,277 0 8		
	10,297 19 10		
Management—			
Directors allowance	£1,850 0 0		
Salaries of Secretary and Clerks	2,233 18 9		
Collectors' commission	3,531 13 10		
Stationery and printing	756 14 8		
General charges	1,656 10 5		
Company's Auditors	112 10 0		
	10,143 7 8		
Law and parliamentary charges, including £2409 10s. 6d. under agreement for purchase of land	3,359 15 5		
Bad debts, including £1134 6s. 1d. allowances on coke accounts	3,790 6 2		
Superannuations and compensation	5,959 3 3		
Gas Referees and Official Auditor	187 16 5		
	£260,275 1 3		
Total expenditure	£260,275 1 3		
Balance carried to net revenue account, No. 5	117,423 12 9		
	£377,698 14 0	Total receipts	£377,698 14 0

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits	£513 15 6	Balance from last account	£104,005 7 9
Insurance fund	9,180 0 0	Less dividend on ordinary capital for the half year ending June 30, 1880	98,746 18 10
Amount for debenture interest	1,523 8 9		
Amount for bonds	1,389 7 6		£5,258 8 11
Balance applicable to dividend on ordinary share capital	110,432 8 7	Amount from revenue account, No. 4	117,423 12 9
		Interest on moneys on deposit	336 18 8
	£123,019 0 4		£123,019 0 4

No. 6.—RESERVE FUND.

Balance on Dec. 31, 1880	£184,126 12 2	Balance on June 30, 1880	£180,740 12 5
		Interest on amount invested	3,385 19 9
	£184,126 12 2		£184,126 12 2

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1880.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	24,082	204,474	192,870	93	35,593
Cannel coal	2,078	5,050	5,119	..	2,009
	26,160	209,524	197,989	93	37,602

* 1 cwt. of Coke equals 1 sack of 4 bushels, under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made, partly measured in Gasholders.	QUANTITY SOLD.			Quantity used on Works, &c., (partly estimated.)	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity sold.				
Common	Thousands. 1,938,226	Thousands. 139,710	Thousands. 1,658,393	Thousands. 1,798,103	Thousands. 19,000	Thousands. 1,817,103	Thousands. 121,123	13,181

No. 12.—BALANCE-SHEET.

To Capital—	By Cash at Bankers	£13,665 15 5
For balance, per account No. 3	Amount invested—	
Reserve fund—	Reserve fund	£184,126 12 2
For balance, per account No. 6	Renewal fund	3,632 6 5
Renewal fund—	Insurance fund	21,180 14 8
For balance, per account No. 7		208,939 13 3
Insurance fund—	Cash in hand for sundry payments	570 2 6
For balance, per account No. 8	Stores in hand—	
Net revenue account—	Coals	£26,583 19 2
For balance, per account No. 5	Coke and breeze	4,279 2 1
Debenture and bond interest for amount due to Dec. 31, 1880	Tar and ammoniacal liquor	3,518 9 2
Sundry tradesmen, for amount due for coals, stores, and sundries	Sundry stores	4,616 12 7
Deposits by consumers		39,028 3 0
Dividend account (outstanding)	Accounts due to the Company—	
Temporary loan	Gas and meter rental, quarter ending Dec. 31, 1880	£184,035 1 0
	Arrears outstanding	2,077 12 1
		186,112 13 1
	For coke and other residual products	32,417 4 11
	Sundries	1,703 3
		£482,436 15 3
		£482,436 15 3

The CHAIRMAN: You have before you the Directors' report and accounts, which I have no doubt you have studied, and been able to obtain from them all the information you wish as to the prosperity of the Company and the conduct of those who manage it. The report has been issued a few days later than usual; but in future the Proprietors may expect to receive it about a week before the half-yearly general meetings. It is not possible for individual Proprietors to make comparisons between the corresponding half year and this one, because in 1879 there were two separate and distinct Companies; but the following items may be interesting to you. In 1879 the price paid for coal was 13s. 10d. per ton; in 1880 it was 13s. 5d. In 1879 the receipts from residual products were 8s. 9d. per ton; in 1880 they were 9s. 10d. Some non-recurring exceptional expenditure, consequent on the amalgamation, has reduced our dividend fund; and, moreover, the reduction of 4d. per 1000 feet, which took place from Midsummer last in the district formerly belonging to the Phoenix Company, has taken £14,000 from the same account. The Directors feel that the results have fully justified this reduction, and after paying the dividends to be declared by you, there still remains a surplus on the half year, and all concerned have been benefited—the late Phoenix consumers to the extent of 10 per cent., the Shareholders of the Company to the extent of $\frac{1}{2}$ per cent. in their dividend, and those of the late Surrey Consumers' and South Metropolitan Companies to the extent of $\frac{1}{4}$ per cent. The Board fully realize the fact that the interests of the consumers and of the Proprietors are identical, a reduction in the price of gas being mutually beneficial. They have therefore made a further reduction of 2d. per 1000 feet, which entitles the "B" Shareholders (those of the late Phoenix and Surrey Companies) to another $\frac{1}{4}$ per cent. dividend from December last, and the "A" Shareholders will then begin to derive substantial advantage from the amalgamation. It is the policy of the Directors to adopt every means in their power to reduce the price of gas, by economizing capital, reducing all unnecessary expenditure, and adopting such improvements in the method of working as will conduce to this end, and they have not the slightest doubt that in the teeth of all rivalry—no matter what, of this or that light—a large and steady increase in the consumption of gas will take place, which will again materially assist them in reducing the price. I now move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. HENRY FINLAY seconded the motion.

Mr. E. HORNER remarked that the only opportunity of those who were outside to find out matters as to the working of the Company was to observe what the other Metropolitan Companies were doing. If, he said, the Shareholders would look at the accounts of the Chartered Company, they would see there, as the Governor of the Company stated, that they produced 10,328 feet of gas per ton of coal; and the South Metropolitan Company fell short of this by 500 feet per ton at the very least. If they examined the accounts and worked out the figures, they would find that 500 feet per ton meant 10,000 tons of coal in the half year; and if they

took the price of coals and the cost of carbonizing them, they found that this would come to £8000 or £9000. Of course, this was a Company about which it was to be said that "nothing succeeds like success." Still, when he was in the position of Director, he used to call the officers to account with regard to the manufacture. He did think that the Company should at least work as well as any other, for surely it could not be said in these days that a Company on the north side of the river could do better in its carbonizing than one on the south side. He made these remarks, not because he wished to find fault, for his experience of Shareholders in general was that so long as an undertaking was prosperous no one took any interest at all in the working. They simply came to the meetings and received their dividends. He did not, however, think this was right. He could not for a moment doubt that the Chairman had gone into all of these matters, and he had the advantage of a very good officer. He (Mr. Horner) made these remarks, therefore, and they would probably give Mr. Livesey an opportunity of returning such an answer as to make the concern appear even more prosperous to the Shareholders than it was. At any rate, he thought they should show that they were equal in working to other Companies. In the case of the Chartered Company, the residual products were slightly better than in the case of the South Metropolitan Company. He saw in this Company the fuel used was 27 per cent., which was a very large percentage for carbonizing. He had taken great interest in these matters for many years, and had no doubt that the reply made to what he had said would still further confirm the Shareholders in the solidity of their property.

Mr. V. HILLS remarked that the report stated that £30,000 stock was sold on the 7th of January last, and this realized some £24,000 more. The Proprietors would like to know to what account the excess was carried.

Mr. R. SMITH observed that the reserve-fund was £200,000, and this appeared to him a very considerable amount. Was it not advisable to divide half of it among the Proprietors?

The CHAIRMAN: As regards the last speaker, I will answer him myself without troubling Mr. Livesey, who will go into the technicalities of the manufacture much more subtly than I can do. I think every large commercial undertaking is much strengthened by having a good reserve fund. We see this course followed in all large and well-managed concerns; and where you want the public confidence, the first thing to look to is the reserve fund, and how it is invested. The public then begin to see whether the concern is really something in which they can put their money and their confidence at the same time. Ten per cent. is not such a very large reserve fund to have in connection with a manufacture which at times may be subject to all sorts of fluctuations and many accidents. We see that those who have fleets at sea have very large reserve funds. The large shipowners who insure their own vessels, put very substantial sums aside for this purpose; and we, in our case, insure our holders very much in the same way. I think, too, generally speaking, that if you put it to the sense of the meeting they would think that our large reserve fund ought not to be divided, but kept very much as it is now, thus strengthen-

ing the reputation of the undertaking. Besides, it cannot be divided. The premium on the sale of the stock goes to capital, without bearing dividend. I will now call upon Mr. Livesey to answer Mr. Horner's question in reference to the manufacture.

The SECRETARY and ENGINEER: I am very much obliged to Mr. Horner for asking the questions he has done, because it gives me an opportunity of returning an answer which to my mind is perfectly satisfactory. In the first place the Chartered Company (who, I may say, are represented here), with their unrivalled facilities at Beckton, ought to get coal much cheaper than we do, we only having stations on the canal and the river; but their coal, notwithstanding, came to over 15s. per ton in the past half year, while ours cost us only 13s. 5d. The gross proceeds from their residuals were just about the same as ours, though they are making very large profits out of their tar and ammoniacal liquor. The net cost of coal in their case is 1s. 7d. (or, say, 1s. 6d. and a fraction) more than ours. I have gone very carefully into the question of a large make of gas per ton of coal, and I am prepared to state that, when you have to supply 16-candle gas, by increasing the make per ton of coal beyond about 9800 cubic feet, you impoverish the gas, and have to use more cannell, and every ton of cannell that a company uses is a decided loss to the company. I believe it is more economical to make 9800 cubic feet per ton with a very small percentage of cannell—our own is $2\frac{1}{2}$ per cent.—than to make 500 feet more per ton, and of necessity increase the percentage of cannell that has to be used. I am quite prepared to take my stand on this point. I believe every 100 feet per ton beyond 9800 feet is a loss to the Company rather than a gain. I think it is proved by the fact of our buying coal cheaper than the Chartered Company. I am not at all afraid of the competition of that Company, and I believe we shall be able to hold our own against them in the future as we have done in the past. I quite agree with Mr. Horner that the fuel account ought to be reduced, but I do not think 27 per cent. is a very excessive amount of fuel, as things go now. The amount used is quite a matter of estimate, and it is a very difficult thing to get at the exact amount; but we are trying to do so, and I think we shall succeed. I am rather doubtful whether, if the two concerns were compared exactly on the same lines, the 20 per cent. of the Chartered Company ought not to be something more. As to the residuals, we have done better on the whole, though the Chartered Company have done so well with their tar and ammoniacal liquor. I regard these comparisons as wholesome, and I believe it will be the object of every one connected with the Company not to be second to any one else.

Mr. HORNER thought the comparison as to the price of coal paid by the two Companies was not a fair one. He took it that the Chartered Company used about 27,000 tons of coal for making cannell gas alone, and this would bring the price paid by that Company very nearly down to the level of that paid by the South Metropolitan Company. He purposely avoided saying anything as to the price of coal, wanting to know what was done in the retort-houses. He did not think the price of coal was correct as stated. The Chartered Company had used nearly 30,000 tons of coal for cannell gas making purposes, at a cost probably of 25s. per ton.

Mr. J. ORWELL PHILLIPS said he was very much obliged to Mr. Horner for coming to the rescue of the old Chartered Company, and if Mr. Livesey had not almost mentioned him (Mr. Phillips), he would probably not have addressed the meeting. The fact was that the Chartered Company made cannell gas proper, and to a very large extent. At one of their stations they made cannell gas only—nothing else—and the cannell they used was chiefly Lesmahagow, which cost them 37s. 6d. per ton on the river. He thought Mr. Livesey should have mentioned this; but he had not the least fault to find with anything that gentleman had said—quite the contrary. It was a moot point, as Mr. Livesey had intimated, whether it was better to make 10,000 or more cubic feet of gas per ton of coal, or only about 9800 feet. No two engineers would agree, and each might be right and each wrong; still, let them take the facts and figures as they really appeared.

The motion was then put, and carried unanimously.

The DEPUTY-CHAIRMAN (Mr. James Shand): The motion I have now to submit is one that I had the opportunity of putting for a great number of years at the Phoenix Company's meetings. As regards the details of manufacture, this is a matter, as was justly said, for the engineers; but no doubt you will always look at the broad result—the dividend. I have much pleasure in moving—"That dividends at the rate of 12 per cent. per annum on the "A" stock, and of 11 $\frac{1}{2}$ per cent. per annum on the "B" stock, be now declared and made payable on the 8th of March, and that the small surplus of divisible profits be added to the reserve fund." Of course, you are all aware of the state of transition in which this Company is. This is the first half year of the united Company, and, as was said by the Chairman, we cannot make any proper comparison with the corresponding half of 1879, as there were then two Companies—the South Metropolitan, amalgamated with the Surrey Consumers', and the Phoenix. I think it is very creditable to our officers and all concerned that we have come before you with such a good account. It has been mentioned that immediately on the amalgamation taking place with the late Phoenix Company, whose district is rather more than half of the whole area supplied by this Company, the price was reduced by 4d. per 1000 feet, although there was no obligation upon us to do so for some twelve months. This reduction represents a benefit of £14,000 to the consumers, and now we are reducing the price by another 2d.; and we hope our friends on the other side of the water will reduce their price from 3s. 2d. to 2s. 10d. per 1000 feet. The South Metropolitan Company are selling gas at 2s. 10d. per 1000 feet—a feat which no other Gas Company in London has accomplished; but this cannot be done without economy in the management. It has been mentioned that the accounts are presented on this occasion rather later than hitherto; but, owing to the amalgamation, there has been some difficulty in this matter. Each Company had its own separate offices—Bankside, Rotherhithe, and Old Kent Road. As soon as the amalgamation between the Surrey Consumers' and the South Metropolitan Companies took place, the whole was brought together in the Old Kent Road; but the Phoenix Company being larger than the other two, it was impossible to bring the business to the Old Kent Road. An increased amount of work has fallen on the officers through the amalgamation, and to accomplish this they worked early and late, with the result that we have been able to have this meeting sooner than the Phoenix Company, or any of the other Companies could, and, as a consequence, to pay you the dividend earlier. The amalgamation has also, as you may suppose, entailed an immense amount of labour on all the officers, the Engineers, and the Secretary, and it is due to Mr. Livesey and all the officers of the Company to say that they have done their utmost to bring the thing into complete shape. We are not in such a position as we shall be in six or twelve months hence; but the work has been done most earnestly. The Directors have considered very seriously as to where the offices of the united Company should be, and it was at first thought that it would be more convenient to have them near the City; but it was afterwards found that such offices would be a great expense, and the Company having at the Old Kent Road some land which was not available for any other purposes, we have decided to build the offices there. They will then be as nearly as possible in the centre of the amalgamated district. When this

is done, you will have the accounts earlier than on the present occasion, and consequently have more opportunity of considering them. I did not intend saying anything about the electric light, but one could hardly have come into this room without seeing the great lamp-posts that are being set up to carry out the experiments for showing that light in the City. Your district is not one that is very well suited for displaying the electric light. It consists largely of manufacturing and trading places and suburban residences, and there is very little room there for the electric light. It is being experimentally used at the South-Western Railway Station, in the Waterloo Road; but we look on the light rather as a friend. People are now being educated up to the use of more light. In old-fashioned times, when people had candles, they were accustomed to a very meagre amount of light; then they had gas, which made them used to a better kind of light, and now that they have seen the electric light, they require still more. In our district over 350 lamps—more than ever before—were added last half year, and the experiment the late Phoenix Company carried out, under our friend Mr. Horner's direction, in the Waterloo Road, on the first appearance of the electric light, has done good for the Company. Several of the large lamps put up were retained by the parish, and now they are put up at all the important crossings in the district, and there has been an increase of 4 per cent. in our consumption. This shows your property is as good and firm as it can well be. Then the recent sale of your stock produced very good results, the average price realized *ex div.* being £180 5s. 1d. for every £100 of "B" stock, and £192 9s. 6d. for every £100 of "C" stock. This shows the public estimation in which your concern is held. The surplus beyond par goes to capital; and these people have invested their money at somewhere about 6 per cent.

Mr. SIMPSON ROSTRON seconded the motion, which was carried unanimously.

The CHAIRMAN: There is one more resolution, as to the sale of land and houses.

The SECRETARY and ENGINEER read the resolution, which authorized the Directors to sell certain land and buildings at Kennington, which, as stated in the report, were of no further use to the Company, and three pieces of land at Rotherhithe, required for widening Rotherhithe Street.

The CHAIRMAN moved, and Mr. JOHN MEWS seconded the resolution, which was carried unanimously.

Mr. HORNER then moved the re-election of Captain Heathorn as a Director of the Company.

Mr. JENKINS seconded the motion, and it was carried unanimously.

On the motion of Mr. HORNER, seconded by Mr. JENKINS, Mr. Shand was unanimously re-elected a Director of the Company.

The CHAIRMAN, in returning thanks for his re-election, said that where large undertakings could be brought together into such close union as the amalgamation of the three united Companies, it gave the greatest incentive to those who had the conduct of affairs, and also gave them fresh strength to renew their efforts for the successful conduct of the business in the future.

The DEPUTY-CHAIRMAN having also returned thanks,

The retiring Auditor (Mr. A. Footner) was re-elected, and the business of the ordinary meeting terminated.

The Wharnclyffe meeting was then held, for the purpose of considering the Company's Bill now before Parliament.

The SECRETARY and ENGINEER, after reading the notice convening the meeting, said the Bill was intitled "A Bill to authorize the South Metropolitan Gas Company to purchase additional lands, construct new works, and raise further capital, and to amend their Acts and for other purposes." After reading the principal clauses of the Bill, he said the gist of it was that it gave the Company power to purchase something like 150 acres of land at East Greenwich, opposite Blackwall. The other main feature of the Bill was power to raise additional capital for this purpose, as mentioned in the report of the Directors. He then read a resolution formally approving the Bill.

The CHAIRMAN moved, and Mr. R. O. WHITE seconded the resolution, and it was carried unanimously.

Mr. Pocock said the Shareholders had just consented to the laying out of £1,000,000, which was to be for their interest, and he trusted also for the interest of the consumers, without whom the Proprietors' interest would be *nil*. He had always stood up for the interests of the consumers, and he hoped the Company would reduce the price from 2s. 10d. to 2s. 8d., in which case the Proprietors would derive corresponding advantages. He expressed satisfaction at the price now charged for gas in the Company's district as compared with that charged before the amalgamation of the three Companies—3s. 9d., 3s. 6d., and 3s. 4d. The amalgamation had caused benefit to all concerned, and with such a balance-sheet as the Shareholders had had presented to them on this occasion, he thought they should be thankful to those who had the conduct of the affairs of the Company. He concluded by moving a vote of thanks to the Chairman and Directors for their able management.

Mr. WEBBER seconded the motion, and it was carried unanimously. The DEPUTY-CHAIRMAN, in reply, said: It is a great pleasure to us to find that the consumers are satisfied, and we shall try still more, if possible, to give them satisfaction in the future. It is all very well, however, to thank the Directors; but we all know who is the mainspring of this amalgamation. I ask you, therefore, to give your thanks to our Secretary and Engineer, Mr. George Livesey, and the other officers of the Company. They have had very hard work to do, and they have all laboured to the best of their ability.

The CHAIRMAN having seconded the motion,

A SHAREHOLDER expressed his regret that the Metropolitan Board of Works intended to oppose the Bill of the Company, some of the reasons for their opposition being, he said, that the Company had not exactly ignored, but not admitted, the *locus standi* of that august body. Another reason for their opposition was that they said the residual products clauses in the Bill would prejudicially affect private manufacturers and traders. They held that the Company ought to sell the residual products at a fair value, and reduce the price of gas. He himself thought that, if the residuals were sold instead of being manufactured, they would become of more marketable value.

Mr. HORNER asked whether Mr. Livesey would tell the Shareholders if it was correct, as stated in the JOURNAL OF GAS LIGHTING, that the Board of Trade intended to put a proviso into all Bills, under certain circumstances, enabling them to go into the question of the initial price of gas—as to whether the question of the initial price should be reconsidered. It seemed most unjust, after capital had been sold by public auction on certain conditions, that such an idea should be entertained. It appeared nothing but a breach of faith.

The SECRETARY and ENGINEER: Before acknowledging the vote of thanks I will reply to Mr. Horner. The statement in the JOURNAL OF GAS LIGHTING relates to some Provisional Orders, and does not affect us in any way whatever. I am not acquainted with the exact particulars, but I intend to call on the Board of Trade and see what they are. I have reason, however, to believe that they will not affect us—in fact, if they have any idea of reinstating the revision clauses, they throw overboard the principle of the sliding scale, for which the Board of Trade themselves were

strong advocates. I think a satisfactory answer can be given to the other question. The Metropolitan Board of Works, and I think fairly, took exception to the 18th clause in our Bill, which relates to the purchase of residual products by the Company. It is as follows:—"The Company may purchase from any other gas company, local authority, or person manufacturing gas either for sale and distribution or for their own use, the products resulting from such manufacture, and may manufacture and convert the same on the lands aforesaid, or they may sell their own products, for the purposes of manufacture and sale, to any other company authorized to manufacture products, and such purchasing company may manufacture and sell the same as their own products." A letter was sent yesterday to the Board of Works, stating that the Directors unreservedly withdrew this clause. It was inserted by the Parliamentary Agents without instructions—simply copied from another Bill; and directly the attention of the Directors was drawn to it, we saw that it was unreasonable that we should go into the market as chemical manufacturers, except from our own products. The Chartered and Commercial Companies both have this power, which is in another clause—to "renew all such works, machinery, and apparatus as are necessary for and incidental to the manufacture and storing of gas, and the manufacture, conversion, or utilization and storing of residual products." The only reason why the Company asked for the power to work up their own products, was to reduce the price of gas. While last half year we received for our tar at the rate of 2s. for every ton of coal, the Chartered received for theirs at the rate of 3s. 1d. for every ton, and they also did a little better than we did as regards ammoniacal liquor; but we did better than they with coke, and this balanced it. I did not intend to say anything unfair towards that Company. It is quite true they manufacture a proportion of canal gas; but this does not affect my statement, for I am satisfied that where you have to make 16-candle gas, you had better be contented with a moderate make, using a minimum quantity of canal, than produce a large quantity of poor gas, and use a considerable quantity of canal to make up the quality. It gives me very great pleasure to hear the kind way in which Mr. Shand proposed the resolution, and the manner in which you passed it. For the staff generally I can say that they have worked very late without grumbling—in fact, sometimes without letting me know of it. This, I think, is evidence that they are anxious to serve the Company to the best of their ability. I hope we shall go on and prosper, and shall succeed in satisfying not only ourselves, but also the consumers.

The proceedings then terminated.

WOLVERHAMPTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Tuesday last—Mr. J. UNDERHILL in the chair.

The SECRETARY (Mr. A. Jones) read the report of the Directors, as follows:—

Your Directors have much pleasure in presenting their fifty-eighth half-yearly statement of accounts and general balance-sheet, duly certified by your Auditor, showing the total receipts to be £27,303 2s. 10d., and the expenditure £20,969 8s. 2d., leaving a net amount of profit of £6,333 14s. 8d., which, added to the balance of last account, amounts to £6736 5s. 4d. From this your Directors recommend the payment of a 5 per cent. dividend upon the consolidated stock, and 3 per cent. (less income-tax) upon the paid-up capital of the preference shares.

During the past half year the usual alterations and repairs have been carried out at both stations, and your works are all in good working order, and are capable of supplying a much larger quantity of gas than has been required during the past year. The slackness of trade has interfered with the increase in the consumption of gas, but your Directors believe there is now a revival, and they are taking the necessary steps to erect another gas-holder, so that they may be prepared with full storage room to meet any increased demand that may arise.

Since the last meeting your Directors have to regret the loss, by death, of Mr. G. L. Underhill, who had been a Director for several years.

At this meeting three of your Directors retire by rotation—namely, Mr. J. Underhill, Mr. H. W. Owen, and Mr. H. Loveridge; but offer themselves for re-election. Your Auditor, Mr. L. T. Smith, also retires, but offers himself for re-election.

In conclusion, your Directors assure you they will continue to devote their best energies to promote the interests of the Company.

The CHAIRMAN, in moving the adoption of the report, said he had to congratulate the Shareholders on the affairs of the Company continuing prosperous. If they looked into the accounts, they would find that the Directors intended to divide the customary dividend; but although paying the same dividend as formerly, they had scarcely made sufficient profit during the past half year to pay a higher dividend, and they carried forward a rather smaller balance than they brought forward. During the past half year the manufacture of gas had, like every other business, suffered from the prevailing depression in trade, but as things improved the consumption might be expected to increase. Then, again, there had been a falling market for coke and other products. The coal contracts were made for twelve months in advance, but the coke contracts were not made at the same time; and the consequence was that with a falling market for coal lower prices were obtained for coke. However, as coal rose in value better prices were paid for coke, and the increase would be shown in the next balance-sheet. There was another thing the Shareholders had to consider in looking at the dividend. During the past half year a call had been made on the preference shares, and this had taken for dividend a larger sum than in the corresponding period of last year. The usual alterations and repairs to the plant had been carried out, and they might consider their works, &c., in good order, and capable of supplying a much larger quantity of gas than had been consumed in the past six months. With a revival in the trade of the town and district, they might fairly expect an increase in the consumption of gas. In view of this the Directors proposed to erect another gas-holder, and when this was done he had no doubt they would be able to supply a larger quantity of gas than would be required for some time. In connection with the Company's new offices, he mentioned that they would now be able to consolidate the various branches of their business, and they hoped to be able to increase their trade and profits from the sale of gas-stoves, chandeliers, and other things connected with the use of gas.

Mr. OWEN seconded the motion, and it was carried, and the dividends recommended were unanimously declared.

The retiring Directors and Auditor were then re-elected, and votes of thanks having been passed to the Chairman, Directors, and principal officials, the proceedings terminated.

REDHILL GAS COMPANY.

The Twenty-first Annual Meeting of this Company was held on Friday, Feb. 18, when the Directors reported that a further considerable increase in the receipts for gas took place during the past twelve months; while the amount realized by the sale of residual products again showed a satisfactory advance. The net profit on the year's working amounted to £4075 14s. 4d., out of which the Directors recommended a dividend, free of income-tax, on the paid-up capital of the Company, of 10 per cent., with the addition of a bonus of 1 per cent. upon so much of the capital as was subscribed prior to Jan. 1, 1874, and 1 per cent. upon so much of it as was subscribed prior to Jan. 1, 1873, towards making up the deficiency in the dividends paid thereon below the statutable rate in antecedent years. An interim dividend of 5 per cent. was paid in September last, leaving 5 per

cent., in addition to the bonus, to be paid on the 1st of March (to-day), and a balance of £400 11s. 4d. to be carried forward.

The Directors stated that they "fully anticipated being able to announce the completion of the new gas-holder referred to in their last report as being then in course of construction. They regret, however, that the progress of the work has been considerably retarded by an unfortunate disaster caused by an unprecedented flood." Under the advice and superintendence of their Engineer, the necessary steps have been taken to remedy the damage done, and the work has proved so far successful as to leave little doubt in the minds of the Directors that the holder will be finally completed early in the coming spring, at a very moderate additional outlay on the part of the Company.

The Company's share and loan capital amounts to £34,050; and they have power to raise a further sum of £17,200 in shares, and £11,250 by borrowing. The expenditure on capital account during 1880 was £5055; making the total £35,400, or £1340 beyond the amount paid up, after reckoning a small sum of £10 received in anticipation of calls.

The revenue account for the year, leaving out shillings and pence, gives the cost of manufacture as £3827; distribution, £76; public lighting, £181; rents, rates, and taxes, £196; management, £1044; sundries, £131—or a total of £5455. Sales of gas realized £7231; meter-rents, fittings, &c., £374; residuals, £1789; sundries, £77—total, £9472. There was thus left to be carried to profit and loss account, a sum of £4017; increased, by balance in hand and interest, to £4431, of which amount £300 was transferred to a renewal fund account. The Company's reserve fund stands at £2310.

The coal carbonized and used during the year was 3908 tons; but the make of gas is not given in the accounts. The residuals estimated to have been made were—Coke, 3236 chaldrons; breeze, 645 chaldrons; tar, 47,898 gallons; ammoniacal liquor, 76,000 gallons.

TOWN AND COUNTY OF POOLE GAS AND COKE COMPANY, LIMITED.

The Tenth Half-Yearly Meeting of this Company was held on Monday, Feb. 14—Mr. W. PEARCE in the chair.

The SECRETARY (Mr. J. Budden) read the notice convening the meeting; after which the Directors' report was presented. This announced the raising of a further sum of £1000 during the past half year; and that there had been an improvement in the consumption of gas, while the price of coals was less than in the corresponding period of the previous year. The profits were sufficient to pay maximum dividends, and leave a small balance to be added to the net unappropriated revenue, which brings this item up to £238 15s. 1d. The profits for last half year were £1044 19s. 3d., so that if there is no great falling-off in the consumption, there is now, the Directors anticipate, a fair prospect of maximum dividends being continued.

The Company's capital consists of £9600 of 10 per cent. shares, £10,520 of 4 per cent. shares, and £8000 raised at 5 per cent.; besides which they are authorized to issue £19,880 of shares limited to a 7 per cent. dividend. Of the amount raised, all has been expended except £635. The revenue account shows that the cost of manufacture, in the past six months, was £802; distribution, £48; management, £218; miscellaneous, £90. The receipts were, from sales of gas and meter-rents (the ominous line, "public lamps, none," appearing), £1818; residuals, £379; miscellaneous, £6—leaving, as above stated, £1044 odd as net revenue. Appended to the accounts is an interesting statement showing the amount received for gas, dividend and interest paid, and various other matters, in each year from 1860 to 1880.

The CHAIRMAN, when moving the adoption of the report, said the Company were progressing to prosperity by slow degrees, and last half year they sold more gas than in any previous six months, even when they had the public lights.

Mr. PHILLIPS seconded the motion, which was carried, after a short conversation.

The CHAIRMAN then moved the declaration of a dividend of 10 per cent. on the "A" shares, and 4 per cent. on the "B" shares, for the half year ending the 31st of December last.

Mr. BURDEN seconded the proposition; and, on the suggestion of Mr. PHILLIPS, it was agreed that the dividend on the "B" shares, like that on the "A" shares, should be paid free of income-tax.

Mr. W. Pearce and Mr. C. J. Stone were the retiring Directors, and as they were eligible for re-election, they were again appointed.

The CHAIRMAN returned thanks for his re-election, and proposed that Mr. Wheatley be appointed Auditor in the place of Mr. William Livesey, who, the report stated, would be unable to act further in this capacity.

Mr. Stone seconded the proposition, which was carried unanimously; as was also a vote of thanks to the Directors for their services.

The proceedings then terminated.

NEWPORT (MON.) GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Monday, Feb. 14—Mr. T. GRATEX presiding.

The SECRETARY (Mr. E. F. Marfleet) read the notice convening the meeting, after which the Directors' report was presented. This was very short, and merely stated that "the net balance [of the last half year's revenue account—£2010 7s. 3d.] is not sufficient to pay the same dividends as in the past half year. This arises from three causes—viz., the reduction in the price of gas, the loss in the amount realized from the sale of residual products, and the exceptional expenditure in converting the old gas-holder into an ammoniacal liquor tank. It is hoped that the increased consumption arising from the reduction in the price of gas may, in the future, more than cover the loss arising under that head; and inasmuch as the charges before referred to will not again occur, the Directors recommend the payment of the usual dividend." The Engineer (Mr. T. Canning) reported that the works were in good and satisfactory order.

The authorized share capital of the Company is £90,000—viz., £12,600 of "A" (10 per cent.) stock, and £27,400 of "B" (7½ per cent.) stock, both fully paid up; also £50,000 of "C" (7 per cent.) shares, half of which remains to be issued. Mortgages, under the Company's Act of 1855, to the extent of £10,000 have been effected; while the borrowing powers (£12,500) under their Act of 1875 have not yet been exercised. The capital expenditure on works, &c., last half year was £355; raising the total, to Dec. 31, to £78,224.

The manufacture of gas during the past six months cost £5732; distribution, £423; public lighting, £248; rents, rates, and taxes, £211; management, £535; sundries, £346—or a total of £7495. Against this there were receipts from sales of gas, £7777; meter-rents, £832; residual products, £1348; rents and miscellaneous, £49—showing total receipts of £9505, and leaving £2010 to be carried to net revenue account. This account shows a balance (subject to the dividends for the past six months, about £2600) of £4041. The Company's reserve fund amounts to £5000; and the depreciation fund (for works on leasehold land) to £400.

During the six months July to December there were used 6312 tons of common and canal coal; about 5½ per cent. of the latter class. The

residuals were—Coke, &c., 4511 tons; tar, 311 tons; ammoniacal liquor, 93,592 gallons.

The CHAIRMAN moved the adoption of the report and accounts. He said that during the past half year there had been a large expenditure upon works, which had diminished the sum available for dividends. The works were, however, considered necessary, and as they would enable the Company to increase their make of gas, must prove very advantageous to the town. The loss of revenue was a more important item, being equal to £600 a year, and he could only hope that in future the increased requirements of consumers would make up this deficiency. It was hoped the town would increase and prosper—there seemed now to be a move in the right direction.

The DEPUTY-CHAIRMAN (Mr. E. J. Phillips), when seconding the motion, replied to the criticism of one of the Shareholders on certain items in the accounts. He said that, at the last half-yearly meeting, the Directors announced that they had determined to make a reduction in the price of gas, in consequence of representations by the Mayor and Town Council. They were told that times were bad, and that if a reduction were made in the price of gas a considerable increase of consumption would result. The Directors took this sanguine view of the matter, and by reducing the price looked for a large augmentation of revenue, because the establishment charges would be but little more; but the result had not been what was anticipated. This was one of those cases in which "hope told a flattering tale" that was not realized—and they lost on net revenue £600 or £700, which had not been recouped. However, certain items of expenditure would not occur again, and taking all the circumstances into consideration, the Directors did not see any reason this half year why they should not recommend the payment of the same dividend as before. It was true the Shareholders might say the concern had not earned enough to pay the money; but the Directors argued that there was a sum derivable from the profit and loss account which enabled them to do so justifiably. The amount needed was only £500, and he pointed out that but for extraordinary expenditure there would not have been any difficulty about providing for the dividend, notwithstanding the decreased revenue from gas consumption. Next half year there would be less to pay, whilst they hoped there would be still greater consumption of gas.

The motion was carried unanimously.

The CHAIRMAN next proposed—"That dividends at the rate of 5 per cent. on class "A" stock, 3½ per cent. on class "B" stock, and 3½ per cent. on class "C" shares, for the half year ending Dec. 31, 1880, be declared."

Mr. CHRISTOPHERS seconded the proposition. He thought it was apparent, from what the Vice-Chairman had said, that the expenditure last half year had been exceptional, and on this ground alone he endorsed the Directors' recommendation with regard to dividends.

This motion was also carried unanimously.

A vote of thanks to Mr. Gratex for presiding closed the proceedings.

COLNE VALLEY WATER COMPANY.

The Fourteenth Half-Yearly General Meeting of this Company was held at the Charing Cross Hotel, on Monday, the 21st ult.—Mr. J. R. HOLLOND, M.P., in the chair.

The CLERK (Mr. W. Verini) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The increase in water-rates amounts to £121 8s. 8d., as compared with the corresponding half year of 1879; while the expenditure has decreased by £79 10s. 7d. The increase in water-rates would have been greater had it not been for the unusual number of houses in the Company's district which have remained unoccupied during the last six months.

The official analyses of Dr. Frankland on the quality of the Colne Valley Company's water continue to be most favourable, and to show that the water is superior to any supplied by the Companies in the inner or outer London circle.

The following Directors, General Sir E. Walter Forester Walker, K.C.B., James B. Capel, Esq., and S. Noakes, Esq., retire by rotation, but offer themselves for re-election. Thos. F. Blackwell, Esq., retires from the auditorship, but offers himself for re-election.

Dr.	Capital Account on Dec. 31, 1880.	Cr.
10,000 shares, at £10 per share, paid up	£100,000 0 0	
72 new shares, at £10 per share, paid up	720 0 0	
Debentures	25,000 0 0	
		Expenditure, as per last account
		£122,087 15 9
		Expenditure for half year ending Dec. 31, 1880
		290 19 10
		£122,378 15 7
		Balance carried to general balance
		3,341 4 5
	£125,720 0 0	£125,720 0 0

Revenue Account, for the Half Year ending Dec. 31, 1880.

Water-rates	£1,553 17 2	Working expenses	£617 2 9
Rent of water-meters	54 8 3	Salaries and office expenses	152 0 11
Transfer fees	2 10 0	Law expenses	7 17 10
Sale of gravel and refuse lime	63 14 7	House services, &c.	1 16 8
		Commission to Collector	39 1 10
		Rates and taxes	21 8 4
		Bad debts	5 12 5
		Interest on debentures	662 10 0
		Profit	166 19 3
	£1,674 10 0		£1,674 10 0

The CHAIRMAN, in moving the adoption of the report, observed that last half year, as the Shareholders were aware, the Directors were able for the first time to show a profit, and he was glad to say that this had been continued. They had now a profit of £166 19s. 3s. to show as the result of the working of the past half year. There had been an increase in the amount receivable from rates to the extent of £121 8s. 8d., and this increase would have been very much greater had it not been for the number of unoccupied houses in the Company's district. The consequence of this had been that so much less had been received from water-rates than would otherwise have been received by £70 19s. 3d.; so that the total increase in the water-rates, had these houses been occupied, would have reached nearly £200. The total rates receivable for the current half year amounted to about £1725, which would be £3450 for the whole year; but, of course, this figure was not brought up to the present time, and the Directors had every reason to believe that during the whole year they would receive a considerable addition to the amount he had mentioned. The number of houses to which fresh supplies were given during the half year was 123; so that out of the total number of houses in the Company's district they now supplied 1690, leaving 1472 houses still to be supplied. For the moment they must look forward for an increase of rates to the supply of houses which still remained unsupplied, and if there should be a dry summer this year he thought the Company might count on a large number of applications for water. With regard to the expenditure, there had been a decrease of £79 10s. 7d., which resulted principally from the economies the Directors were able to make about a year ago. There was one point in the expenditure about which he believed the Shareholders would like to have some information—that was the amount they were paying for coal. The Directors had made a number of experiments with regard to the burning of coal and coke, and they had found coal for which they paid 14s. 6d. per ton, which they found extremely good, and which suited their purposes very well indeed. The reports of

Dr. Frankland on the quality of the Company's water continued to be most favourable—in fact, in the last half year the Colne Valley water had stood at the head of the list. He thought the Shareholders must all feel that this was a satisfactory feature just now, when questions connected with the supply and quality of water were coming to the front, and that it was a very important thing for the Company to be able to show that their water was the best supplied in the neighbourhood of London.

Mr. FRANCIS seconded the motion.

Mr. ROGERS referred to the debentures, amounting to £25,000, and said he believed they bore 5 per cent. interest, but the amount charged for interest was £1325, instead of £1250. He desired an explanation of this. He also thought that £60 was a good deal for the Company to pay for stamps, stationery, and printing. If the expenses could be curtailed it would be most desirable to do so. He regarded the stores in hand as far too large in amount—£1247 16s. 11d.—for a Company like this, unless they had some idea of extending the works, and had bought these stores in anticipation of that object.

The CHAIRMAN said the £1325 was interest not only on the debentures—it included interest at 5 per cent. on the loan of £1500 which would be found in the general balance-sheet. It should have been stated that it was interest on debentures and this loan, instead of on the debentures only. The amount set down for stamps, printing, and stationery included the cost of printing the Directors' reports and the Collector's books.

Mr. FOX, referring to the amount set down for pipes, valves, hydrants, &c., £974 19s. 9d. (he did not include the house stores), stated that he had looked through the list, and it seemed to him that there was nothing in stock which was not absolutely necessary in case of repairs, with the exception of 28 15-inch pipes and 4 15-inch valves; and the reason they were in stock was that they were originally ordered, but owing to an alteration in the works during their construction they were not used.

The motion was put, and carried unanimously.

The retiring Directors and Auditor were then re-elected; and a vote of thanks having been passed to the Chairman and Directors, the meeting terminated.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Queen's Hotel, Birmingham, on Thursday last—FRANK JAMES, Esq., J.P., in the chair.

The following report of the Directors was taken as read:—

The number of houses laid on during the half year ending Dec. 31, 1880, was 1358, making the total supplied 37,189.

The gross revenue from water-rates accrued during the half year was £24,844 15s. 2d. as against £23,007 11s. 2d. in the corresponding period of the previous year.

After providing for interest on loans, debenture stock, and preference stock, the amount remaining for division (including the balance brought from last half year) is £9797 16s. 8d., and your Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 4 per cent. per annum, less income-tax. The amount of this dividend being £7609 16s., there will remain £2188 0s. 8d. for the credit of the next half year.

The following members of the Board will retire from office by rotation; but they are eligible, and offer themselves for re-election—viz., Messrs. John Nurthall Brown and William Henry Holland.

The Company's Engineer (Mr. W. Vawdrey) reported that the whole of the machinery and other works are, at the present time, in thorough repair and good working order; and that, "notwithstanding the extraordinary demand throughout the several districts during the late severe weather, the supply has been efficiently maintained."

The expenditure on works and plant to the end of 1880 was £723,711 5s., of which sum £7935 11s. 10d. was added during the last six months. The ordinary stock of the Company amounts to £400,637; and the preference (4 and 5 per cent.) stocks to £175,000. The balance of the sum expended has been raised on mortgages, by debenture stock, and from the Company's bankers. The principal items in the profit and loss account were dealt with in the Chairman's speech which follows.

The CHAIRMAN, in moving the adoption of the report, pointed out that the gross revenue received from water-rates was £1800 in excess of the amount received in the corresponding half of last year, which, he said, was only what the Directors had led the Shareholders to expect. There must be a gradual increase in the water-rates, or else he did not know what they would look to for their increased dividends. They could only hope that the revenue would continue to increase in the same ratio, as they had no reason to doubt that it would, and if it did, they would arrive again at the happy time when the Shareholders would receive a fair return for the money they had expended. On the other side of the revenue account, the engine charges were a little less than in the last half year, and about the same as in the previous one. Maintenance of works figured also for a little smaller amount than before. This was always a moveable item, because in a mining district they could never tell how soon they might be called upon to raise their pipes. He must not lead the Shareholders to expect any diminution in this item, certainly not in the next half year, for, like every other water company, they had had during the past two months a very serious time of it, through the bursting of pipes. He did not think there was any other item that he need notice until they came to that of rates—an ever-increasing and unsatisfactory item—£1286, for the half year, against £926 for the corresponding period of the previous year. There was not the slightest hope, so far as he could see, of any diminution, unless they could induce his co-Director, Mr. Wiggin, M.P., to use his influence with the right honourable gentleman who was at the head of the Board of Trade to bring in a Bill for the purpose of what he should call the equitable rating of public companies. The incidental charges also figured for a larger amount, but they included the entire cost of the inauguration ceremony in connection with the new works—a capital expenditure which had been paid out of revenue. The ordinary charges for the working of the Company amounted to a total of £9098, and one-seventh of this amount was for the rates. Discount to landlords represented the sum deducted from the accounts of those who undertook to pay for their tenants, whether their houses were occupied or not. Next was an item which he hoped might some day or other, with reviving trade, be considerably reduced. Although it was put down as adjustments and allowances, it represented not only adjustments on meter and other accounts where over-charges had crept into the accounts, but also allowances which were made for void houses in the district, but which were in charge. The number of these void houses at present was nearly 3000, principally in the towns of Walsall, Wednesbury, Darlaston, and to a small extent in Tipton. The void houses represented something like £700 of the item in question. The interest on loans was necessarily smaller, because the redeemable loans were being paid off as the Company were creating permanent debenture stock; the interest, therefore, on loans diminished, and the interest on the permanent debenture stock increased. The result of the whole was that the balance out of which the dividend had to be declared was £9797 16s. 8d. The actual earnings of the half year were £7177 1s. 3d., and to pay a dividend of 4 per cent. required £7609 16s. They, therefore, had to take £482 14s. 9d. from the balance of £2620 15s. 5d. brought from the previous year. As the balance was carried forward from year to year,

and as the Company had had an exceptional item of expenditure during the half year, he thought they were warranted in the course recommended. Referring to the period of the frost, and the complaints received from many of the consumers, he said that the Company had done everything to remedy the inconvenience caused by the frost, but reminded customers that the Company were only responsible for the mains, the supply-pipes being under the control of the persons supplied. The vexed question of service-pipes to blocks of houses had been again under the attention of the Directors, and he had received a deputation on the subject from the West Bromwich Commissioners. The Directors were desirous of protecting the Company against frauds and the stealing of water by those who did not pay for it. The Commissioners had intimated their willingness, when service-pipes were laid to blocks of houses, to put in force their own powers to compel neighbouring people who had no supply of water to take that of the Company. The Directors were willing to meet the Commissioners in the matter, and they would see what the effect would be.

Mr. R. WILLIAMS seconded the motion, and it was carried unanimously. The dividends recommended in the report were then declared, the retiring Directors and Auditor re-elected, and the proceedings closed with the usual vote of thanks to the Chairman and Directors.

BIRMINGHAM CORPORATION WATER SUPPLY.

At the last Meeting of the Birmingham Town Council, the report of the Water Committee having been taken as read,

Alderman AVERY, in moving its adoption, said it was very satisfactory to observe that the prosperity, the progress, and he believed the efficiency of the water undertaking continued without interruption. During the past year the Committee had fixed to the different mains in the borough and district 2053 hydrants, which, with the 2397 fixed during the last two or three years, made the total number of hydrants 4450. This work was now nearly completed, and at most it would only be necessary to fix 100 or 200 additional hydrants. During the same time the Committee had constructed 15½ miles of additional mains, which, with the 93 miles of mains laid down since the transfer of the water-works to the Corporation, made altogether 108½ miles of new mains. He had before informed the Council that a great number of the mains were laid down in districts where few services really existed, or were likely to be established for some time to come. Whenever the Health Committee either of Birmingham or of the surrounding districts required a single house or any blocks of property to be furnished with the Corporation water, there was never any hesitation in immediately making provision for these requirements, whether they were remunerative or not; because the principles upon which the undertaking was conducted were sanitary rather than economical ones. During the past year £30,406 had been expended in the extension of works calculated to increase the power of distributing the water, and the quality of the water. The new services numbered 6211, which were pretty nearly up to the average of former years. The gross revenue of the undertaking in 1876—the first year of the transfer—was £93,527, and it had increased in 1880 to £121,074; while the profits, which in 1876 were £1888, had increased in 1880 to £12,046, to which must be added a substantial sum laid aside in the same year by way of sinking fund. The reserve fund now amounted to £40,000, £9604 having been transferred to it out of the revenue last year, in addition to £1600 odd for the sinking fund. It might be necessary to make some occasional contribution from revenue to the reserve fund; but in the main it was not proposed that this fund should increase in any other manner than by the addition of interest. The surplus of about £12,000 which existed would be appropriated in applying £5000 to the reduction of water-rates, and the remainder in providing interest for the large works, the construction of which the Council had sanctioned at Shustoke. He ventured to think that the Committee's statement of their proceedings would be satisfactory to the Council and the public. Referring to the strain which had recently been put upon the department—a more trying and perplexing state of things had not, he said, occurred since the establishment of the works, about the year 1826. As nearly as could be estimated between 5000 and 6000 private services between the mains in the district and the houses were broken by the frost, and also 171 mains belonging to the Corporation, some of the latter being 3 feet under the ground. There was, however, an abundant supply of water, the difficulty being to supply it for the use of consumers. The enormous number of broken pipes by the frost, and the number of taps allowed to run, notwithstanding all remonstrances, wasted water which ought to have been placed within the reach of consumers. In 1880 the average quantity of water pumped daily was 10 million gallons—the highest quantity pumped in any one day was between 13 and 14 million gallons—5½ millions of it being river water, and 4½ millions derived from deep wells. In the third week in January this year, however, the quantity rose from 66 millions in the first week to 10½ millions, in the fourth week it was 104 millions, and in the fifth it was 99 millions. In the first week in February, again, it was between 99 and 100 million gallons. Some days there were pumped between 17 and 18 million gallons. Replying to a question, he said the Committee saw no necessity for adopting the practice of the Gas Committee to allow 5 per cent. discount upon all accounts paid within a month. Their entire income was £120,000, and the cost of collecting the water-rates did not exceed £1300 or £1400 a year at the outside. By allowing 5 per cent. it would amount to £6000 a year. The only commissions allowed were to house agents who collected large quantities of rates, thereby saving the Committee trouble and expense.

The motion for the adoption of the report was then put and carried.

THE WATER SUPPLY OF NEWPORT (MON.).

BOARD OF TRADE INQUIRY.

An inquiry, in reference to the application of the Newport and Pilsbury Water Company to the Board of Trade for a Provisional Order authorizing an increase of capital to the extent of £100,000 for the purpose of executing certain necessary works, was held on Friday, the 18th ult., by Major MARINDIN, R.E.

Mr. A. T. LAWRENCE appeared for the Company; Mr. A. A. NEWMAN (Deputy Town Clerk) for the Corporation, who opposed the application.

Mr. LAWRENCE, in opening the case, said the Company obtained their first Act of Parliament in 1846, and were empowered to raise £20,000 in shares and £7000 on loans; by their second Act of 1854 they were empowered to raise £20,000 in shares and £6000 on loan; by their Act of 1872 they were empowered to raise £40,000 in shares and £10,000 on loan—making the total amount of capital £80,000 in shares and £23,000 on loan, or £103,000 in all. The whole of this capital had been exceeded by the execution of works to the extent of about £6000; so it was now found necessary, owing to the increased and increasing population of the town, to ask for more capital to extend the works. Mr. Taylor, the Company's Engineer, had projected the following works:—A northern bye-wash to the upper (new) reservoir; a subsiding reservoir at the lower (old) reservoir; improvements in the old reservoir, by deepening the pitching round it; the covering in of the Stow Hill reservoir; an alteration to the St.

Woollos tank; the conversion of the present engine-house and premises into a board-room and necessary offices; and the making of provision for increased mains and service-pipes, both immediately and prospectively. The Directors, from their practical acquaintance with the wants of the district, approved of these proposals. He then proceeded to criticize the petition which had been presented by the Corporation against this application. It was objected, he said, that the Provisional Order did not specify the works proposed to be carried out. This was never done in such applications as the present one. He should prove by evidence what the works would be. The Corporation then objected to the additional capital because it would increase the selling value of the concern; but he (Mr. Lawrence) always understood that the selling value of any concern would be calculated upon the income. If the Company raised £100,000 additional capital, it would not increase the selling value of the undertaking.

Mr. John Lawrence, Vice-Chairman of the Company, then gave evidence. He said the district supplied by the Company was considerably outside the limits of the municipal borough. In his judgment it was necessary to construct the new works to meet the requirements of the district. He believed Mr. Taylor's estimate was a right and proper one. In his (witness's) judgment, filter-beds were unnecessary. To adopt filter-beds would involve an entire change of scheme, and the laying out of a great deal more capital. The Directors had received one complaint of contamination, and it was at once remedied. There had not been any complaint of the kind since. The property did not yield any dividend from 1846 to 1854, and the average dividend to the present time was 5 per cent. per annum from 1846, whilst the Company were entitled by their Act to 8 per cent. In 1878 he accompanied a deputation from the Council to the old reservoir, and they approved of the subsiding pond now projected. The Council had never offered to purchase the works, and the Company had no intention of selling.

Cross-examined: It was absolutely true, as far as he knew, that the Corporation had never offered to purchase the Company's works. It was not only for the inhabitants, but the supply of water required by ships was so greatly increasing month by month, that additional works were needed at once.

By the INSPECTOR: The Urban Authority under the Board of Guardians and the Christchurch Local Board had jurisdiction within the district over which the Company supply water. During the time the old reservoir only existed, great economy in the supply of water had to be observed, and on one occasion the Company had to request the Corporation to obtain water for general purposes from the canal.

Mr. John Taylor, C.E., of Great George Street, Westminster, said he had had 35 years' experience in the construction of water-works. For many years he was with Mr. Simpson, and Mr. Simpson and himself had been connected with the Newport Water Company since the works were started; and it was in consequence of a report made by him that the Company were seeking to increase their capital and enlarge their works. It was proposed to construct a bye-wash at the Pantyrehos reservoir, costing £3000; a new subsiding reservoir at Ynysbrow, which would cost £20,000; to deepen, pitch, and generally improve the lower reservoir, at a cost of £14,000; to lay down new mains and service-pipes, costing £34,938; and to carry out minor works, such as covering over the Stow Hill reservoir, building workmen's cottages, and new offices. Witness then went into details respecting the various items of expenditure, and said that, allowing £12,000 for working capital and 10 per cent. for contingencies, the total amount was £97,881. The items for works were moderate, and he believed that, having regard to the increase of population, the extensions proposed to be carried out were both desirable and necessary. The works were originally laid out without providing for filtration. It was found that after storage in a subsiding reservoir the water became almost as pure as when filtered. During the operation of deepening the lower reservoir it was proposed to supply the town by means of pipes laid down from Pantyrehos, and of course these pipes would always be available in the future. The existing reservoirs would hold 225 million gallons, the daily supply was 200 million gallons, and it was proposed to increase the storage capacity to 245 million gallons. The average daily consumption was about 180 million gallons.

Cross-examined: The subsiding reservoir would hold from 18 million to 20 million gallons; and the deepening of the lower reservoir would increase its capacity. The cost of cleansing this reservoir was not included in the sum of £14,000 for deepening and pitching it. In the event of the works being sold, he thought the amount of the purchase-money would be based on the income of the Company, and not on the amount of capital.

Mr. C. CULHAM, Secretary to the Company, gave figures showing the increase of population in 30 years in the district covered by the Company. It had doubled in this time. He also gave the exports of coal in 1866 and 1880, showing a large increase.

This was the case for the promoters.

Mr. NEWMAN did not address the Inspector, but proceeded at once to call evidence.

Mr. J. R. JACOB said he was Mayor of Newport, and Chairman of the Parliamentary Committee of the Council. The first objection to the Company's proposed Provisional Order was the doubling of the capital, for which there did not appear to be any necessity. He thought there was misapprehension on the other side as to the gradual development and future increase of the town. The rateable value of the borough in 1875 was £118,853; in 1876, £111,851; in 1877 (after the Improvement Act), £137,740; 1878, £145,000; 1879, £154,000; 1880, £153,000; 1881, £154,000. Number of houses built in the years 1875-80 inclusive, 163, 172, 191, 151, 67, and 145. With reference to the question of purchasing the works, there seemed to be a consensus of opinion in the town that it was desirable for the Corporation to acquire the works if they could be had on reasonable terms. The desire was based on health considerations. With regard to the estimated cost of new service-pipes, he deemed it excessive.

The INSPECTOR intimated that if the Council had an expert to call to show that the figures given on the other side were excessive, it would be more satisfactory than a mere opinion.

Cross-examined: Had no large experience in the laying out of water-works. Had never held a share in a water-works company. His contention was that the extra 1 per cent. should be given up because the pumping was not needed. He had been advised that it was proper to apply for permissive powers of purchase.

Re-examined: The proposal as to permissive purchase was made to show that the Town Council acted *bona fide*. A resolution was passed by the Council in January approving of the proposal.

By the INSPECTOR: He was of opinion that the Council would be able to supply water at a cheaper rate than the Company. His principal objection was to the excessive estimate for the new service-mains.

Mr. CONYERS KIRBY, Borough Surveyor, said he generally supported the Mayor's evidence. At the same time he was surprised to find that the Company wanted to spend £20,000 at the new reservoir and £14,000 at the old; £35,000, too, was an excessive amount for mains and service-pipes. It was quite possible for the Corporation to seek to purchase these works in a few years, and it was not desirable that the Company should have ten or twelve years for the proposed works. When the Corporation spoke of

a settling-pond, they had a notion of a much smaller pond than the one proposed. Filtration would be an improvement, but the northern bye-wash would do away with a good deal of the turbidity of the water.

Cross-examined: He did not mean to say that Newport was a stationary town. The Pontypridd Railway would perhaps do good to the trade, the same as the Alexandra Dock; but he doubted whether it would have the effect of increasing the population very greatly.

This concluded the inquiry, and the Inspector said he would visit the works before making his report to the Board of Trade.

BIRMINGHAM CORPORATION GAS-WORKS.
STATEMENT OF ACCOUNTS FOR THE YEAR ENDED DEC. 31, 1880.

Loan Capital.				
Description of Loan.	Rate per Cent. of Interest.	Total Amounts Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
Mortgages . . .	4 3 3 3 4	£726,702 7 2 61,000 0 0 36,550 0 0 48,650 0 0	£27,798 12 10	{ £2,000,000 (calculating the annuities at 20 years' purchase. At 25 years' purchase, the amount would be £2,274,824 15s.)
Debenture stock .	4			
Annuities (capitalized at 25 years' purchase) . . .	—	1,374,123 15 0		

Dr.—Capital Account.			
	Expenditure to Dec. 31, 1879.	Expended this Year.	Total to Dec. 31, 1880.
To Expenditure to Dec. 31, 1879 . . .	£2,153,336 9 1	—	£2,153,336 9 1
Since that date—			
Lands acquired, including law charges . . .	—	£2,967 5 0	—
Extension of buildings, manufacturing plant, machines, storage works, and other structures connected with manufacture . . .	—	49,916 11 5	—
New mains, and other works connected with distribution . . .	—	5,229 3 3	—
New meters (not in place of old ones)	—	1,563 1 7	—
		£59,676 1 3	
Less amount received under arbitration for West Bromwich supply, exclusive of sum to be paid for additional plant fixed since award . . .		70,750 0 0	
Deduct			11,073 18 9
Total expenditure			£2,142,262 10 4
Balance of capital account			104,763 11 10
			£2,247,026 2 2

Cr.—Capital Account.			
	Certified Receipts to Dec. 31, 1879.	Paid off during Year.	Total Receipts to Dec. 31, 1880.
By Debenture stock	£18,650 0 0	—	£18,650 0 0
Mortgages and bonds	840,382 16 4	£16,130 9 2	824,252 7 2
Annuities (capitalized at 25 years' purchase)	1,374,123 15 0	—	*1,374,123 15 0
* After deducting capitalized value of the annuity payable by the Corporation of Walsall			
			£2,247,026 2 2

Dr.—Revenue Account.			
To Manufacture of gas—			
Coals, including carriage, &c.	£146,347 10 4		
Purifying materials and wages	2,672 12 4		
Salaries of Engineers and Officers at works	2,851 10 8		
Wages at works	36,910 1 0		
Repairs and maintenance of works and plant—less old materials sold	55,643 17 1		
		£244,425 11 5	
Distribution of gas—			
Salaries of Inspectors, and Clerks in Light Office	£10,031 15 4		
Repairs and renewal of mains and services	23,363 7 11		
Repairing, renewing, and refixing meters	10,323 11 8		
		43,718 14 11	
Lighting and repairing public lamps	4,701 2 4		
Rents, rates, and taxes	15,834 6 0		
Management—			
Salaries of Secretary, Accountant, and Clerks	£2,316 10 4		
Collectors' commissions and salaries	1,376 13 9		
Stationery and printing	692 8 4		
General establishment charges and incidentals	3,166 10 1		
Auditor	52 10 0		
		7,544 12 6	
Law and parliamentary charges		13,651 14 10	
Bad debts		2,001 2 2	
Bank charge		100 0 0	
Cost of maintaining recreation ground at Nechells		74 8 6	
Total expenditure			£332,051 12 8
Balance carried to profit and loss account			148,437 12 3
			£480,489 4 11

Cr.—Revenue Account.			
By Sale of gas—			
Common gas, 586,407,400 ft. at 3s. 6d. per 1000 ft.	£87,961 2 2		
Ditto, 452,264,000 " 2s. 10d. "	64,070 14 8		
Ditto, 608,127,300 " 2s. 8d. "	81,083 12 8		
Ditto, 873,905,000 " 2s. 6d. "	109,238 2 6		
Public lighting and under contracts	22,044 7 5		
	£364,397 19 5		
Deduct adjustment for stock, &c.	143 11 1		
	£364,254 8 4		
Less discounts and adjustments	14,703 0 8		
		£349,551 7 8	
Residual products—			
Coke, less labour and cartage	£47,549 7 8		
Breeze, do. do.	39,306 6 5		
Tar	39,374 1 4		
Ammoniacal liquor	43 14 7		
Sundry residual products		126,273 10 0	
Rents		1,482 15 1	
Fittings		2,361 17 4	
Discounts on purchases		811 17 4	
Transfer fees		7 17 6	
		£480,489 4 11	

Dr.—Profit and Loss Account.	
To Amount carried to sinking fund account from profits of 1879 . . .	£26,165 18 4
Interest on temporary loans	86 12 6
Interest on mortgages and bonds, accrued to Dec. 31, 1880 . . .	32,535 15 5
Interest on debenture stock to Dec. 31, 1880	1,946 0 0
Annuities	54,964 19 0
Sinking fund, for redemption of loans and annuities	4,075 9 4
Balance, being net profit for the year	57,009 2 9
	£176,783 17 4

Cr.—Profit and Loss Account.	
By Balance of net profit brought from last account	£51,165 18 4
Less amount paid to borough improvement fund	25,000 0 0
	£26,165 18 4
Balance brought from revenue account, being profit for the year to Dec. 31, 1880	148,437 12 3
Interest on amount invested on account of reserve fund	2,000 0 0
Interest allowed by bank	180 6 9
	£176,783 17 4

Statement of Coals.					
Description of Coal.	In Store, Dec. 31, 1879.		Received during Year.		Carbonized or Used during Year.
	Tons.	Cwt.	Tons.	Cwt.	Tons. Cwt.
Common	24,990	18	316,825	1	310,964 15
Cannel	1,056	15	4,834	8	4,738 16
					30,551 4
					1,152 7

Statement of Residual Products.					
Description of Residual.	In Store, Dec. 31, 1879. (estimated).	Made during the Year (estimated).	Used in Manufacture during Year (estimated).	Sold during Year.	In Store, Dec. 31, 1880 (estimated).
Coke—common, chaldrons of 36 bushels	13,610	373,966	107,953	262,242	17,381
Breeze—ditto	3,808	24,841	7,828	17,988	2,833
Tar—gallons	74,400	3,762,026	900	3,458,482	377,044
Ammoniacal liquor—batts of 108 gallons	1,311	87,845	—	87,797	1,359

In addition to the foregoing accounts, statements are given in regard to the reserve funds and other accounts of the gas department. The reserve fund amounts to £50,000, and there has not been any addition made to it during the past year. The sinking fund account stood at £40,549 on Dec. 31, 1879, the interest on which for 1880 was £2695; while to it has been added the two amounts shown above, in the profit and loss account, making the total up to £73,485. The superannuation fund account shows a balance brought forward of £2028 9s.; the contributions during the past year being £491 16s. 10d.; and interest, £90 14s. 4d. Of this sum £29 1s. 9d. has been repaid, leaving an amount in hand of £2611 0s. 2d. The sick and funeral allowance fund account has a balance of £122 4s. 4d., as against £79 11s. 3d. on Dec. 31, 1879; the contributions during the twelve months and interest being £873 8s. 3d., while the sick pay, funeral allowance, and medical attendance, with sundry expenses, only absorbed £880 15s. 2d.

ALTERATIONS AT THE ILKESTON GAS-WORKS.

Gas affairs at Ilkeston have been for some time under a cloud. We have, from time to time, noticed in these columns the course of events, by which the undertaking of the Ilkeston Gaslight and Coke Company became the property of the Ilkeston Local Board. The negotiations have been far from friendly; and, as in all such cases, the consumers are the losers. Indeed, with a singular want of public spirit, those responsible for the old Company, from the moment of the possibility occurring of the concern changing hands, ceased to add to the works, although the consumption of gas advanced at the high rate of 14 or 15 per cent. per annum. The result was that when the new Manager was appointed, and the new proprietors could see the concern for which they had paid so high a price, they found it totally impossible to manufacture gas economically; or, when made, to account for it at the consumers' meters. A thorough examination of the mains and services throughout the district reduced the leakage account, and the works were placed in the hands of Mr. G. W. Stevenson, of Westminster, for his report on their efficiency. But the Local Government Board here stepped in, and demanded an inquiry before leave could be obtained to expend money on these necessary improvements; and another season consequently passed without anything being done. The result, as may be anticipated, was that the works, long since too small, were utterly unable to contend with the production of gas. As it was, the gas in the purifiers was changed completely every 80 or 90 seconds; and the gas was passed to the town impure, and deficient in illuminating power and in quantity. A discriminating public, of course, blamed the new management, saying that such things did not exist under the old régime.

The new works were all complete in the first fortnight of the present year, and on a cold January day the difficult task of making the permanent connections was attempted, and accomplished within the short space of daylight then existing. The alterations are most complete, but have made the work of carbonizing very difficult during their progress, as, in point of fact, the whole of the apparatus, &c., had to be remodelled and extended. The new works consist, in the first place, of a retort-house and shaft. The retort-bench is fitted with beds of seven oval clay retorts, with Morton's patent self-sealing retort-lids. The retorts are relieved of pressure by Chandler and Stevenson's automatic valves, which pass the gas first into a D-shaped hydraulic main, arranged in sections over each bed; and then into a circular foul main, from which the heavy tar is at once taken direct to the tar-well. The lighter hydrocarbons are conducted round the retort-house in a rectangular 12-inch by 24-inch wrought-iron main, and, after being deprived of the condensable constituents, passed on to the condenser. These alone of the old works remain unaltered. On the site of the old purifier-house has been erected a substantial engine and meter-house. The engine and exhauster has been supplied by Messrs. Gwynne and Co., and quite comes up to the high standard of excellence this firm have gained for good workmanship and machinery. Their contract also includes pumps for tar and liquor, which are worked from the engine by a shaft and belt. Steam is supplied by an egg-ended boiler, made and erected by Mr. J. Whitehouse, of Ilkeston. The engine also gives motion to the shaft of a "Standard" washer-scrubber, erected by Messrs. Kirkham, Hulett, and Chandler. The two old retort-houses made into one, form a spacious purifying-house and revivifying shed. The purifiers are 12 feet square and 5 feet deep, and have been supplied by Messrs. Goddard and Massey, of Nottingham. The gas current is regu-

lated by one of Laidlaw's patent 12 inch recessed cone valves. The station meter is by Messrs. W. and B. Cowan, of Edinburgh; and the governor by Messrs. D. Bruce Peebles and Co., of the same city. The contractor for the brickwork and main buildings was Mr. F. Shaw, of Ilkeston. The plans and specifications were furnished by Mr. G. W. Stevenson, C.E.; and the works carried out under the very able superintendence of the Gas Manager, Mr. F. C. Humphrys.

PROPOSED PURCHASE OF THE KIDDERMINSTER GAS-WORKS BY THE CORPORATION.

At the Meeting of the Kidderminster Town Council on Wednesday last—the MAYOR (Alderman Willis) in the chair,

Mr. C. E. JEFFRIES submitted a motion to the effect that it was desirable that the Corporation should purchase the property of the Kidderminster Gaslight and Coke Company on equitable terms. In doing so he remarked that if the motion was carried, he would move for the appointment of a Committee to treat with the Company. In bringing this matter before the Council, he said he was only doing his part as a Town Councillor in seeking to benefit the ratepayers of the borough by getting the gas-works into the hands of the Corporation, and it was what they saw was being done in many other places. Personally, he had no wish to damage the Company, and if their property were bought by the Corporation it would be on equitable terms. In Kidderminster there were factories and houses to the number of about 6000, and he believed there were not above 1600 gas consumers in the whole town. If the gas-works were conducted on a popular and fair system, there ought to be gas in almost every house; but everything was thrown in the way of supplying small consumers, and he did not see why they should be charged more than other people. If the purchase were not effected now, he believed it would be ultimately, and the sooner it was carried out the better.

Mr. H. DIXON seconded the motion, remarking that the matter was a fair one for consideration, and if the purchase could be made on equitable terms he believed it would be an advantage to the ratepayers, and a source of profit to the Corporation. He had always felt that such undertakings as water and gas works should belong to corporations, and if in the present case the purchase were decided upon, there would be no difficulty in obtaining the purchase-money at a reasonable interest.

Mr. C. CROWTHER said some time ago he should have had doubts as to the expediency of considering this matter, but there appeared now to be difficulties connected with the electric light, which would make it long before it became opposed to gas. The question of economy and the benefit to the poor were points that the Council should study, and he thought it would be a great advantage to many people if they could have gas at moderate cost for cooking purposes, especially in the summer months.

Mr. W. GREEN said the matter was one that would require careful consideration, but there could be no harm in a Committee going into it. He thought the electric light would come into use in towns, and though gas-works would still be carried on, their owners might not be able to make the profits they had done.

Alderman TOVEY said he did not think gas would be the light of the future, and he believed it would not be well for the Council to buy the gas undertaking under present circumstances.

Mr. GREAVES suggested that Mr. Jeffries's resolution should be altered to this form—"That a Committee be appointed to consider the desirability of purchasing the gas-works."

Mr. JEFFRIES accepted the suggested alteration.

Mr. GOODWIN thought it was his duty to say a few words on this subject, but having an interest in the Gas Company he did not intend to vote. He considered the speech which Mr. Jeffries made when he introduced the question as detrimental to his (the speaker's) co-Directors. There had been reductions in the price of gas in Kidderminster from time to time, till 3s. 1d. per 1000 feet was now to be the maximum charge, while the average price to all consumers would be 2s. 11½d. per 1000 feet. He did not think, therefore, that it could be said that the Gas Company were unmindful of the public, and he believed their gas was sold at the lowest price within 50 miles of Kidderminster, while many of the places in that area were better off as regarded their rates for coal. If a Committee were appointed by the Council, the Directors would be pleased to confer with them; but he did not think the town would agree to the Council going to a large expense in regard to the purchase of the gas-works; and there was the question whether the public would be able to get the same advantages as they did now. The Company's charges in future would be 2s. 10d. per 1000 feet to large consumers, without discount; 3s. per 1000 to the next class of consumers; and 3s. 1d. per 1000 to small consumers.

After some further conversation, the motion was put and agreed to, and a Committee appointed as therein suggested.

MIDLAND GAS MANAGERS' ASSOCIATION.

At the conclusion of the President's address to the members of this Association at their fourth annual meeting, as given in the last number of the JOURNAL,

Mr. W. CROSS (Leamington) read the following paper:—

THE INEXPEDIENCY OF DOING AWAY WITH THE HYDRAULIC DIP.

As our worthy Secretary has honoured me with a request to introduce to the present meeting a subject for discussion—at the same time intimating that something short would be preferred, on account of the pressure of other business to be transacted—I agreed to comply with his request, and therefore beg, in a few remarks, to submit to the meeting the question of the inexpediency of doing away with the hydraulic dip. My object in introducing this subject is not to advocate the superiority of the old-fashioned dip, to the exclusion of the very many excellent so-called anti-dips of more recent date, but to elicit from the present meeting opinions as to the comparative merits of the "old" and the "anti" dip. Unfortunately I have had too little experience with the latter to speak of it with any authority, but I trust those present who may have them in use will give the meeting the benefit of their experience with them.

I think we are all agreed that the one objection to the old dip is that it conduces to the deposit of carbon in the retorts, by the action of the liquid in the seal-pipe during the passage of the gas from the retort to the hydraulic main. But this action may be minimized by reducing the depth of the seal to the lowest practicable point. Not many years ago anything less than a 3-inch seal was considered unsafe; whereas now, under some precisely similar circumstances, we find 1 inch, or even ¾-inch, quite ample to meet all requirements. It must, however, be borne in mind that where it is practicable to reduce the depth of the seal to this extent, it is absolutely necessary that the horizontal position of the hydraulic main should be maintained, or the seal of the dip is in danger of being destroyed, as well as the quality of the gas, by the admission of air on the removal of the retort-lid. To my mind, the best way of ensuring the level of the hydraulic is to have a separate length of main to each set of stand-pipes, the gas and other products passing through an 8-inch valve connection into a secondary main. It may be argued that this arrangement is expensive, as the extra cost per setting would be from

£7 to £8; but this, I think, is compensated for by the advantages in maintaining the minimum seal without fear of its being destroyed by the tilting of the hydraulic, and the decided advantage of control obtained by the valve, which may be of a kind for adjusting the level of the liquor in the hydraulic.

Reverting to the question of carbon deposit, I find that for the past two years the amount of carbon accumulated at Leamington gives an average of from 1 lb. to 1½ lbs. per ton of coal carbonized. Whether or not this may be considered excessive for single settings may be determined by comparisons with the workings of others. There is little doubt, I think, that the deposit of carbon in settings of single retorts is greater than in through settings. In either case it is a great nuisance, and the prevention of its deposit most desirable. The question is, will the removal of the dip secure the remedy? At present I am of opinion that it will not do so *absolutely*. I believe the exhausters most generally used contribute their mite of the evil. If we take it that the power of the exhauster—Beale's, for example—is in proportion to the area of the plate exposed to the gas, then we find that in each revolution its minimum power is when the plate is about in a horizontal, and its maximum power when in a vertical position. With a water-gauge fixed upon the inlet of a 10,000 feet per hour Beale's exhauster, making 104 revolutions per minute, the oscillation of the water-line equalled ½-inch in each revolution. How far this action may affect the retorts will depend on circumstances. If the condenser and mains between the exhauster and the hydraulic are of a capacious character it is possible that it would be absorbed; but if the capacity be too limited, and the distance short, then I fear the retorts would be affected by it.

But leaving the question of the exhauster out altogether, and assuming that by removing the dip the desired end can be obtained, will the advantage so gained compensate for the loss in cost of new anti-dips? I need not go farther than this, as one at least of the anti-dips I should consider as reliable in its automatic action as the old hydraulic dip itself, and possessing the advantages of both. I think the question resolves itself into one of cost—that of adopting the most approved anti-dip against the troublesome obstructive to the carbonizer, and the cost, in wear and tear of retorts, of removing it. Where the cost of the anti-dip precludes its adoption, I think it advisable to minimize the depth of the seal, whether an exhauster is used or not. Works of the capacity of 1 million cubic feet per day downwards may work well with a 1½ to 1¾-inch seal; and for those of greater capacity, where a deeper seal is absolutely necessary, I would venture to suggest whether, instead of allowing the back pressure of the apparatus to fall back upon the retorts during a temporary stoppage of the exhauster, it would not be worth while to have a flap-valve on the outlet of the exhauster, and divert the production for the time being into a gas-holder connected to the inlet side of the exhauster, and capable of holding, say, a quarter or half an hour's maximum make of gas, the pressure of which would be comparatively small, and would relieve the retorts. On re-starting the engine, the contents of this holder would be gradually exhausted from it, and carried forward with the make for purifying, &c. I am not sure whether such an arrangement might not be adopted at works of medium size. In some works there may possibly be a discarded holder with which the experiment could be tried without much expense. This, however, must be left to those who may think the suggestion worth a trial.

In conclusion, I may state that at Leamington for the past five years we have been working the hydraulic dip with a ¾-inch seal. The lengths of the hydraulic vary from a three-setting length to a single-setting length. The maximum pressure of our apparatus equals 15 inches. The interior dimensions of the hydraulic are 8 ft. 4 in. by 18 in., and the dip-pipe is 4 inches in diameter. The carbonizing results have been good throughout. I should, however, like to know whether the quantity of carbon I have mentioned would be considered excessive. I may state that two new beds of through retorts, which have now been at work for upwards of three months, show no signs of carbon deposit up to the present.

Discussion.

The PRESIDENT, in inviting a discussion of the paper, expressed his regret that Mr. G. E. Stevenson, of Peterborough, was not present to take part in the proceedings of the meeting. He would, however, ask the Secretary to read a letter which had been received from Mr. Stevenson.

Mr. NORTH then read a letter, dated Feb. 1, in which Mr. Stevenson, after stating that he would be unable to attend in consequence of a meeting of his Board, which had been adjourned to that day, said: "I particularly desired to be present at the discussion on the dip-pipe question. I am of opinion the dip-pipe should be abolished, not on account of the pressure, but to obviate the contact of the gas with the thick tar. The pressure can always be reduced to 5-10ths by drawing a vacuum with the exhauster; and I do not think that 5-10ths on the retorts makes any appreciable difference in the make of gas or the deposit of carbon. Not only the dip-pipe but the hydraulic should be done away with. Since this has been done at Maidstone, 11,000 feet of gas per ton of coal can be made, of better illuminating power than previously, when the make was only 9700 feet per ton, and at the South Metropolitan Gas-Works Mr. Livesey can, in his new retort-house, with his arrangement for separating the tar, get 16-candle gas without the use of cannel. These facts are conclusive evidence that the contact between the gas and the tar in the hydraulic main is injurious, and no anti-dip arrangement which does not provide for doing away with the hydraulic main is complete."

Mr. HUNT said that he sympathized somewhat with Mr. Cross in the opinion he expressed—that it was possible with the hydraulic main and dip-pipe so to reduce pressure within the retorts as to give as nearly as possible the best results. As the members were aware, he (Mr. Hunt) had some time ago expressed himself in favour of abolishing the dip-pipe as a means of reducing pressure. He had, however, arrived at the conclusion that a certain amount of pressure was necessary, and the question in his mind now was, whether the minimum could not be reached with the hydraulic main. At the same time he was aware how difficult it was to keep this properly adjusted. With regard to the prejudicial effect of the contact of gas with the heavy tar, raised by Mr. Stevenson in his letter, there was no doubt of it at low temperatures; but he questioned very much if it had been proved to be hurtful to the illuminating power of the gas at the ordinary temperature of the hydraulic main. At all events, he was not prepared to accept the experience at the Maidstone and South Metropolitan works as conclusive on this point. It might be said that he was arguing rather in favour of the retention of the dip; but this was not so. He had been for the last two or three years endeavouring to arrive at a definite conclusion on the matter, but up to the present time had made very little progress. He should be glad to hear the experience of gentlemen present.

Mr. R. MORLAND (Gloucester) said he had not had any experience with the anti-dip; but he understood that the chief advantages claimed for such an arrangement were reduced back pressure, and absence of direct contact between the gas and the thick tar. In the erection of new works for his Company, in order to attain these desirable ends, he had adopted a system of a separate hydraulic main to each setting; putting a bridge-valve to each main, and taking the gas away by a duplicate or foul main.

In accordance with the new ideas on the subject, he drew off the tar at the end of the bench; but discovered, by experience, that this method was not convenient, owing to the large quantity of naphthaline which was deposited in the mains. He then made an alteration, carrying the tar some distance along the foul main, and drawing it off at a temperature of about 90° Fahr., which he found very much diminished the deposits of naphthaline. With regard to the first advantage—the reduction of back pressure on the retort—by means of these bridge-valves of which he had just spoken, he could regulate the seal so equally on each bed that he had no difficulty in almost entirely removing the whole of the back pressure on the retort. To prevent the gas coming into direct contact with the tar, he had introduced in his hydraulic main an arrangement which he might say very much, if not entirely, removed the evil effects produced by such contact. Inside the main, and opposite the outlet, he fixed an apron, under which the tar must first pass, leaving always a certain amount of liquor in the main on the top of the tar; and this method succeeded admirably. As he before stated, he could regulate the exhausting so beautifully that he found with ordinary clay retorts it was not the presence but the absence of carbon deposit that was objectionable. A clay retort when heated to a very high temperature shrank considerably, especially if not thoroughly burned. This was, of course, equally the case with a brick retort; but there was this difference in the manner of shrinking. Clay retorts contracted, leaving one or two fissures of perhaps $\frac{1}{2}$ -inch each all round, and which were continually showing themselves when the exhausting was very fine. Brick retorts, on the contrary, shrank a little at each joint; but the rent produced was so small as to be practically of no consequence. For these reasons he had adopted brick retorts, and now with him a crack in a working retort was a very rare occurrence. He did not see that any very great advantage could be gained by adopting the anti-dip. He considered the old method with the hydraulic main was a better and more comfortable way of working.

Mr. J. S. CRANMER (Stratford-on-Avon) said, with reference to deposits of carbon, it was very seldom—not above once in twelve months—he had to lay a retort by to remove the carbon. He had never gone so closely as Mr. Cross into taking note of the quantity of carbon removed from each retort, per ton of coal carbonized; but perhaps it would be very useful to do so. He had had serious thoughts of making trial of one of the many anti-dip valves, and had been in communication with the makers of White's anti-dip valves, with reference to them. In the autumn of last year he went to Maidstone to see the working of these valves, and their action gave him much satisfaction. He found that no gas came back during the time the retorts were being re-charged; and he was told they were getting over 11,000 feet of gas per ton of coal carbonized. He considered that if it was possible to obtain an increased yield of gas, per ton of coal carbonized, of from 200 to 500 cubic feet, it would be a great advantage. He also thought it would be well to know if it was desirable or not to retain the hydraulic main.

Mr. W. R. COOPER (Banbury) said last autumn he had the pleasure of visiting the gas-works at Portsmouth, and there saw a hydraulic main some 8 feet wide with an apron fitted in, and a constant flow of ammoniacal liquor was passed through the main, and by this means they carried off the whole of the thick tar. Their yield of gas was very good. He (Mr. Cooper) came to the meeting thinking the anti-dip would be the great feature, but was glad to find that some friends were able to work satisfactorily with the dip. If the statement published in regard to Mr. White's apparatus was borne out by experience, the cost of the new mode of working would soon be recouped, and any ordinary retort would pay for the extra outlay, but he was in doubt whether the anti-dip was the correct plan to adopt; a slight pressure on the retort was, he thought, far preferable.

Mr. J. ANNAN (Wolverhampton) said he was very much taken with what Mr. Cross said. He himself had found the hydraulic main to act so well that he should be sorry to do away with it, and put in anti-dips. He did not see the least need for them, although he had tried them. A hydraulic main, or rather a hydraulic seal, could be so nicely adjusted, and managers could work with so much more perfect safety with it than with any anti-dip he had seen or experimented upon, that he much preferred the hydraulic. As to the heavy tar in the hydraulic main, it was one of the simplest things to take it out. It was about 20 years since that he first knew it to be done, and he believed it was still carried out by the same gentleman—Mr. Whimster, of Perth, who had a scheme of his own for doing it, which he (Mr. Annan) did not think had ever been surpassed. He had tried schemes of his own, and never found the least difficulty in taking all the heavy tar off.

Mr. TINDALL said he had not had any experience with anti-dips; and, therefore, his remarks would be merely his own opinion. His first impression of anti-dips was that they would complicate the apparatus, and so increase both capital and labour in the retort-house; and on looking at the other side of the question, to discover advantages arising from the use of them to compensate for the extra labour and capital, he was bound to say that he failed to find them. If proper arrangements were made for exhausting, by having the benches separated, and by exhausting from each bench into an exhaust or relief main at the back, he did not really see what advantage could be gained by having anti-dips. With regard to the point which Mr. Stevenson had raised—that the gas came in contact with thick tar at the bottom of the hydraulic main, and so deteriorated it—he (Mr. Tindall) must say (although this was a side question) that he did not agree with the opinion. The dip-pipe should not go into the hydraulic main more than $1\frac{1}{2}$ inches, and in this case the gas could not get to the bottom, but would simply come in contact with the light oils on the top, which, instead of impoverishing the gas, would, in his opinion, tend to improve it.

Mr. J. S. REEVES (Bilston) wished to add to what had been already said by the other members, as to the advantages in favour of working with hydraulic mains, that in his own particular works he had not any great difficulty in removing the carbon deposits. Working with a seal of about $\frac{3}{4}$ to $\frac{1}{2}$ -inch, he sometimes had to reduce the carbon, but he was not unduly troubled with it. He knew that in one respect there was an advantage in favour of the present mode of bringing the gas in contact with the tar, which was that there was an absence of any deposit of naphthaline. Some years ago he had a great deal of trouble in this way; but latterly had not experienced any at all.

Mr. ANNAN: Just one single remark. Some time ago—twelve months since, I think—there was in the JOURNAL OF GAS LIGHTING a suggestion as to allowing a small jet of steam to pass into the hydraulic main. Did any one try that?

The PRESIDENT said he did not think he could throw any light on the subject, but would state what he felt to be the most extraordinary feature in this discussion. It was that he himself was the only anti-dip man in the meeting. He had no idea, when Mr. Cross's paper was promised, that the opinion of such a large section of the Midland Gas Managers' Association would, on the one hand, have been antagonistic to the anti-dip, and that Mr. Hunt would have been so lukewarm over it. He (the President) thought Mr. Hunt would have given it more hearty support. However, it was not a question of opinion, but of fact. Mr. Hunt had had experience with a particular arrangement, and his experience was not altogether satisfac-

tory, and naturally his experience must control his opinion. To go back to the subject as treated by Mr. Cross in his opening remarks, if any one argued against the dip-pipe on the ground that it was less safe than the hydraulic main, then he (the President) was forced to join issue with him at once; for he admitted no such liability to accidents. He had for the last eleven years been working an establishment where, from the earliest stages of the institution of the works, a hydraulic main had not been known; and he was perfectly sure no one could point to an accident having happened at Cheltenham from the mere fact of there not being a hydraulic main. He thought this was conclusive evidence that for safe working—that was to say, for working in a way that would not tend to the accidental interruption of the works—there was not any reason to suppose that accidents were more likely to happen with the anti-dip than with the hydraulic main. If this was the experience of small works, it might not go for so much; but it was the experience of works making $1\frac{1}{2}$ million cubic feet per day, and treating a large quantity of coal entirely on the principle of the anti-dip arrangement. Having so many years' experience to fall back upon, and not finding a single accident from the anti-dip, he thought the objection urged by Mr. Cross against the anti-dip from this point of view would not carry weight. It might be exceptional experience he (the President) had had; but it was not an experience of yesterday, nor one of slight degree. The question of expediency he would admit might come in. If the hydraulic main were abolished, and the anti-dip arrangement adopted, certain conditions were required, otherwise injury would be sustained by the gas, or there would be a loss instead of a gain arising from it. The conditions necessary to be observed in working without the dip were chiefly, however, controllable. In the first place, the exhausting must be done in a regular and steady manner. This was a question, therefore, of mechanical contrivance. The anti-dip arrangement had not more to do with the regular exhausting than had the working with the hydraulic main. In working without the hydraulic main, and with the anti-dip, managers must have—he put it strongly—brick-built retorts. He would never advise any one to adopt the anti-dip who did not use such retorts, as it was impossible to work the anti-dip effectually without them. Built retorts were considerably condemned on the ground of being more expensive for fuel than moulded retorts, but this he (the President) did not admit at all. There was no positive necessity for the fuel account to be more with built than with moulded retorts, and he did not see that any one should stand in the way of using anti-dips because of the need of having built retorts. With the anti-dip, one could work at a much lower pressure in the retort, but it was not to be supposed that it was necessary to work with an exhaust upon the retort. The pressure might be kept down as low as possible. He (the President) worked at 2-100ths or 3-100ths of an inch, or even less, for when working without the dip the pressure could be reduced to any extent with a proper exhaustor, and the lower the better. The danger of drawing furnace gases into the retorts from the chamber was, he thought, more a "bugbear" than anything else. With a level gauge the tendency was for the gas to pass outward through the pores of the retort into the heating chamber. On the question of the amount of dip, and what amount of pressure might be put on the retort without interfering with the quantity of gas yielded from the coal, he would say that if he were to put on $\frac{1}{2}$ -inch as suggested by Mr. Cross, he should not make two-thirds of the gas from the coal he now did. If managers once adopted the anti-dip arrangement, they must carry it through, and it was a *sine quâ non* that the exhaustor must work regularly, and be maintained at an equal pressure. He (the President) had accomplished this with a steam-jet exhaustor, and he understood that Mr. Livesey was doing it in London with a balanced gasholder. To say that one could get as much gas with $\frac{1}{2}$ -inch pressure as with a level gauge, was, he thought, going a little too far. He believed it was capable of proof that any pressure in the retort was injurious both to the quality and quantity of gas yielded from a given quantity of coal. As an advocate of the anti-dip arrangement, he said managers were not justified in having any pressure on the retort; but he must admit that the anti-dip arrangement required things to be much more carefully looked after, and there was, perhaps, more anxiety attending it; but the results were so immeasurably superior, he thought, that it was worth all the trouble. He asked whether the question did not resolve itself into this—that if one "can make two blades of grass grow where one grew before," it was his duty to do it; and if managers could get 400 or 500 feet more gas than they did before, it was their duty to get it. The question of the heavy tars and light tars he agreed with Mr. Tindall had no business to be associated with the anti-dip arrangement. Advantages might be obtained from the more ready separation of the gas and tar, and the same amount of trouble might not have to be taken to accomplish it as with the hydraulic main; but this was a question which could hardly be said to affect the question of anti-dips. It was a most important question, however, and he (the President) hoped they would have a paper this year upon it; but a quite different line of argument must be followed before much light was thrown upon the question. [The President then showed the members an illustration of the anti-dip arrangement at Cheltenham.]

Mr. HUNT said that as some little misconception might arise from a remark made by the President, perhaps he (Mr. Hunt) would be allowed to explain that he felt perfectly satisfied with the means he adopted to relieve his retorts from pressure, and do away with the dip. He believed them to be very similar to those employed for so many years by the President. With the exception of not having built retorts, every condition insisted upon by the President had been observed, only a uniform pressure of 1-10th being maintained within the retort; the result being, as he had said, that he was still unable to satisfy himself as to the balance of advantages resulting from the system.

Mr. MORLAND: Where is the gain?

The PRESIDENT: The great gain is that you have no pressure inside the retort.

Mr. ANNAN: Mr. Cranmer said at Maidstone they obtained 11,000 feet of gas. Was it the same coal?

Mr. CRANMER: I believe it is North Country coal. The Maidstone works are quite new.

The PRESIDENT: It is not a correct thing to compare the working of one works with the working of another, if you are making a comparison of different systems.

Mr. Cross said this seemed to be still an open question, so he hoped some other member would take it up and help to clear away the difficulties. He then briefly noticed some of the points in the discussion, and thanked the members for the manner in which they had received his paper.

LECTURE ON "COAL GAS" AT BLACKBURN.—On the evening of the 14th ult., Mr. S. R. Ogden, the Manager of the Blackburn Corporation Gas Department, read at the Chapel Street School in that town an interesting paper on the "History and Manufacture of Coal Gas." After tracing the progress of the gas industry up to the present time, and giving a short description of the processes of manufacture and distribution, Mr. Ogden compared the price of gas with that of other illuminants, and concluded with some special references to the price of gas at Blackburn. A vote of thanks was accorded to Mr. Ogden for his paper.

THE MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Eleventh Annual and Forty-fifth Quarterly Meeting of this Institution was held at the Mitre Hotel, Manchester, last Saturday. There was a large attendance of members and visitors. Mr. WILLIAM CARR (the retiring President) occupied the chair. The minutes of the previous meeting were read and confirmed; and Mr. Robert Shadbolt, Manager of the Gas-Works, Fleetwood, and Mr. Robert Smith, Manager of the Gas-works, Heywood, were elected members.

The HONORARY SECRETARY (Mr. R. Hunter) next read the report of the Committee, which was adopted.

Mr. John Chadwick, of Oldham, was then unanimously elected Vice-President for the year, and Mr. Carr vacated the chair in favour of Mr. John Chew, of Blackpool, who was received with applause; after which the election of officers was proceeded with.

Mr. James Paterson, of Warrington, was re-elected Treasurer; Mr. Robert Hunter, of Stalybridge, Honorary Secretary; Mr. Charles Eastwood, of Batley, and Mr. George Smedley, of Buxton, Members of Committee for three years; Mr. Thos. L. Sheppard, of Farnworth, Member of Committee for one year; Mr. John Cockroft, of Littleborough, and Mr. Walter W. Hutchinson, of Barnsley, Auditors.

The President delivered his Inaugural Address; and Mr. T. B. BALL, of New Wortley, Leeds, read a paper entitled, "Is the Elimination of Light Oils from the Tar and their Retention in the Gas desirable?" A full report of the proceedings will appear in our pages in due course.

As the time did not admit of Mr. Smedley's paper on "Six Months' Experience in Working Retorts without the Hydraulic Main" being read, it was, with his permission, deferred until some future meeting.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The office of Manager of the gas-works in Dundee entails onerous duties, and if the rewards are at all sufficient to repay the anxiety and care which must always be exercised by the occupant of the office, he is not likely to forget the circumstance, because by direct statement, as well as by way of innuendo, it is well kept before the public. At the outset of his career in Dundee, Mr. McCrae was found fault with for being too young, and the majority who favoured his appointment were denounced because they gave him too large a salary, and for making him a "gentleman all at once." Now that these directly personal considerations have been laid, some local Fellow of the Chemical Society—troubled either with *cacoethes scribendi* or with a burning desire to impart to the community of Dundee, and to the county of which Dundee is the principal town, or indeed to any county or town in want of information upon the point, his idea of the qualities essentially necessary to secure success in a gas manager—writes to the local paper. Holding, as he presumably does, the diploma of the Chemical Society, he is, of course, eminently fitted to convey such advice, and it really ought to be well received, because it is given gratis, and I might also add gratuitously in one sense of the latter term. This Fellow of the Chemical Society has discovered that as there is now a "stir among gas managers," it is, in his opinion, a fitting opportunity to air his views on the subject of their duties and qualifications. He modestly prefaces his statements by saying that "the qualifications needed to make good and cheap gas are something more than a common practical gas maker possesses." The true secret of producing cheap gas, it seems, lies in obtaining the fullest value for the bye-products, instead of selling them at a low figure. This I should have regarded as a truism, but for the sentence which follows, in which it is maintained that to do this a manager must be a good chemist as well as an engineer. According to this modern instructor, the manager should also be able to test the gas in every stage of its manufacture, both as to its illuminating power and purity, and also test the strength and value of its tar and ammoniacal liquor, and the lime, both raw and spent, oxide of iron, &c. The gas managers of Scotland will recognize that many duties are here enumerated, with respect to which they have hitherto been neglectful; but when their education has been raised to this standard of perfection, they will have the satisfaction of thinking that they ought, according to this writer, to receive a good salary. If salaries were paid according to the fulfilment of these requirements, a pretty general increase would be the immediate result all over Scotland; and it is just as well that the Chemical Fellow should add this bit of information to his already overflowing store. Empirical knowledge of gas making has long since been displaced by the scientific.

Stationed as I am in the very heart of a district famed for the number as well as the quality of the wet meters which it annually produces, I watch with considerable interest anything that may be said in the JOURNAL or elsewhere, affecting either the meters or the trade. I observe that Mr. Urquhart, of Manchester, has been calling attention to the necessity for revising the fees exigible in respect of testings. He says that the present scale is remunerative only as applied to dry meters. Surely it must have escaped Mr. Urquhart's observation that wet meters are made most extensively in Edinburgh; that here there is a surplus of over £6000 which no one can touch under present circumstances; that this capital sum is receiving yearly additions, not only from interest but from the amount of revenue over expenditure; and that this revenue is mainly derived from testing wet meters. Mr. Urquhart also gives an extreme illustration with the view of supporting an argument to increase the fees for testing meters up to 20 lights. He says he has been an hour and three-quarters in testing a 2-light meter with a 10-feet index drum, and for this expenditure of time and talent he had received the handsome remuneration of 6d. He must be aware that since the time of Crosley, meters have been in use, in testing which it is not necessary to wait for the passage of 10 feet to apply the test; that upon the vertical spindle of most meters now made there is a small drum, divided into three sections of one foot each, and that by means of a small pointer the inspector can ascertain in a few minutes how long it takes to pass one or three cubic feet of gas. Speaking for large centres, I think the fees ought to be reduced rather than increased.

There are 88 applicants for the position of Gas Manager and Treasurer of Arbroath, and 135 applications for that of Inspector of Cleansing.

In my "Notes" of last week I made mention of the condition of street lighting in Banff, and stated that the Clerk to the Police Commissioners was instructed to obtain certain information from the Gas Company as to the arrangement between them and the town. This has now been done, and a report was submitted to a meeting of the Commissioners on Monday last. Originally there were 80 lamps, which were to burn 16 nights (in the month, I presume), from sunset till eleven o'clock, and for which the town was to pay £100 a year—the Company finding the lamp-lighters and executing all repairs. In subsequent years more lamps were brought into requisition, until now there are 137 lamps. The cost of fitting up these was £2 5s. per lamp; the annual cost for repairs and breakages amounting to about £10, while each lamp consumes 2000 cubic feet of gas per annum. It was also stated in the report that from May, 1855, to May, 1871, the price of gas was 7s. 11d. per 1000 cubic feet; in 1873 it was reduced to 7s. 6d. per 1000 feet; but in the succeeding year it

was increased to 9s. 7d. per 1000 feet. In the years following the price was—1875, 8s. 9d.; 1876, 8s. 4d.; 1877, 7s. 6d.; 1879, 7s. 1d.; and 1881, 6s. 8d. The price of the best coal placed in the Company's stores at Banff is 26s. per ton. In the course of the discussion which took place, it was pointed out that the lamps were not kept lighted according to this arrangement, and the result is that the police are to have the additional burden placed on their shoulders of seeing that the arrangement is properly carried out.

The Shareholders of the Elgin Gaslight Company met on Saturday last in order to wind up their affairs as a Company, the town having recently acquired the gas-works. Amongst other business transacted was the declaration of a further dividend of £3 5s. on each of the 621 shares of the Company, which makes the total sum received for each share £23 5s., since the commencement of the proceedings for the transfer. With their expiring breath the Shareholders have done a handsome thing, by resolving to give to the men at the works a gratuity for their long service. The thanks of the Shareholders were then tendered to the Chairman, Mr. A. Cameron, and to the Secretary and Treasurer, Mr. D. Forsyth, who had held office for 27 years, and the active history of the Gas Company of Elgin came to an end.

Operations are being actively prosecuted to bring in a proper supply of water for North Berwick. Excavations are being made for a reservoir to contain 141,414 gallons of water. This is in addition to the present storage. It is also proposed by the Water Company to sink a large well 50 feet deep, which will be capable of giving a supply equal to 18,000 gallons a day.

The fortnightly return of the Edinburgh and District Water Trust shows that the total quantity of water in store is 2,218,006,000 gallons, as compared with 2,111,597,000 gallons at the same date last year. The supply has been 41.18 gallons per head per day for a population of 304,300.

A case came up before Lords Curriehill and Lee on Thursday last as to whether the Castle Douglas Water-Works should be put on the valuation roll. The works had been put on the roll at the annual value of £200; but it was contended that, as they could not be let, they were not assessable. The Court, however, held that the question seemed rather to be, not whether the works were assessable, but whether they were lands and heritages within the meaning of the Act. Holding that the works could be let, their lordships thought the valuation reasonable.

A question of considerable importance has been raised in the Court of Session as to the pollution of the atmosphere by sulphurous and sulphuric acid, and the consequent destruction of vegetable life in the district where sulphur fumes are liberated. The Right Honourable John Inglis, Lord President of the Court of Session, is proprietor of the estate of Glencorse, in the neighbourhood of Penicuik, and not far from the Pentland range of hills. When he purchased the estate he planted it with trees, some of the more common, and some of rarer descriptions. By-and-by his lordship began to see his trees and plants flourishing, and indeed so tastefully had the grounds been laid out, and so luxuriant was the foliage, that he had been frequently complimented thereon by visitors. But a visitor came one day whose operations, according to his lordship's statements, have ruthlessly destroyed the beauty of the scenery. The Shotts Iron Company acquired the minerals under several of the estates adjoining that of the Lord President, and in the course of time they brought to the surface quantities of iron ore which they calcined in bings before removing it to the furnace. It is in conducting these operations that the Lord President says he has been the sufferer. He asserts that the sulphurous fumes arising from this calcining process, especially on moist days, are converted into sulphuric acid, which, carried to the earth by the prevailing moisture, is deposited on trees and plants, the vitality of which is thereby destroyed. In support of this contention his lordship brought forward this week Professor Dittmar; Professor Dewar, of Cambridge; Dr. Angus Smith; and Professor McNab, of Dublin. The evidence of Professors Dewar and Dittmar was especially interesting. They placed bottles at various parts of the estate, and collected rain water as it fell, and this water was afterwards subjected to analysis, and the percentage of sulphuric acid which it contained was then determined. The analyses proved, according to Professor Dewar, that there had been very great aerial contamination, and the rain falling under such conditions, it was maintained, must prove very deleterious to plant life. He was perfectly certain that the presence of the sulphurous fumes was injurious to the amenity of the estate. Professor Dittmar arrived at pretty nearly the same result upon the question of the pollution of the atmosphere. The case is expected to last for some days yet.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

I am glad to be able to say that the negotiations between the Glasgow Corporation Gas Committee and Dr. C. W. Siemens for the application of his regenerative gas system to the firing of gas-retorts have been attended with a practical result. The system is to be adopted at the Dalmarnock Gas-Works, the application of this system of heating being limited in the first instance to two ovens, each containing seven retorts; but should it prove successful, it may confidently be expected that it will be extended over a larger portion of the works. I understand that the gas producer which is to be laid down at Dalmarnock is the new form which was described by Dr. Siemens himself in his recent lecture delivered under the Glasgow Science Lectures Association, and so graphically characterized on the occasion by the Hon. President of the Association, Sir William Thomson. Besides being the first adoption of the new gas producer, this will likewise, I believe, be the first application of the Siemens heat regenerative system in the manufacture of gas in this country. I had almost omitted to mention that the gaseous fuel—carbonic oxide, hydrogen, &c.—is to be obtained from the coke which is drawn from the retorts. The work of laying down the new plant required, and the modification of the retort-ovens so as to suit the new condition of things, will be commenced very shortly, under the immediate superintendence of Mr. Foulis, the necessary plans being furnished by Dr. Siemens.

It is specially worthy of note that the central offices connected with the Glasgow Corporation gas supply undertaking in Virginia Street and the three gas manufacturing stations—Dawsholm, Dalmarnock, and Tradeston—are about to be, if indeed they have not already been put into communication by telephone.

The Watching and Lighting Committee of the Glasgow Police Board, at a meeting which they held yesterday, had again under consideration the proposal to employ the electric light in George Square. Being unsuccessful with their first offer to put up four electric lights in the square for the sum of £560 per annum, Messrs. R. E. Crompton sent in an amended offer of £240 per annum for two electric lights; and as this did not produce the desired result, they have now volunteered to give two lights gratuitously for a week, as an experiment. As the Committee could scarcely with good grace do otherwise, they have accepted Messrs. Crompton and Co.'s offer.

A disposition to complain of the quality of the gas supplied in Saltcoats, since Mr. Wilson transferred his managerial abilities from that town to Coatbridge, has found a medium for its ventilation in the editorial columns

of one of the local papers, in the current issue of which there are the following remarks:—"We do not know what illuminating power the Manager of the Saltcoats Gas Company registers at the works, but this we do know, that the illuminating power as visible at the west end of Saltcoats is extremely feeble. Consumers do not grudge the gas item in their household expenditure; but in that, as in everything else, they wish value for their money, and that they are not getting at the present time." The same journal gives prominence to a letter from a Shareholder in the Dalry Gas Company, in reference to what he regards as the tyrannical and despot conduct of the Directors, who, it seems, have given summary notice of dismissal to Mr. Alexander Brown, the Manager of the gas-works, apparently without assigning a single reason for doing so. He says the inhabitants of the town were rather startled last week at learning of such conduct, Mr. Brown having been Manager for the last 16 years, a man of unblemished character, sober, intelligent, and obliging to all, and under whose management the works have been an uninterrupted success. He speaks of the gas supply undertaking of Dalry as being, perhaps, the only one in Ayrshire of which the original shares command such a high premium, and the yearly dividend on the original shares of which has averaged 15 per cent. for a long series of years. There may be some good reason for the correspondent speaking strongly of the doings of the Directors, and, therefore, it is proper that they should give some explanation.

Following up the lecture by Mr. James M'Gilchrist, briefly noticed in last week's issue of the JOURNAL, there was an exhibition of the apparatus used by him in the illustration of the lecture. It extended over two days, and was a very great success. Some cooking-stoves which stood high in the report of the jurors at the recent exhibition of gas apparatus, &c., in Glasgow, were shown in operation by a practical cook, and the economical way in which they turned out roast beef, tarts, pastries, loaf bread, &c., gave the utmost satisfaction. The business which continues to be done in Dumbarton in the use of gas cooking-stoves, &c., is something extraordinary, and is even greatly on the increase. Of course, much of the credit is due to Mr. M'Gilchrist, who is never half-hearted in anything he takes in hand; indeed, his energy and enthusiasm are almost proverbial.

The Lanark Local Authority have finally completed their arrangements with the Public Works Loan Commissioners for the loan of £10,000 for 30 years, to pay the cost of the works connected with the Lochlyoch water scheme.

At a meeting of the Kilbirnie Local Authority held on Thursday, at which the water question was considered, an amendment was adopted to the effect that no extra water was required, there being a plentiful supply from present sources. This decision was obtained by 10 votes against 7; but it can scarcely be expected to be a final one, as there is a strong feeling amongst many of the ratepayers that there is not a sufficiently good water supply for the parish.

Little or no change has shown itself this week in the Glasgow pig iron warrant market, but the general tendency is towards easier prices. An enormous amount of business has been done daily. Business was done yesterday at noon at 50s. 1d. to 50s. cash, and at 50s. 2½d. down to 50s. 1½d. one month.

A slack demand in the house coal business is the chief feature of the Glasgow coal trade at the present time.

ON THE PREVENTION OF WASTE OF WATER:

WITH SPECIAL REFERENCE TO METHODS EMPLOYED IN GLASGOW.

The following is an abstract of a paper recently read before the Graduates' Section of the Institution of Engineers in Scotland, by Mr. THOMAS STEWART, Assoc. Inst. C.E.

On the introduction of a plentiful supply of water to towns there has followed a much higher consumption than the conditions warrant. The consequences have been that many towns which had been provided with supplies considered sufficient to serve them for some time to come have had either to increase their supplies or adopt measures for the prevention of waste.

The investigations which have taken place in connection with the prevention of waste, have shown that in many cases more than one-half of the total consumption has been wasted, the terms "waste" being here applied to the water which escapes by defects in the house fittings or service-pipes, and does not include that due to extravagance in its application to domestic purposes. The greater part of waste is due to service-pipes too light to stand the pressure, and flimsy water-fittings. Water companies, and corporations in charge of water supplies, have been obliged to procure special Acts of Parliament to enable them to cope with the evil, and working under these Acts they have succeeded (in Norwich and Manchester especially) in reducing the consumption below one-half; or, in figures, the consumption in Norwich was reduced from 40 gallons to about 15 gallons per head per day; and in Manchester from 35 to 14 gallons. These results have been obtained by prescribing certain classes of water-fittings, testing and stamping approved apparatus, and making stringent house-to-house inspections. In 1873 the Corporation of Liverpool tried to get an Act similar to those of Norwich and Manchester, but, having failed, went in for a special method of checking waste. For carrying out this method, their Engineer, Mr. G. F. Deacon, M. Inst. C.E., invented a meter which, by means of a diagram, records the time and rate of flow of water through the main. The first apparatus was placed in 1873, and the whole area of supply has since been placed under the control of 205 meters, the result being that Liverpool has been enabled to have a constant and abundant supply, instead of, as in 1872 and several years before, an intermittent and deficient supply.

When the Loch Katrine water was introduced into Glasgow in 1860, the consumption increased so rapidly that a system of special house-to-house inspection was begun, and the result was to reduce the rate of consumption by 20 gallons per head per day. On account of some complaints being made to the Water Commissioners, the most stringent regulations were relaxed, and the old state of things soon came about again. House-to-house inspection was still carried on, however, and in 1872 more attention was given to the water-fittings by an increase being made in the staff of inspectors. Since then various classes of fittings have been prescribed, and a system of testing and stamping introduced, which bids fair to put an end to much of the waste. A system of district meters has also been introduced, and is in operation in various parts of the city. It is similar to that in Liverpool, and the same class of meter is employed. Before the system was introduced a few experiments were tried with three Siemens meters, and afterwards one of Deacon's waste-water meters was put on a fourth district. The method was to sound the stopcocks at night, and visit those premises only where water was found passing. The meters showed the effect of the inspection and the results which followed the repairing of defective fittings, &c. The average results over the four districts were as follows:—The total consumption per 24 hours was reduced from 58·7 to 33·5 gallons per head, and the night rate—from 1 to 5 a.m.—was reduced from 33·5 to 9·7 gallons. These quantities include about 3 gallons per head for trade purposes. These results were considered so satisfactory that Mr. James M. Gale, M. Inst. C.E., Engineer to

the Glasgow Water Commissioners, recommended a large experimental district to be proceeded with. This was done, and the results led to a further extension of the system over an area which at present contains 81,337 persons. There are ten districts, spread over the city so as to embrace as many varieties of house property as possible. They are divided into 50 sub-districts, each commanded by a meter, which, except in one instance, is a waste-water meter. The meter which forms the exception is one of Kennedy's piston meters, provided with an automatic registering apparatus. The largest district contains 3310 persons, the smallest 642, and the average number of persons to one meter is 1627.

The rise of a district was dependent on the facility with which the piping could be so arranged as to isolate it, and at the same time secure the efficiency of the fire-plugs, without going to much expense in laying extra piping. While the meter was being fixed, and alterations in the piping being made, day inspectors took the census of the district, and ascertained the premises supplied by each stopcock. The cases and boxes on the stopcocks were repaired, or rebuilt, to facilitate the night inspection. When a few diagrams had been taken to show the initial consumption in the district, a night inspection was made. This, at present, consists in two inspectors sounding the stopcocks; those found passing water being noted in their books, and the premises supplied through them are visited by the day inspectors during the following day. When all the stopcocks in the district have been shut, an interval of half an hour is allowed to elapse before opening. The diagram shows the effect of the night inspection. When the districts were started, the night inspections took place at intervals of three weeks, and the districts were visited in rotation. This was for the purpose of getting them into order. At present the worst districts receive the most attention. The sources of waste were numerous, and in many cases obscure; the latter consisting chiefly of lead pipes burst underground, and the water not rising to the surface, and of a certain class of fittings which wasted water at night only. In the large experimental district 69 lead pipes were found burst underground, and the water not rising to the surface.

The three first inspections were the most effective. Over the whole population the average consumption per head per day at starting the mains was 49·0 gallons, and the night rate per 24 hours, 37·7 gallons. By the three first inspections these rates were reduced to 32·0 and 17·5 gallons, respectively. When a district was left without night inspection the consumption invariably showed an increase in about nine weeks. The most reliable observations gave an increase of 3·4 gallons per head on an average, so that if this continued for ten months the consumption would be as bad as at the beginning. At present three diagrams are taken off each meter on three consecutive days in one month, in order to show the rate of consumption in the district; and in addition 24 diagrams, to show the effect of as many night inspections, are taken from among the 50 sub-districts. These are sufficient to show the state of the districts and to keep them in order. The saving at Jan. 6, 1881, which, however, is a little less on account of frost, was 13·7 gallons per head per day. The total saving over the whole population under control, 81,337 persons, is therefore 1,114,317 gallons per day.

As the rate of waste at night is much higher than during the day, on account of the increased pressure, various methods have been devised for reducing this on the service mains, and thereby on the fittings. One of Foulis's patent pressure-reducing valves has been in operation on one of the sub-districts commanded by a waste-water meter, and it has effected a very considerable saving. The valve was, at first, placed on a sub-district containing 2971 persons. The pressure in this district varies from 40 lbs. during the day, to 85 lbs. per square inch during the night. The valve was adjusted so that the pressure on the outlet should not at any time exceed 45 lbs. per square inch. During one experiment the saving from 4 p.m. to 8 a.m. on the following day was 12,600 gallons. The night rate per head per 24 hours was reduced from 24·7 to 15·0 gallons, or a saving of 9·7 gallons. The saving appeared to begin at 4 p.m.; to go on increasing to 12, midnight; remaining stationary till about 5 a.m., and terminating at about 8 a.m.

The conclusions are—(1.) House-to-house inspection is not the most effective method for preventing waste, but for all places where there is an abundant supply, it is quite sufficient to prevent extensive waste. It can be made effective enough when stringently carried out; but to do so requires a deal of energy which might be saved if the most wasteful localities were known. (2.) District meters, by showing what districts require most attention, enable the energies of the inspectors to be applied to better purpose; but of themselves they are powerless to prevent waste, although they detect it. (3.) Pressure-reducing valves directly prevent waste, but they do not show where it exists; however, they require no attendance when once in order. (4.) Testing and stamping constitute a most effective method for securing good fittings, and, when combined with moderately cheap house-to-house inspection, cannot fail to produce good results.

The discussion on the paper was postponed.

SOME NOTES FROM AMERICA. (FROM OUR OWN CORRESPONDENT.)

Feb. 9, 1881.

The year of 1880 has been an epoch of note in the history of the gas industry in this country. It has been a year of considerable anxiety to the officers of gas companies, and doubtless more so to the holders of gas stock. Moreover, if the lessons which the past year suggests are duly considered and rightly followed, much good must result therefrom to the cheapening of the cost of gas making, and the extension of its use. I would therefore ask the patience of your readers while I take a slight retrospective glance over the year 1880.

At the commencement of the period to which I refer, that return of general prosperity, which has since assumed a permanent footing over well-nigh the whole country, was just becoming apparent, and the gas companies who had struggled, more than lived, through the preceding year, saw the possibility of an early return to their former "send out." Yet it was a time of considerable anxiety, for the advocates of the several systems of electric lighting had been so persistent in claiming for it the future illumination of the world, that while few practical managers had any real fears as to the permanency of their vocation, while few engineers thought that gas was to be superseded, in the immediate future, by electricity, yet science had made such great strides in so many different directions, that all could not prevent a certain indescribable uneasiness as to what the year 1880 might produce towards the perfection of electric lighting. But electricity and its possible future was not the only thorn that gave gas managers uneasiness; for during the general depression through which the country had been passing, a majority of the companies had reduced the price of their commodity, and at the beginning of the year it was apparent that the items that go to make up the cost of 1000 feet of gas delivered at the consumer's meter, would, on the return of the general prosperity which was then dawning, be considerably advanced. Then the question arose, how would consumers take it if the price of gas were raised in like proportion? The electric light had been enough of a scare to cause the companies to rank the opinion of their customers as an important

factor in their calculations. The "boom" in the iron trade had assumed such huge proportions, that its image was reflected in nearly all its cognate industries; the advance in the price of coal and labour followed in natural sequence. So, as the year advanced, and the cost of the raw material used in the manufacture of gas advanced fully 25 per cent., and the men employed in the works were asking for higher wages, gas companies saw that it would be a difficult matter to keep down the price of their commodity without affecting their earnings. In a few cases the charge was raised to correspond with the increase in the cost of manufacture. These cases, however, were the exceptions, not the rule; for the more astute of the gas managers saw that the way out of the trouble was not to raise the price of the article they supplied, and which had come to be regarded as one of the necessities of life, but to increase their sales by bringing back old customers, and gaining new ones, as well as by extending the use of gas for other than illuminating purposes. Further, it was plain that, if from a given quantity of coal more gas could be obtained than had been in the past, the increase in the cost of coal and the rise in the rate of wages would be in part counterbalanced. Nor did it need a more extended line of argument to show that if, by a more intelligent mode of condensation, the candle power of the gas could be maintained with less candle, and without diminishing the yield per ton, there was in this respect another saving to be effected. In other words, the difficulty was to be met by increasing the consumption of gas, and by the exercise of greater care in working, and the use of improved machinery, keeping down the cost of gas making, notwithstanding the enhanced value of many of the important factors which together make up the price of the production of 1000 cubic feet of gas.

The times were favourable to the carrying out of this plan in its entirety; for as spring gave way to summer, a feeling of confidence throughout business circles was restored. Iron, which had risen from the lowest price to a fabulous figure, had now settled down to a reasonable quotation, so that parties who purposed building factories or railroads, and had been holding back on account of the unsettled state of business or the high price of iron, now pushed ahead with their ventures; and the gas industry soon felt the effects of this prosperity, which was sweeping slowly but surely over the country. Men had more money to spend, and were willing to part with it. This made itself apparent by the addition of new names, and the replacing of old ones, on the gas companies' books. Again, our gas-stove manufacturers had not been idle. On the contrary, they had so improved the construction of their goods that gas companies were in a position to offer for sale gas-stoves that they were not afraid to recommend. In the western part of the country—why the same cannot be said of the eastern section is not plain—the introduction of gas-engines was pushed with vigour, still further increasing the daily out-spend. The means for keeping down the cost of gas making were also at hand.

To enumerate all the appliances which were waiting for a trial would be a superfluous task. In the larger works, machine stoking received an impetus by the introduction of the Ross machine—an apparatus which, it is claimed by those competent to judge, has in store a brilliant future. All gas managers, whether they controlled large or small works, could not put off the consideration of the question of improved furnaces; many different forms had been tried, and their success was only a difference in degree. All produced results so far ahead of the common furnace, that it was simply a question of which was best suited to the special wants of each individual manager. The introduction of those minor yet important appliances, such as self-sealing lids, bye-passes, dip-pipes, &c., was also destined to make steady progress during the year. In regard to the process of condensation, some improvement has been effected. In a few cases Farmer's scrubber or some similar apparatus has been adopted, with the object of retaining more of the hydrocarbon vapours in the gas. Others, again, who were unwilling to go to this expense, so modified their existing appliances as to gain in some degree the same object.

Outdoor superintendents will long remember the winter of 1880-1, for it has been a season of unusual severity in this country. The latter part of 1880 was excessively cold, and gas managers were put to a great deal of trouble. The freezing of the public lamps causes very much annoyance every winter in this country, excepting in the southern cities. The present winter has been almost without a parallel in this respect. The intense frosts have occasioned many serious breaks in the mains. Gas companies are supposed to lay their pipes below the level of the ground usually affected by frost, but this year the frost has in some cases to my knowledge reached to a depth of 3 feet. It needs no remarks from me to show how much annoyance this occasions.

Looking back on the past year, managers have cause for congratulation on the result of their twelvemonth's work, and on the present bright outlook. Electricity made little progress during the year. In New York, as I noted in a previous letter, the new style of lighting has been applied for the purpose of illuminating a few blocks of buildings in the Broadway. This is, however, only an experiment, so far; while down town in the same city the Maxim light is used—or rather is on exhibition—at the Safe Deposit Company's office.

Many examples of the danger caused by frost reaching gas-mains have recently occurred. The scene of one of the accidents was Eighty-first Street, New York City. Here the main broke, and as the ground was heavily frozen, the gas, instead of escaping at the surface of the road, found its way into the neighbouring houses, including St. Joseph's Industrial Home. Both the Harlem and the Knickerbocker Companies have mains laid in this street, and both were notified of the leakage, but each insisted that the break was on its rival's line of pipe, so the search for it was not pushed very energetically. It was fortunate there was not more damage done, as sufficient gas escaped into the houses along the street to make many of the inmates sick. At St. Joseph's Home the gas collected under the main steps, and igniting by some unknown means, exploded with great force, hurling the guard rails into the air, and breaking the stone steps, besides throwing the massive stone pillars out of plumb. The total damage caused will be covered by 800 dols. When at last the workmen were able to get through the frost and reach the pipes, it was ascertained that the source of the trouble was a break in the Knickerbocker Company's main.

Another explosion, also happily unattended with loss of life, occurred in Seventy-first Street in the same city, caused by a break in the Metropolitan Company's main. The street is lined here by a row of fine brown stone dwelling-houses. The fracture occurred during the night of Feb. 3, opposite the house No. 457. The occupants of the house No. 459 were roused early in the morning by a feeling of suffocation, and they were greatly alarmed when they discovered that the house was full of gas. Fortunately the inmates took proper precautions against an explosion. Though the night was intensely cold, all the windows were opened, and the lights put out. Thus the house was soon ventilated, and by leaving the cellar windows open further danger was averted. The occupants of the adjoining house, No. 457, were not so fortunate. They likewise ventilated their house by opening the windows; but the gas coming in contact with the fire in the heater situated in the cellar, a serious explosion occurred. The members of the family were at the time at breakfast in the room directly over the place where the explosion occurred. The floor

of this apartment was torn up, the breakfast-table upset, and the persons sitting thereat were thrown to the floor. The furniture in the lower portion of the house was badly damaged, and all the windows throughout the building were broken. The exploding gas set fire to the woodwork, but the flames were extinguished before serious damage was done. Fortunately the occupants of the house were not seriously hurt, though all were badly frightened. The total loss was about 1200 dols. The explosion in this dwelling was communicated to No. 455, where a slight explosion followed. The gentleman of the house was in the cellar at the time, and lost his beard, eyebrows, and a portion of his hair by the explosion. When the workmen arrived from the Metropolitan Gas-Works, considerable difficulty was experienced in getting to the main, on account of the frozen state of the ground. When, however, the pipe was laid bare, it was clear that the fracture had been caused by the sewer ditch not being properly rammed; thus the earth settled, carrying the pipe with it. On the same day that this accident happened, another, of a curious nature, occurred in the upper part of the same city. This section of the city was formerly the villages of Tremont, West Farms, and Fortham. The Northern Gas Company supply this district from their works at West Farms. During the night in question the gas would not light in any part of the district, nor could the officers of the Company explain the cause of the trouble. Thus darkness reigned throughout the night, and not till the next day was the reason discovered. The leading main is laid over a road crossing the Bronx River Swamp. At this point the heavy frost caused a fracture of the pipe, and instead of gas leaking out, water rushed in, flooding the main and shutting off the gas. The damage was quickly repaired, so that the residents were without gas for the one night only.

There is really little new to report in regard to electric lighting. The Maxim lights on exhibition at the Safe Deposit Company's office are all very well in their way, but it would certainly take two such lights to equal a good gas-burner. In the reading-room, an apartment 15 feet square, 12 Maxim lights are used, arranged as follows:—A centre chandelier with five lights, three wall brackets with two lights each, and one portable. The appointments of the room are of the very best, no heavy dark colours are used; on the contrary, the surroundings are such as to absorb the minimum of the light generated. The lights are made to imitate gas-jets as far as possible. Some of them are enclosed in etched globes; in other instances shades are used as screens for the lamps, which are fitted on to the regular fixtures in place of the gas-burners. No progress has apparently been made by the Edison Company since my last letter. Their plans never seem perfected; they are always going to do something, but never accomplish it. An important case has recently been decided against Mr. Edison in the Patent Office. When he patented his "perfect" lamp, including the thermostatic regulator, Mr. Maxim claimed the prior invention of the regulator, and filed an application which was put into interference with Mr. Edison's patent. The arguments in the case were submitted last December. The Examiner of Interferences recently reported that Mr. Edison was not the first inventor of the apparatus in dispute, and that the patent must thus be issued to Mr. Maxim. There are no particulars to note in regard to the Brush lamps in use on the Broadway. The flood of light that was anticipated is certainly conspicuous by its absence. When the Company supplying the lights make a proposal for the permanent adoption of the lamps, I may be able to go into the question of the relative cost of the electric lights as compared with gas; but at present it is impossible to get any figures.

Great trouble is still being experienced owing to the lack of water. The drought is the most severely felt through the middle section of the States. At Newburgh (N.Y.) the water supply has been short for a long time, and the result is that a large number of the factories are forced into idleness. The ground is covered with snow, but the weather is too cold to allow it to thaw; the consequence is that wells and cisterns throughout the country are dry, and in many cases farmers have to melt the snow to get water for their cattle. The Commissioner of Public Works of New York City has just issued another card to the citizens, calling upon them to exercise the utmost care in the use of water.

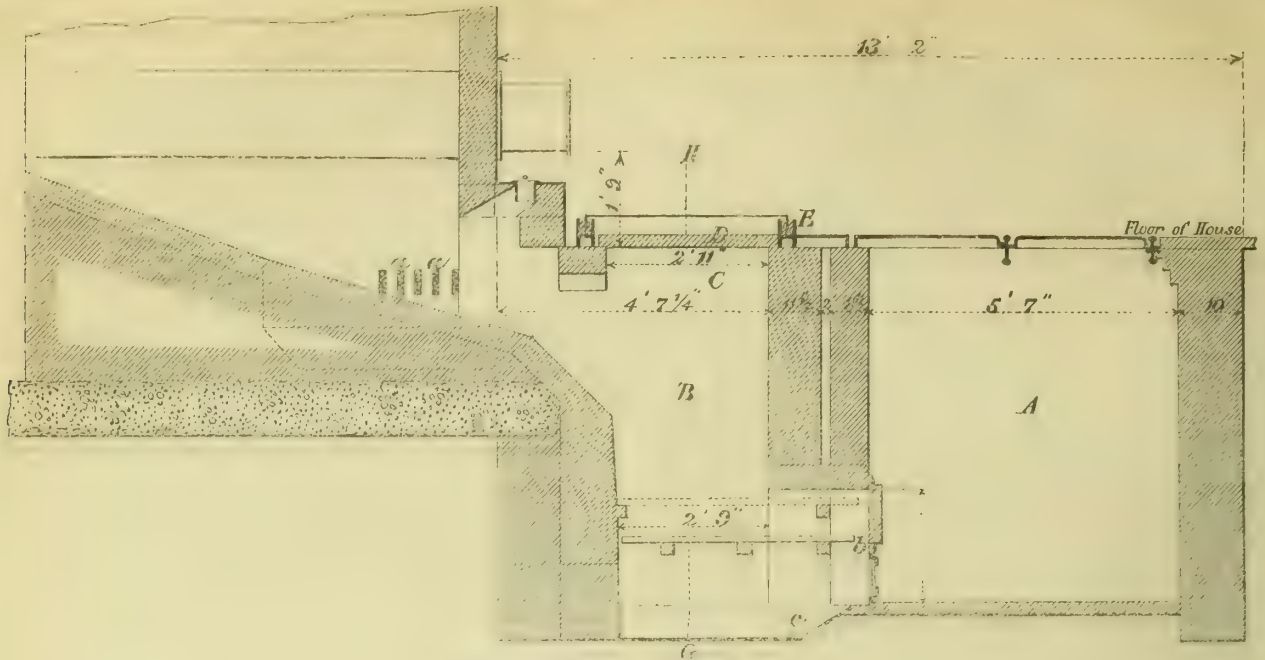
In Paterson (N.J.) a Committee of the Board of Trade, in a recent report, stated that the daily consumption of water in that city was 5,500,000 gallons, that the pumping basin would hold only 3,800,000 gallons, and that the storage reservoirs held only 18,160,000 gallons. They recommended that the Water Company should increase the capacity of their pumping basin to 10,000,000 gallons, their pumping power to 18,160,000 gallons per day, and their storage capacity to 40,000,000 gallons. The Committee claim that the source of supply—the surplus water of the Passaic—will be ample for some time to come if their recommendations are adopted. The large consumption of water in Paterson—110 gallons per head per day—is in great part due to the extensive silk-dyeing establishments situated there.

P.S.—Since closing my report, news has reached me of a serious explosion at the works of the Westchester Gas Company, of Yonkers (N.Y.). One of the drip-cocks under the centre seal was accidentally left open, allowing the gas to escape into the purifying-house; and adjoining this room was the workmen's washing-room. It seems there were several holes in the partition dividing these two rooms, so that the gas easily found its way into the workmen's apartment; consequently, when one of the workmen entered with a light, a terrible explosion occurred. The purifying-house and adjoining rooms were completely demolished. The fire department was promptly on the ground; but things had been so thoroughly blown up that there was nothing left to burn. Strange to say, the workman who held the light that caused the damage was not seriously hurt. He only complained the next day of being a little sore.

THE DIETERICH FURNACE. (FROM OUR AMERICAN CORRESPONDENT.)

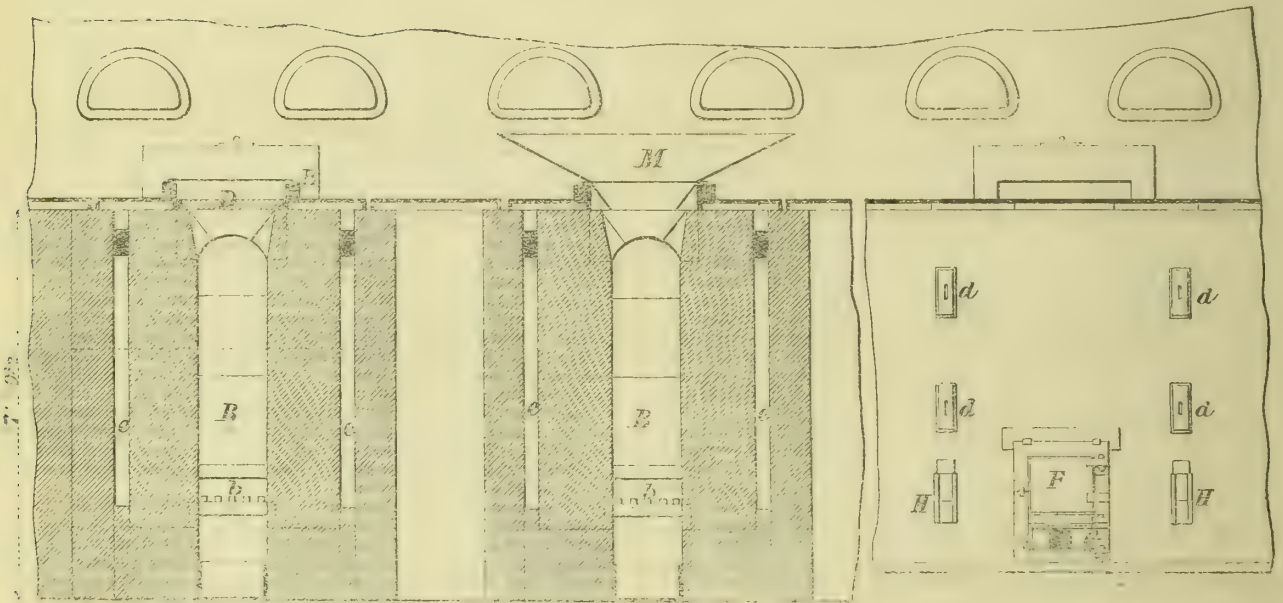
I have long been desirous of laying before your readers a description of Dieterich's furnaces for heating retorts, and the results obtained by their use. I postponed my report on the subject, wishing to visit the works where they are in operation, and derive my knowledge of their merits and demerits from a personal examination. Recently I made it my business to go to Baltimore, Maryland, where I had the opportunity of seeing 20 benches of retorts heated by these furnaces. Had I been writing on this subject a few years ago, I should have felt compelled to first enter into a description of regenerator and generator furnaces in general, and argue the question of their utility, before giving an account of the particular furnace I have chosen for my theme. At this day I feel I can, without making my paper less complete, pass direct to the object of my report; taking it as admitted that the principle of regenerator furnaces is a correct one, and that the point to be decided is, which one of the various modifications of regenerator furnaces is, all things considered, best suited to the needs of the gas manager.

The Dieterich furnace was patented in 1878 by Mr. Charles F. Dieterich, Engineer of the People's Gas Company, Baltimore. The object the inventor had in view was to produce a furnace that could be easily adopted in existing works, without disturbing the setting, and also to



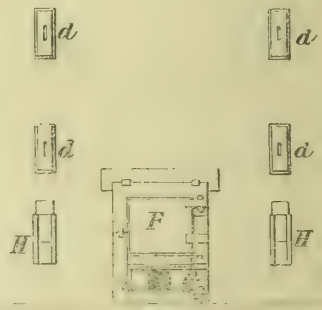
Longitudinal Section on line C D (fig. 4).

FIG. 1.



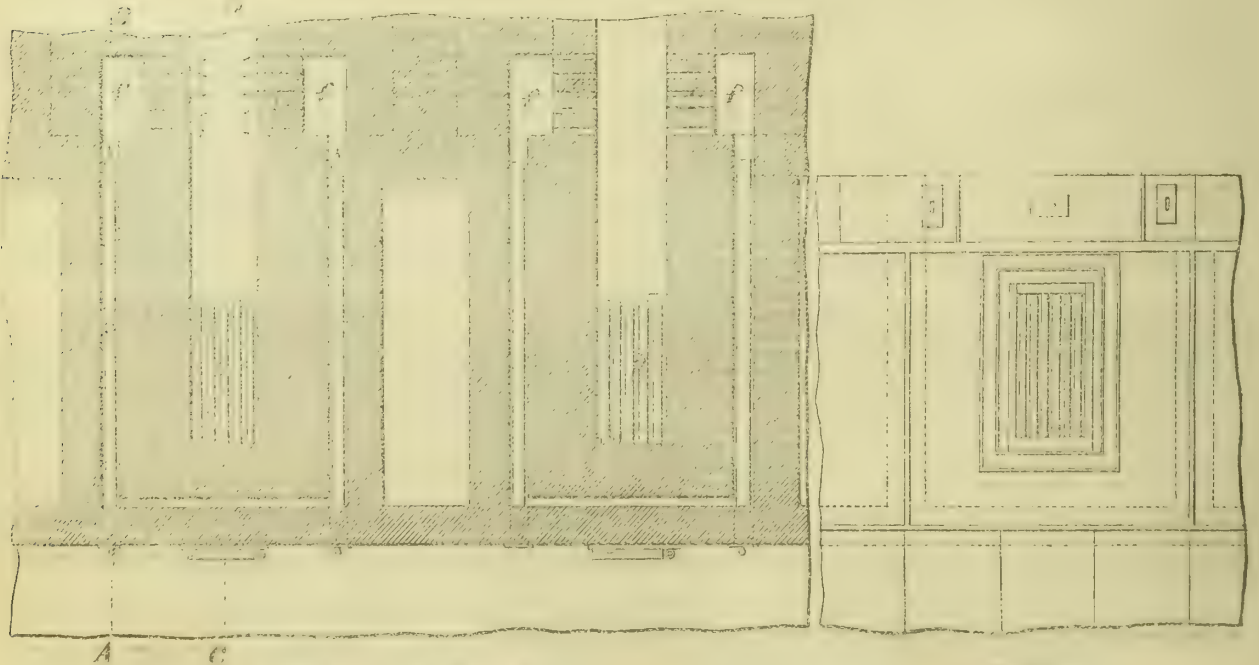
Transverse Section on line H I (fig. 1).

FIG. 2.



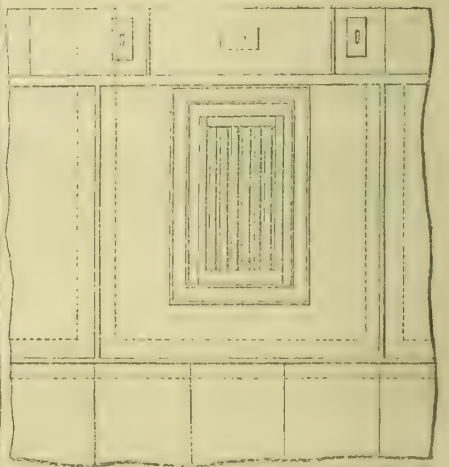
Front View.

FIG. 3.



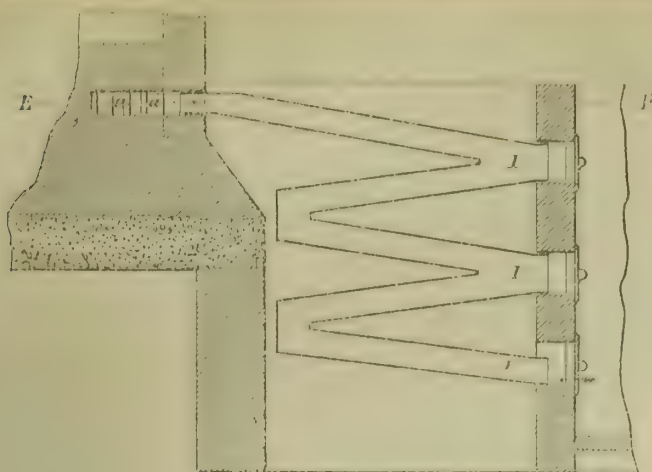
Section on line E F (fig. 6).

FIG. 4.



Top View.

FIG. 5.



Section on line A B (fig. 4).

FIG. 6.

make a greater quantity of gas with a less expenditure of fuel than is obtained by the furnaces in common use; and I think it will be admitted, before I have finished to-day, that he has accomplished his purpose. The furnaces were first tried in the works of the patentee, and were built in arches, which were at the time pretty well worn out; and during last summer these arches were rebuilt, thus affording the furnace a better opportunity of showing its capabilities. Many of these furnaces have been erected in other cities, principally Boston, Providence, Lowell, and Woonsocket; but their erection is of so recent a date that I am not able to give any complete data in regard to them.

The accompanying drawings give details of the construction of the furnace. Fig. 1 is a longitudinal section through the line C D, fig. 4—the middle of the furnace. A is the tunnel or cellar used as an approach to the clinkering door; B is the furnace; C is the opening to the furnace, through which the coke is charged; D is a tile cover for the opening, fitted in a wrought-iron frame; E is a cast-iron cover, made to go over D, with its lower edges setting in a sand lute; a, a, are the openings through which the heated air enters the furnace; b is the grate-bar, and c the ash-pan. The position of the ash-pan prior to the introduction of this furnace is shown in dotted lines. Fig. 2 is a transverse section through the line G H, fig. 1. Two benches are shown; in one the covers of the furnace are represented in position, while in the other the covers are removed, and the funnel, M, is in position ready to receive the coke from the two lower retorts. Fig. 3 is a front view, showing the clinkering door, F, the ash-pan door, G, and the openings for the admission of the air used in the secondary combustion, H; d, d, are stoppers to be removed when cleaning out the pipes in which the air is heated. Fig. 4 is a section through the line E, F, fig. 6, and gives a view of the furnace from above; e, e, are the channels in which the pipes, I (fig. 6), are placed; f, f, are chambers where the air comes to a state of comparative rest before issuing through the openings, a, a. Fig. 5 is a view of the furnace opening from above, the covers being removed. Fig. 6 is a section through the line A, B, fig. 4, showing the pipes, I, for heating the air.

In working the furnace, two men remove the covers, D and E, by means of a couple of hooks; the funnel or shoot, M, is placed in position with its mouth resting in the opening of the furnace; and the hot coke is drawn into this, and falls down into the furnace. The funnel is then removed, the bearing on which the tile cover, D, rests is cleaned of any stray pieces of coke, and the covers quickly replaced. The quantity of coal charged into the two lower retorts is so regulated as to give the requisite amount of coke to fill the furnace—viz., 45 bushels. As the charges are of three hours' duration, the furnace is thus filled eight times in the 24 hours. In clinkering, the door, F, is opened, and a couple of furnace-bars are thrust through the coke, on top of two bearing-bars let into the brickwork about 6 inches above the grate-bars; thus the coke in the furnace is held in position. The regular grate-bars are then removed, when the clinker falls down into the ash-pan; the bars are then replaced, those put in temporarily removed, and the door closed. The positions of the extra grate-bars are shown by dotted lines in fig. 1. The whole work of clinkering is accomplished by the regular men in three minutes, and has to be performed every third hour. The air for the primary combustion is admitted through the damper in the ash-pan door, G, while the second portion of the air passes into the iron pipes, I, through the dampers, H; the former are led back and forth as shown in fig. 6, in the compartment e, e, formed by the furnace wall on the one side and a brick wall on the other. These pipes are made of No. 14 sheet iron, and are 3 in. by 7 in. The total length of the pipe is 50 feet—25 feet on either side. After passing through these pipes the air enters the chamber, f, in close proximity to one of the main flues of the setting. Here the true regeneration, or recuperation of heat, takes place, for the waste heat of the flue is made to heat the air used in the secondary combustion. This process of regeneration can be extended by continuing the pipes and the chambers farther back, and the plan may be advantageously adopted in building new stacks; but in fitting the furnace to old benches it would necessitate undermining the stack, while the object Mr. Dieterich has been particularly anxious to secure is to produce a furnace that could be applied to existing benches without seriously disturbing them. The drawings accompanying this report represent the furnace as adopted at the Baltimore works; those recently built at the Boston and Providence works are slightly changed. The step shown between the opening, C, and the front wall of the setting is abolished; the opening is thus brought close to the wall, and the furnace is more within the setting than in the plan shown in the drawing.

In adopting the Dieterich furnace in existing benches, the ordinary furnace door and ash-pan are removed, and after the space formerly occupied by the latter is levelled off and lined with fire-brick, and the openings, a, a, the chambers, f, f, &c., are constructed, the front wall of the setting, where the furnace door was, is bricked up, and the necessary excavation for the furnace and the cellar is then made. In regard to this latter point—the cellar—it may be built in various ways. In Baltimore it is 6 ft. 7 in. wide in the clear, and 6 feet high, the ceiling thereof, or the floor of this part of the retort-house is made of open ironwork, thus preventing an excessive heat in the cellar. Access is gained to the cellar by steps leading down from the yard. In another case (a small works where two of these furnaces were erected) the cellar is built of similar size to the ones in Baltimore, but is reached by stairs direct from the retort-house. In Boston and Providence this part of the building is made of greater proportions, and has quite a fine appearance; in each case a spiral stairway

connects it with the retort-house. As shown in the drawings, the clinkering door, ash-pan, and the entrance for the secondary supply of air, as well as the stoppers to the air-pipes, are situated here.

As I have given a description of the furnace and the mode of working it, I will now consider its action, endeavouring to discover just how far it is a generator and to what extent it is a regenerator furnace. The chief point which impresses one in regard to its action is the charging of hot coke. The definition of a generator furnace has been given as a furnace supplied at its grate with a limited amount of air, and the resulting carbonic acid, in passing through a considerable stratum of fuel above, is converted into carbonic oxide, which is then burnt in conjunction with heated air. Again, it has been remarked, in regard to generator furnaces, that a higher temperature than a dull red at the upper part of the fuel indicates the presence of carbonic acid, and thus the action of the furnace is impaired. The question then arises, as in the Dieterich furnace the whole of the fuel is in a brilliant red heat, is carbonic acid produced throughout it? We have here a limited supply of air admitted to a mass of already incandescent fuel, in the lower portion of which carbonic acid will be produced. Is this gas converted into carbonic oxide in passing through the fuel above? Doubtless it is. The carbonic acid coming in contact with the incandescent fuel, the action is the same as if the coke had been charged cold—namely, the formation of carbonic oxide, provided the proper proportion of air is admitted. If in the case of a generator furnace charged with cold coke, sufficient air is admitted through the grate to raise the whole of the fuel to a state of brilliant incandescence, doubtless carbonic acid, and not carbonic oxide, will be produced throughout; but, as in the case under consideration, fuel already red hot is supplied with a limited amount of air, the result will be the production of carbonic oxide at the top of the fuel, provided the other circumstances are favourable to its formation. The question then suggests itself—Is the shape of this furnace such as would tend to ensure the carbonic acid coming in contact with the fuel above? As the coke is charged into the furnace, it is pushed back, or "crowned off," so that a large portion of the fuel is in the furnace directly under the retorts, and in the line of the draught or passage of the gases resulting from combustion. The stratum of fuel, through which the gases formed in the lower part of the furnace pass, is thus considerable, being never less than 20 inches; further, as the coke is red hot, the individual pieces will tend to lie closer together—will, in fact, fuse to a certain extent, thus reducing the chances of openings in the fuel, for the carbonic acid to make its way through.

Again, the Dieterich furnace possesses the advantages which the use of heated fuel gains. Thus, when the fire is freshly charged, there is not that withdrawal of heat from the bench, caused when a furnace is filled with cold coke; for, in the latter case, the coke being colder than the surrounding brickwork, draws from it the necessary heat to equalize their temperatures; while when the fuel is red hot when charged, their respective temperatures are more nearly equal, and the absorption of heat noticed is reduced to the minimum. While upon the top of the stack, I examined the outlet of the chimney-flues, but could not discover flame at any of them, except where the fire was being either charged or clinkered.

In regard to the heating of the secondary air supply, it is plain that there is only a partial regeneration, for the air is heated in part by traversing pipes placed contiguous to the furnace; thus the heat gained by the air is derived from the furnace—from the live heat, so to speak. There is here, though, a beneficial transference of heat; that is, the air draws the heat from the furnace, where it is not needed, and delivers it in the body of the setting, where it is of benefit. In the chambers, f, f, where the air comes to a state of comparative rest, it is further heated, and this increase of temperature is obtained from the waste heat of the two main flues. To this extent, then, the furnace is of the regenerative class. The heat of the fuel seems to be well used up in the setting, for I was able to pass my hand slowly over the exit of the flues without experiencing any inconvenience, showing that the temperature of the escaping gases could not be very great.

Before giving the figures, which I collated from the books of the Company, placed at my disposal by their Engineer, I must note one or two peculiarities in regard to gas matters in Baltimore that have a bearing on the question. Thus, by the terms of the contract between the Company and the City, the public lamps are not lighted when the moon shines. During the portion of the month when the moon cannot shine, this arrangement is well enough; but when the time comes round when the moon sheds, or ought to shed its rays upon the City for a part or the whole of the evening, then the case is anything but pleasant for the Gas Company. In some cities where the moonlight system is in use, a hard-and-fast schedule is adopted, so that the lamps are not kept lighted when the moon ought to shine; but in Baltimore the lighting and extinguishing of the lamps is governed, not by the fact of whether the moon ought or ought not to shine, but whether it is so doing. Thus on a possible moonlight night, if the evening sets in cloudy, but later the clouds break away, then the lamps which had been lighted at sundown are extinguished, and the quantity of gas they had been using is thrown back on the gasholders of the Company. Again, on a reversal of circumstances, the Company are required to light the lamps when the Engineer has calculated to the contrary. In a small town such a system may work well enough, but in a city of the size of Baltimore it places the Engineer of the Company in a very unpleasant situation, and is a serious obstacle in the way of economical working. Further, it has a direct bearing on the subject of this report, for as, during the winter, the lamps use about half a million cubic feet of gas per night, the Engineer is unable, for a portion of the month, to estimate the quantity of gas that will be used during the night, more closely than by this amount. This, in the case of a Company sending out about 3 million cubic feet of gas per day, is a very serious matter, often necessitating pressing the benches to the utmost, and as frequently forcing the works to the far more disagreeable predicament of coming to a standstill. It can easily be seen that having to bring the works to a standstill, even once or twice a month, will have a considerable effect on the general averages for the month—such an effect, in fact, as will make them hardly reliable as the correct estimate of the worth of any particular form of retort or furnace; for if the men have got into the "swing" of charging 1400 lbs. of coal per bench, they do not immediately fall into the groove when they are forced suddenly to reduce their charges by 100 lbs. or 200 lbs. And when it is necessary to stop charging a bench, or a series of them, it becomes a difficult matter to prevent choked stand-pipes, &c. The size of the hydraulic main and its position are against the advantageous working of the furnace. The main is only 18 inches in diameter, and it is placed but 4 inches up from the top of the stack; moreover, it is frequently required to pass as much as 1 million feet of gas per day. That is to say, the main for the 10 benches, 75 feet in length, is required to pass 500,000 cubic feet, or the two mains together 1 million; it thus becomes a difficult matter to prevent the formation of pitch in the mains.

I will next consider the work done by the Dieterich furnaces at the Scott Street station of the Baltimore Gas Company. As previously noted, the furnaces were first put in in arches which were pretty well worn out at the time. This was in June, 1878. The dimensions of the arches are—width, 6 ft. 2 in.; height, 8 ft. 6 in. The retorts are D-shaped, 20 in. by

12 in., and 8 ft. 6 in. long, or 8 ft. 3 in. in the clear. Owing to the fact, before noted, that the city lamps are lighted irregularly, it is well-nigh impossible to select any two months for the purpose of instituting a comparison between the results gained by the use of these furnaces and those which were obtained prior to their introduction. I have, however, selected the month of August for the years 1876 and 1879. During the former year the old-fashioned furnaces were in use, while in 1879 all the retorts were heated by the Dieterich furnaces. In August, 1876, there happened to be but little obstruction in the working, caused by the uncertainty of the public lighting; while in August, 1879, there were no less than 13 days when the Company were forced to lay off a greater or less number of retorts:—

Pounds of coal charged per retort per charge	1876.	1879.
Same for bench	178	216
Pounds of coal charged per retort for day	1,068	1,260
Same for bench	1,068	1,680
Gas made per retort per charge cubic feet	6,408	10,080
Same for day	866	1,063
Gas made per bench for day	5,198	8,507
Yield of gas per ton of coal	31,188	51,042
Average candle power	10,908	11,357
Percentage of cannel used	—	17.83
Coke made per ton of coal, estimated bushels	5	24
„ sold „ carbonized	38	38
„ sold „ carbonized	12	25

The same class of coal was used in each case—namely, Fairmount—with the exception shown above, that in 1879 only half the cannel required in 1876 was used. The candle power was not shown for the selected month of 1876, but for other months during that year it was about 17. In the recent message of the Mayor of Baltimore, attention is called to the fact that for a few years past the brilliancy of the gas has been steadily increasing. The Sugg-Letheby burner was the testing burner used during these years. In August, 1879, there were instances where the make per retort, for several days in succession, was 9000 cubic feet. These results were obtained prior to the amalgamation of the three Baltimore Companies, and the works which are now styled the “Scott Street station of the Baltimore Gas Company” were then the “People’s Gas-Works,” and the public lamps in their district were consuming about 100,000 feet of gas per night when the moon did not shine.

During the summer of 1880 the arches were rebuilt; but the furnaces needed very little repairing. The lower tier of furnace blocks were burnt out to the extent of 3 or 4 inches; it was, therefore, thought advisable to replace them. The benches thus rebuilt were brought into action last October. The charges have been increased from 1300 lbs. to 1400 lbs. per bench, or, say, from 216 lbs. to 233 lbs. per retort; the yield and candle power being about the same as in 1879. Figuring on a basis of a charge of 1325 lbs. per bench, and as one-fourth of this coal is put in the two bottom retorts, the coke from which is drawn into the furnace, I find each furnace uses 45 bushels of coke per day, or, say, 14 cwt. This would be equal to 0.88 bushel, or 30.8 lbs. per 1000 cubic feet of gas made, or 17.5 lbs. of coke used to carbonize 1 cwt. of coal.

In regard to labour, there is certainly a considerable saving effected by the use of the Dieterich furnace. At the works under consideration, a gang of three men do the charging and drawing of five benches, while one man in the cellar takes care of 10 fires. Besides clinkering, he is required to remove the ashes from the ash-pan, hoist them to the yard, and wheel them away to the pile. These clinkering men are not worked hard; one man could take care of 15 or 16 fires.

The coke resulting from carbonization is of a very hard texture and a stone-grey in colour; it comes out in small pieces, well suited for domestic use. I cannot say anything more for the coke than that at the Scott Street works, where the Dieterich furnaces are in use, the supply is not equal to the demand; while at the other coal-gas stations of the Baltimore Company, 10 acres of land are more or less covered with coke heaps. At the time of my visit it was estimated that there were fully 5000 loads here, while at the Scott Street works I heard the Company’s customers fairly fighting over the next load, so anxious were they all to secure this coke.

The matter of the tar resulting from the distillation of a given quantity of coal cannot be left unnoticed when addressing English readers, so great is the value of this bye-product in your country. In America it is a subject of little or no consequence, as the revenue from this source is so very small per ton of coal. Few companies here get over 2 cents (1d.) a gallon for their tar; thus it is not a matter of great moment whether they get 10 or 12 gallons from a ton of coal. The person who buys the tar of the Baltimore Company claims that he now obtains only 10 gallons of tar from each ton of coal carbonized, whilst when the old furnaces were in use he had 11½ or 12 gallons.

I have a few figures relative to the working of the Dieterich furnaces in Providence (R.I.), which I will introduce here, as they aid in estimating the practical value of this process. A stack of eight benches, of six retorts to the setting, were fitted with these furnaces; one-half of them were fired on the 3rd of January of the present year, while the remaining four were fired eight days later. The retorts are larger than those in use in Baltimore, being 14 in. by 22 in., and 9 feet long. I cannot give full details of their working, as other benches are used in conjunction with them; however, I am able to state enough to give a fair idea of their working. Each retort burns off from 250 lbs. to 280 lbs. of coal per charge, or 1500 lbs. to 1680 lbs. for the bench, in three hours. Previously, from 8 to 13 per cent. of cannel was used to maintain the gas at from 17 to 17½ candles. Now, less than 2 per cent. is used to produce gas of similar quality. The furnaces have burnt from 18 to 30 per cent. of the coke made, the average being about 22½ per cent. During one day, recently, all of the gas made at this station of the Providence Company was produced from retorts heated by these furnaces, with the following results:—Coal carbonized, 107,161 lbs., or 47.8 tons, of caking coal, with 0.75 ton of cannel. Thus the percentage of cannel was 1.6. The charges were 280 lbs. per retort, or 1680 lbs. for the entire bench. Thus in the 24 hours each retort carbonized 1 ton of coal, or 6 tons to the bench. The charges were burnt off in three hours. The gas made was 514,000 cubic feet. Gas made per retort, per charge, 1340 cubic feet, or 8040 feet per bench; while the same figures for the day would be 10,700 and 64,200 feet respectively. Yield of gas per ton of coal, 10,730 feet, having an illuminating power of 17.25 candles. Of the coke made, 19.79 per cent. was used in the furnaces. If the quantity of coke resulting from the carbonization of a ton of coal be taken at 38 bushels, it would appear that from each bench 228 bushels of coke were obtained, of which the furnaces used 45 bushels, equal to 14 cwt. 7 lbs. Consequently—I am taking the weight of a bushel of coke at 35 lbs.—24.6 lbs. of coke were used to make 1000 cubic feet of gas, or 13.1 lbs. per hundredweight of coal carbonized. These figures show that the furnace is capable of a good deal of work. In enumerating the advantages accruing from its use, I find prominent the diminution of capital account, owing to the increased make per bench, an increase both in the quantity and quality of the gas from a ton of coal, a reduction in the labour account, a saving in the amount of cannel used, and a like result in the fuel account.

The question naturally suggests itself—How can an alteration in the

form of a furnace effect so many beneficial changes? A slight study of the action of an ordinary furnace is a necessary preliminary to the answering of this question. Where coal or coke is burned at once to carbonic acid, owing to the refractory nature of the fuel, and in order to secure its complete combustion, it is necessary to provide for well-nigh double the quantity of air theoretically necessary for such combustion. This surfeit of air has a cooling effect on the bench. In passing over the highly heated retorts and brickwork, it absorbs heat therefrom which is dissipated uselessly into the atmosphere; and let the operations of the retort-house be conducted as intelligently as possible, let the manager be continually “singeing his pate over his furnaces,” yet it will be found impossible, with ordinary furnaces, to prevent the more or less cooling of the setting by the admission of cold air while clinkering, or by making a fresh fire just when the heat is most required; while in the Dieterich furnace the heat is the most intense when it is the most urgently needed—namely, at the beginning of the charge; but when the evolution of gas is diminished towards the close of the three hours, as the fuel is pretty well burned down, the heat is less intense. It is, then, to this constant even heat that we must attribute the increased yield and greater candle power of the gas. The saving in fuel we would naturally expect from a furnace on the regenerative principle, and also the using of red-hot coke.

In order to put the financial result from the use of these furnaces in a tangible shape, let us take the case of a works required to make 720,000 cubic feet of gas per day. I will take the make per retort, with the common furnaces, to be 6000 feet per 24 hours, this being the average production, a certain percentage of retorts having the scurfers in. Further, I will leave out all the items which would be alike, irrespective of the style of furnace:—

With the Common Form of Setting.

20 benches of retorts 14 in. by 22 in., 9 feet long, 6 retorts to the bench, including ovens, ironwork, &c., 2500 dols. (£500) each, or for the 20 benches 50,000 dols., or £10,000

The interest on this amount, at 6 per cent., would be	Dols. c.	
3000 dols. (£600), or per day	8 22	£1 12 11
The yield from a mixture of 95 per cent. caking coal and 5 per cent. cannel, being taken at 10,900 cubic feet per ton, would give 66 tons of coal required per day, costing—		
62.7 tons of caking coal at 5 dols. 15 c., or £1 0s. 7½d.	= 322 90	64 11 6½
3.3 „ cannel „ 10 dols. „ £2 0s. 0d.	= 33 00	6 12 0
12 stokers on each shift, or 24 per day, at 2 dols. 25 c., or 9s.	= 54 00	10 16 0
4 helpers, or firemen, on each shift, 8 in all, at 2 dols., or 8s.	= 16 00	3 4 0
1003 bushels of coke used in furnaces, being 40 per cent., at 6 c. per bushel, or 3d.	= 60 18	12 0 9

Total daily expense with common furnace = 494 30 or £98 17 2½

With the Dieterich Furnace.

Taking the make, with 14 in. by 22 in. by 9 feet retorts, as 10,000 cubic feet per day, 12 benches would be required, costing at 2500 dols.	30,000 dols., or £6000
Cost of constructing 12 furnaces with the expenses incidental thereto, at 400 dols., or £80	4,800 „ 960
Total of construction account	34,800 dols., or £6960

Interest on this amount at 6 per cent. would be 2088 dols. per annum, or £417 12s., or per day	Dols. c.	5 72 or £1 2 11
Yield from a mixture of 97½ per cent. of caking coal with 2½ per cent. of cannel by these furnaces 11,000 feet to the ton; hence 65.45 tons of coal will be required, costing—		
63.82 tons caking coal at 5 dols. 15 c., or £1 0s. 7½d.	= 328 67	65 14 8½
1.63 „ cannel „ 10 dols., or £2	= 16 30	3 5 2½
9 men (8 stokers and 1 clinker man) on each shift, or 18 men in all, at 2 dols. 25 c., or 9s.	= 40 50	8 2 0
620 bushels of coke, at 6 c., or 3d.	= 37 20	7 8 10
Loss, owing to smaller quantity of tar produce, say 4 c. per ton	= 2 62	0 10 5

Total daily expense with Dieterich furnace 431 01 or £86 4 1

Recapitulation.

With common furnaces	Dols. c.	494 30 or £98 17 2½
Dieterich		431 01 „ 86 4 1
Daily saving in favour of the Dieterich furnaces		63 29 „ 12 13 1½
Saving for a year		23,100 00 „ 4620 0 0

In conclusion, I wish to thank Mr. Dieterich for the aid extended to me in my investigation of his furnace. I am also indebted to Mr. Slater, of the Providence Company, for the figures given in my report relating to his Company.

ON THE WHOLESOMENESS OF DRINKING WATER.

By MR. REUBEN HAINES.

[Abstract of a Lecture delivered before the Franklin Institute, Philadelphia, U.S.A. Dec. 9, 1880.]

It was only about 30 years ago that cholera epidemics were discovered to be largely due to the transmission of the disease from one person to another by means of water used for drinking. This disease is unquestionably transmitted also in other ways, as, for example, by the atmosphere; but that water is one of them, and in some countries the most important one, vital statistics of England prove beyond a doubt. I say in some countries, not in all; for it appears that the evidence in Germany, which seems to have been very thoroughly investigated, is against the theory of the carriage by water of the cholera poison in such a way as to cause infection. Pettenkofer, the celebrated sanitary authority of Germany, is entirely opposed to this view. Nevertheless in England, India, Holland, and a few localities in Germany, the evidence appears overwhelming. Dr. Parkes states that while we should give proper deference to the evidence in Germany and Austria, we should not allow it to outweigh the evidence from other countries.

It has also been found that typhoid fever has been spread through towns and smaller communities, and through separate households, by carriage of the infection by drinking-water. So many instances of this have become known, that it may be considered proved beyond all possible doubt to be a fact, and one which is generally and not merely exceptionally true. It is true, however, that typhoid fever, like cholera, may be transmitted also by the air; and there can be no question that the gases or vapours emanating from sewers and drains, and breathed in a confined atmosphere, are a very frequent means of transmitting the disease.

Dr. Parkes states, in the latest edition of his work, that the question which is the most important or frequent means of infection, air or water, cannot yet be answered. Dysentery has been long known to be caused partly by bad water. There is considerable evidence to show that water may transmit diphtheria, but not sufficient to prove it with certainty, except perhaps some evidence in Massachusetts which is very strong.

When the water in any of these cases has been examined by chemical tests, it has generally been found to have organic matter either dissolved up in it or suspended in it. Frequently this material has been found so entirely dissolved as not to be detected by the eye; that is to say, water which was clear, colourless, free from any thing visible, except a very few floating particles, and which even had a good refreshing taste, was found, on careful examination of all the circumstances, to be without the slightest

doubt the real cause of the spread of typhoid fever and cholera from one person to another. Water, on the other hand, which is pure or free from any contamination with human sewage in any part of its history in past or present time, has never been proved to be the means of infection with such diseases as cholera and typhoid fever. But diseases of other sorts have been caused by mineral matters dissolved in the water or by vegetable matter held in suspension, while the water was nevertheless entirely free from sewage contamination.

Water, then, which is impure, is to be dreaded as a frequent cause of disease. But in what does this impurity consist, and how are we to distinguish the two sorts of impurity I have mentioned? We shall understand this better if we first carefully consider what constitutes a naturally pure water, and which is found, by wide experience, to be perfectly wholesome and should be our daily drink.

Those who have studied chemistry are aware that absolutely pure water is composed of one part by weight of hydrogen to eight parts by weight of oxygen, or, by volume, of two parts of the former to one part of the latter. Chemically pure water contains nothing else whatever. But such water does not exist in nature, nor can it probably be produced in the chemical laboratory, for the purest distilled water, redistilled many times, is found, perhaps invariably, to contain exceedingly minute traces of ammonia, and on standing a few hours it absorbs oxygen and nitrogen from the air to which it is exposed. When, therefore, we speak of a pure, wholesome water, we do not mean water which is chemically pure, but one which is as free from foreign substances as is to be found under the most favourable natural conditions.

We should consider all natural water found either on or below the surface of the ground as having been originally precipitated out of the atmosphere in the form of rain, snow, hail, fog, or dew. Of these, rain and snow are obviously the most important, and these in falling carry down with them a part of whatever may be either naturally or abnormally present in the atmosphere. Now, we know by practical experience that the atmosphere in high situations is generally purer than on level plains or in low places. When our bodies are in need of an invigorating atmosphere we go to the mountains, and those who have travelled in mountainous regions often speak of the delightful effects experienced, provided they do not enter too rare an atmosphere. Chemical analysis confirms this impression. The atmosphere of the mountain is generally really purer than that of the valley at its foot. Rain collected near the surface of the earth will, therefore, be more impure than that collected at a considerable height, because of the greater impurity of the air near the surface of the ground. After the lapse of a short time the rain water will be much purer than during the first part of the time of rainfall.

The purest air of the mountain regions contains, besides nitrogen and oxygen, a small proportion of carbonic acid in the free state, and still smaller amounts of ammonia combined with carbonic acid, nitric acid, and nitrous acid. Besides these, there is found also a very small amount of organic matter suspended in the air, probably dead or effete matter swept up by currents from living animals and from vegetation in decay. The amount of this organic dust becomes less and less as we ascend to greater heights, while the proportion of carbonic acid becomes somewhat increased. All of these various gaseous and solid substances are therefore to be found in rain water. Since a part of the rain goes to form springs, we find these substances in the purest spring waters; but here they exist in a somewhat different form from that which they had in rain. Water in passing through the ground always comes in contact with some substances capable of dissolving more or less in it.

Water in its purest state may be said to be an almost universal solvent. Give it only sufficient time and the proper temperature and atmospheric pressure, and it will dissolve an appreciable amount of the most insoluble substances. This effect will take place much more readily when the water contains certain saline substances, especially nitrates and chlorides. When rain water has carried down from the atmosphere salts of ammonia, even if in very minute amounts, its solvent power on soil and rock is thereby increased, and this increase will be in some proportion to the amount of impurity washed out of the atmosphere.

The soil itself is known to contain carbonic acid in its pores in much larger proportion to the other gases than exists in the atmosphere. Carbonic acid, we all know, is soluble in water in greater amount, according to the pressure, as is well shown in the soda-water fountain. This gas, when dissolved in water, has a great solvent power on limestone rock, and when the carbonic acid gas escapes again by evaporation, the water leaves those beautiful pendant stony icicles which we find in limestone caves like the Mammoth Cave of Kentucky, and which we see on a very small scale on the arched roof of many stone bridges, where they are formed from the mortar between the stones of the arch. In fact, the caves themselves are thought to be formed by this solvent action. Lime is a part of the material of many other kinds of rocks beside limestone, and of the soil resulting from their disintegration. The gaseous carbonic acid of the soil added to that already in the rain and to the nitrous and nitric acids in combination with ammonia also found in it, dissolve a part of the lime and other mineral matter of the soil and rock, and when this soluble mineral matter is in large amount, a mineral spring is formed thereby, or simply an ordinary limestone spring, as the case may be. In either case the water is called hard. If the rock is of insoluble material like granite or gneiss, only a very small part of it is dissolved, and in this case a soft spring water is formed. Yet even in granitic regions the water may be hard, owing to such substances as sulphate of lime in the soil above the rock being dissolved in it. This is to a certain extent the case in Germantown, where some of the uncontaminated wells furnish quite a hard water, while others give very soft water.

All soils contain more or less organic matter derived from vegetable and animal matter in decay. Some of this will necessarily go into solution, and pass into the spring water; but it appears that some spring waters contain less organic matter than the rain from which they are derived, so that there is possibly a filtering action going on in the soil in these cases. In the majority of cases, however, it is probable, and in many cases it is certain, that a proportion of the organic material of the soil is added to that already in the rain. The amount of organic matter in soil and rock varies according to its geological nature. Thus, such rocks as the granitic series contain almost no organic matter, while sands and gravels, sometimes thought very free from it, generally contain considerable amounts of it, and occasionally in so large amounts as to cause the well waters to be decidedly injurious. Dr. Parkes mentions as an instance of this the district in the South of France called the "Landes," where the sandy soil contains so much as to cause water of that region to produce malarial fever. Alluvial soil, or that deposited by the floods of rivers and streams, contains very frequently large amounts of organic matter which passes into springs and wells and renders them unwholesome. Waters from marshes are well known to contain large amounts of vegetable organic matter, so as often to prove extremely unwholesome. The case of the ship *Argo*, sailing in 1834 from Algiers to Marseilles, may be mentioned as a very strong instance in proof of this. Water coming from peat bogs is often highly coloured with dissolved

peaty matter. This peaty matter appears to be very different from the vegetable matter found in marsh water in not being in a state of actual decomposition, but being material which has in the solid state become partially carbonized and undergone thereby a change preparatory to becoming coal. Hence a number of chemists and sanitary officers have of late years strongly protested against the condemnation of peaty waters on the same grounds as marsh waters, declaring it to be a great mistake. It must be admitted by every candid student of this subject that some waters, which experience has proved to be very wholesome, originate in peat bogs, and contain, in the state used for drinking, very considerable amounts of nitrogenous organic matter in solution, and there is evidence to show that this material is mainly of vegetable origin.

Let us now consider the effects produced on the health by the mineral matter commonly present in ordinary spring and river waters under entirely natural conditions. While we can positively say that our present knowledge does not warrant the assertion that any one of a number of these mineral substances have any injurious influence upon the health, it is nevertheless obviously true that a large excess of lime and magnesium salts, such as carbonates, and sulphates, and chlorides, are undoubtedly unwholesome in many instances.

Waters which contain these salts of lime and magnesia are called hard in consequence of their action on soap. The great waste of soap caused by these waters, as well as their injurious influence in the boiling of meats and vegetables, are matters of considerable importance in domestic economy. The soap waste and the tendency to form incrustations in boilers are facts of vast importance to the manufacturer, but these considerations we will postpone for the present. While dyspepsia and other internal maladies have undoubtedly been traced to the drinking of water containing large amounts of these salts, and while goitre and cretinism occur in close connection with, and some affirm are caused by magnesium limestone waters, there seems to be still a decided disagreement among sanitary authorities as to the wholesomeness of a moderately hard water. Hardness, however, which is due chiefly to sulphate of magnesia, would seem certainly undesirable on several accounts.

From these circumstances, it will appear evident that the purest water naturally contains some appreciable amounts of mineral matter, and a water which does not contain it in too large amount, the limit of which has not been satisfactorily settled, may correctly be considered, so far as this is concerned, perfectly pure from a strictly sanitary point of view.

Finally, from this whole discussion it is clearly seen that a hygienically pure water must be defined as one which may contain naturally foreign substances, both mineral and organic, in small amounts; but if the organic matter is in larger amounts it must not be in a state of decay or decomposition, or capable of readily undergoing such changes. Further consideration will lead us to modify this statement in so far as to add that a pure water must also contain nothing which would leave a suspicion upon the mind of a probable present or future contamination with sewage.

Some authorities would add that it also must contain no evidence of contamination with sewage in any past time. This is the position which Dr. E. Frankland takes; but I think we may reasonably dissent from so severe a decision, which would exclude all our river waters as too dangerous for public supply. The chief reason for dissenting is that the premises upon which he founds his conclusions have not been clearly proven—indeed, they are directly disputed by other chemists.

We have heretofore considered water as it exists under wholly natural conditions. We will now consider it as these conditions are influenced by man's occupations and habits, which are consequences or accompaniments of civilized life, and interpose circumstances more or less artificial. We have noticed the influence which the natural atmosphere has on the chemical condition of rain water. What is now the effect of the atmosphere surrounding communities of men?

The atmosphere of cities and towns is rendered impure by the gases, smoke, and soot issuing from the chimneys of houses and factories; by the dust from the streets, which is to a great extent organic; by particles of all sorts of clothing, hair, skin, and refuse material from every trade; organic matter from the breath and persons of men and animals; and also by the gases resulting from decomposition of organic matter, such as garbage and filth usually left for some time in places where it should not be at all, and the gases arising from stagnant sewers. Rain, in falling through such an atmosphere, will wash down these gases and organic dust, thereby rendering the atmosphere more fit to dwell in. But the rain water itself will be exceedingly impure, and, indeed, so foul as to be entirely undrinkable without nausea. Beside the organic matter, nitric, sulphuric, and muriatic acids, in the free state as well as combined, are found in such rain in considerable amount, which will vary greatly. In addition to the effete or dead organic matter we find also in the air minute forms of animal and vegetable life. Nevertheless, the air of well-ventilated streets, even in large cities, is much purer than we might expect. The percentage of oxygen in many streets in the less crowded parts of London—that is to say, outside of the limits of old London—was found very slightly less, and the percentage of carbonic acid very slightly greater than the natural amount on open land. Rain falling in suburban towns will, of course, be much purer than that of cities; but where the houses are situated near much-travelled streets, dust composed largely of organic matter will be deposited on the roof, and the rain water collected from this will contain considerable impurity. If the gutters and pipes placed to carry the water into cisterns, or the cisterns themselves, are made of lead or zinc, these metals will be dissolved by the water so as to render the cistern water poisonous to drink. This corroding action is commonly much more rapid with rain water than with ordinary spring water.

If we pass on to the consideration of other kinds of drinking water, we find that streams, ponds, and rivers, all of which are used for this purpose, contain the dissolved manure from cultivated fields, and the filthy and often very poisonous drainage from factories of various kinds, besides those which make use of chemicals in their processes of manufacture. In addition to these, a most important source of impurity, and wherein lies probably by far the greatest danger, is the sewage of cities and towns situated along the banks of rivers or lakes used for drinking water, or on streams draining into them. Frequent reference is made to the solid impurities, such as wool factory refuse, floating on the surface; but any one who is acquainted with the methods used for cleansing the raw wool knows the disgusting character of the materials used for this purpose, enormous volumes of which are poured into the river after the operation is finished, and which are probably entirely unseen because dissolved in the water. It may be said, however, that much of this organic stuff may be entirely decomposed and destroyed before it passes through the water-mains and is delivered to consumers. We hear frequent remarks made on the impropriety and danger of allowing cemeteries of large extent, like Laurel Hill, to drain into a river water used for drinking. The dangers arising from this source may, however, be said to be infinitesimal as compared with the direct drainage of human bowel excreta into the river by means of city sewers. The peculiar dangers of sewage contamination of public water supplies will be more clearly understood as we discuss the subject in subsequent lectures of this course.

(To be continued.)

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week there has been a very considerable resumption of work at the Lancashire collieries, and the strike is now thought to be practically at an end. So far as any advance of wages is concerned, the men have had to relinquish the demands which they put forward; but in the West Lancashire districts, where the bulk of the colliers have now commenced work, there is an understanding that the masters will concede the question of weekly pays. In the Manchester district the resumption of work is still only very limited in extent, but there has been a gradual improvement during the last few days, and a general expectation is entertained that this week will see the termination of the strike.

Prices are very irregular, but there is already a noticeable downward movement from the exceptional rates which have recently been ruling, and there is little doubt that as soon as the ordinary output of coal is resumed at the Lancashire collieries there will be a return to prices very little in excess of those generally current prior to the strike. In the better classes of round coal especially it will be difficult to maintain any material advance; but for engine classes of fuel it is probable that sellers will be able to command higher prices than have for some time past been ruling in the market. Coke is also likely to reach a higher figure, owing to the scarcity of slack.

In the iron trade there is extremely little doing. Merchants appear to be forcing the market so far as pig iron is concerned, and outside brands in many cases are being offered in this district at considerably under makers' quotations. Lancashire makers are kept going with deliveries on account of old contracts, but extremely few new orders are coming in, and although quotations for delivery into the Manchester district remain at 47s. 6d. for foundry, and 46s. 6d. for forge, less 2½ per cent., local producers would be open to offers at under these figures. Finished iron is without material change, makers being inclined to be stiff in their prices, owing to the increased cost of coal. For bars delivered into the Manchester district the average price remains at about £6 per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

Last week passed without any cessation of the activity I have previously reported. The principal collieries continue to be quite full of orders, and prices are well maintained at Cardiff and Newport. At the present time I am informed that colliery houses look forward to anything but a reduction in the price of coal. The actual shipments at the advanced figures now ruling are but slight compared with the quantities that are being sent away at lower-priced contracts; so that when this fact is taken into consideration, and also the heavy liabilities which have accrued in the shape of demurrage to shipping, the employers have not as yet reaped any real benefit, and were an advance conceded it would leave many of them in an awkward position. The iron trade continues to exhibit firmness and a healthy degree of activity. The shipments of coal, &c., have been very good, and the number of vessels in the various ports ensures the prospect of regular work at the collieries. Freights have been a trifle easier to the Mediterranean, but there is an advancing tendency in many directions for sailing tonnage. The shipments of coal, &c., for the past month have been as follows:—Cardiff: Coal, 424,759 tons; iron rails, 3764 tons. Newport: Coal, 84,675 tons; iron rails, 9006 tons. Swansea: Coal, 73,444 tons.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A steady sale is still experienced for the coal productions of this district, both as regards best deep and manufacturing qualities. Prices remain unaltered, and there is but little expectation of any change at present. The market is most cheerful for coal for domestic purposes. Collieries hereabout possess a much more animated appearance than has been observed for a very considerable time past. For the most part masters report a plentiful supply of orders, and but very few of the pits show any bulk of stock on the surface. In the Cannock Chase locality a good loading business is maintained, the Metropolis requirements being exceptionally urgent. Manufacturers and smelters complain of the increased rates on manufacturing fuel, but a fair supply of orders being now in hand complaints are less numerous. Underselling is not so much indulged in, but a few local owners make considerable concessions on sales at the pit's mouth. Cokes are not in so good request; the market, moreover, is abundantly supplied, and prices are not so steady.

The iron trade continues fairly active, and both makers of finished iron and smelters of the raw material are tolerably well employed. The markets are steady, and possess a progressive aspect. Inquiries are numerous for most kinds of common iron, including bars, plates, hoops, nail rods, and girder and boiler varieties. Specifications are more numerous for several kinds of finished iron, and large parcels are said to be wanted. The price of common bars varies considerably, though for the better productions of this class rates are more uniform. Galvanizing sheets are receiving a greater call, makers reporting the existence of a spirited inquiry, though in the majority of cases at low rates. The demand for pigs is not keen, but at a reduction in rates parcels are more quickly placed. Cinder qualities are the least looked after, and but few lots realize more than 40s. The better class are held very firm. Sales of Middlesbrough, Northampton, and Derby are more numerous, but prices are in the majority of cases somewhat slack, and on an unremunerative basis. The mills and forges are going on at a tolerably satisfactory rate, those in particular engaged in the production of bars, sheets, and plates. The high charges of the Railway Companies are at the present time a matter receiving much discussion in the district, and efforts are being made to secure more reasonable rates.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The South Yorkshire Colliery district is just now in a very unsatisfactory condition, there being something like from 11,000 to 12,000 men and boys out, and these will be augmented by others joining their ranks, the owners refusing to make any concessions. The leaders of the three sections of the miners unions are much divided in opinion as to the mode of procedure to obtain an advance of wages. Messrs. Casey and Chappell are advocating conciliatory measures; but Mr. Frith, whose association embraces fully four-fifths of the men, still holds out for the full advance of 10 per cent. In a violent and ill-vised manifesto issued on Friday, he urges that the men must have an advance of 10 per cent. before they can entertain the question of a sliding scale. His strictures on the local press, which has denounced his policy in strong terms, are very violent, and he is equally strong on the question of arbitration, because the owners did not carry out in its entirety the recent award.

The stoppage of many of the largest thick-seam pits in South Yorkshire is causing orders to be freely executed at those pits which are working. In most instances extra hands are being employed, and a very large tonnage is raised at collieries where work is continued. The demand for house coal for the Metropolis holds up very well, and from both South

and West Yorkshire a full average tonnage is being sent over the Midland and Great Northern lines. The demand for local consumption has also increased at the pits which can be kept going, particularly those working the Silkstone seam, nearly all of which are doing a good business.

The collieries raising a good quality of gas coal have a fair sprinkling of orders on hand, independent of the contracts which have been entered into. The pits working the Silkstone seam of coal are well off for orders, there being just now far more of this kind of fuel used for gas-making purposes than was the case last year. Coalowners complain about the extra tonnage rates which have been placed upon them by the Manchester, Sheffield, and Lincolnshire Railway Company, which, in many instances, have to be paid out of the producer's pocket; the terms of the contract involving delivery on the part of the colliery proprietor.

There is rather more doing in steam qualities for shipment, and of late a fair tonnage has been sent to Lancashire. As many of the thick-seam collieries are closed, prices are somewhat higher, but supplies are still plentiful. A good deal of hard coal is being sent away on account of locomotive contracts for railway and other companies.

No falling off can be noted with regard to the demand for coke, but the output is much less, owing to the damping down of ovens where the pits have stopped. The tonnage sent daily to the Frodingham district is very large, and this has been increased during the week by the blowing in of two additional furnaces.

There is not much change to note with respect to the finished iron trade. Inquiries for merchant qualities are such as to warrant the mills being run pretty nearly full time. Engineers and fitters are, however, not over-well employed, and the same remark will apply to moulders. The Bessemer steel-works continue to find full employment for their men, and on the whole waggon builders and repairers are making full average time.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coals over the past fortnight have barely come up to a winter's average; the bad state of the weather throughout the entire month of February having been a considerable hindrance. At the same time it has been a matter of congratulation to all concerned in this important trade that the supply got away has been so good. During last week some large contracts were made for gas coals to be shipped to St. Petersburg, Berlin, and Copenhagen over the season; they reach an aggregate of 130,000 tons of Durham coals. The contract for St. Petersburg is 70,000 tons; the price, including freight and delivery at Cronstadt, is reported to be 12s. 9d. per ton. This is considered to be extremely low, and is somewhat of a surprise; for the freight, taking the average of last year to Cronstadt for a basis, will be from 6s. 6d. up to 7s. per ton, with other charges on delivery. The contracts for home supply were concluded in January. The leading collieries have a large amount of business on hand, which will keep them fully going over the whole of the year. But all recent business which has been concluded shows that the advance in prices, as compared with last spring, is inconsiderable.

The coasting freight market is dull. A large quantity of cargoes are afloat, as heavy fleets of sailing vessels, which had been detained a lengthy period through contrary winds, left the Tyne and Wear last week. The freight paid to steamers to load gas coals for London is 4s. per ton. The Baltic is blocked with ice, and has been so for nearly a month. No steamers can get through the Sound.

The operations of the year which has opened seem to indicate that a satisfactory business is likely to be transacted in the higher qualities of fire-clay goods; but there is considerable competition amongst firms producing second-class sorts, and prices for the latter description of goods are low. It is found impossible to effect a rise, there are too many goods of the sort in the market for it to be done. The chemical trade, on account of the entire blockage of Baltic business by the ice, is excessively flat; but there is a much better prospect for the middle or latter part of March. The demand for iron has not turned out so good as was anticipated. Under these circumstances, and from the fact that the leading coke manufacturers are well contracted in advance, the coke business done in the open market is not very extensive or urgent at the present moment. Lead is lower in price. Ironfounders on the Tyne are kept very fully employed making large castings, but on the Tees and at Middlesbrough, where a large trade is done in the manufacture of gas and water pipes, ironfounders still find it difficult to procure orders. At the same time the inquiry for pipes is rather better.

ARRANGEMENTS have now been completed for holding an International Medical and Sanitary Exhibition, initiated by the Executive Committee of the Parkes Museum of Hygiene. This Exhibition will be held at South Kensington on the occasion of the meeting of the International Medical Congress this year, and will be open from July 16 to August 13. In the sanitary section will be shown apparatus in reference to ventilation, lighting and warming; water closets, sinks, baths, &c.; sewerage and drainage; water supply and filtration; health resorts and sanatoria; books, diagrams, models, &c. Certificates of merit will be awarded to exhibitors; while new inventions exhibited will be protected under a certificate from the Board of Trade.

THE Associateship of the Institute of Chemistry, along with the prize of £50 offered by Professor Frankland for the "best research involving gas analysis," has been awarded to Mr. Frank Hatton, student in the Royal School of Mines, South Kensington.

At the second ordinary meeting of the Society of Engineers for the year 1881—to be held at 7.30 on Monday next, in the Society's Hall, 6, Westminster Chambers—a paper on "Gas-Engines," by Mr. Charles Gandon, will be read and discussed.

MR. JOHN GRAVES, Secretary and Solicitor to the Peterborough Gas Company, has been appointed Town Clerk of Salford, in place of Mr. Christopher Moorhouse, who has accepted the office of Solicitor to the Lancashire and Yorkshire Railway Company.

As an instance of a high dividend-paying concern, we learn from Mr. Layard Jones, of Porto, that the annual general meeting of the Oporto Gas Company was held on the 14th ult., at the Bolsa, when the retiring Directors were unanimously re-elected, and a dividend for the past year at the rate of 21 per cent., free of income-tax, was declared.

AT last Friday's meeting of the Metropolitan Board of Works, it was stated that a communication had been received from the Board of Trade in reply to the Board's letter, to the effect that the recommendations as to an amendment of the law regulating the sale of gas, by providing for an official examination and verification of the indices of gas-meters, are receiving the best consideration of the Board of Trade.

BROMSGROVE GAS COMPANY, LIMITED.—The twelfth annual meeting of this Company was held on the 15th ult.—Mr. W. Jefferies in the chair. The Directors' report stated that the works, mains, and plant were in excellent condition. The balance-sheet and profit and loss account showed an available balance of £900, with which it was proposed to pay a dividend of 10 per cent. per annum, free of income-tax. The report was adopted.

THE BEVERLEY TOWN COUNCIL AND THE WATER COMPANY'S BILL.—The vote of the ratepayers of Beverley, taken in virtue of a resolution passed by the Town Council, to oppose the Bill now being promoted by the Beverley Water Company, has resulted as follows:—In favour of the Council opposing the Bill, 1614; against the Council expending money in opposition, 583; majority in favour of opposition, 1031.

WHITBY WATER-WORKS COMPANY.—The annual meeting of this Company was held on Tuesday, the 15th ult.—Mr. T. Thistle in the chair. The report stated that the Company's earnings for the past year amounted to £1756 7s. 2d., which with £183 14s. 5d., balance from the previous year, left the sum of £1940 1s. 7d. to be dealt with. The Directors recommended that £150 should be set aside as a depreciation or contingency fund, and that a dividend of 9½ per cent. on the fully paid-up shares, and 9s. 6d. per share on the shares on which £5 has been paid, be declared, free of income-tax, absorbing £1815 16s. 6d., and leaving a balance of £124 5s. 1d. to be carried forward. The report was adopted.

REDUCTIONS IN PRICE.—The Wandsworth and Putney Gas Company are issuing notices to their consumers, to the effect that, from Christmas last, the price of gas throughout the district will be lowered from 4s. to 3s. 6d. per 1000 feet.—The Directors of the Stourbridge Gas Company announce a further reduction of 2d. per 1000 cubic feet in the price of gas in the Stourbridge district, from Jan. 1 last. The prices will now be—for a quarterly consumption under 30,000 feet, 3s. 6d. per 1000; under 60,000 feet, 3s. 3d. per 1000; under 100,000 feet, 3s. 1d. per 1000; over 100,000 feet, 2s. 10d. per 1000, subject to a discount of 5 per cent. on all accounts paid within two months after each quarter. There will also be a reduction in the prices charged at Hagley and Pedmore, which will be 4s. and 3s. 8d. per 1000 feet respectively from the same date.

PROPOSED PURCHASE OF THE BARNSTAPLE WATER-WORKS BY THE TOWN COUNCIL.—At the last meeting of the Barnstaple Town Council, the

Mayor (Mr. W. Avery) moved—"That a Committee be appointed for the purpose of considering whether or not it is desirable, in the interests of the public, that the powers possessed by the Barnstaple Water Company, under their Act of Parliament, for supplying the borough with water, should be in the hands of the Urban Sanitary Authority; and if they should be of opinion that it is desirable, that they be requested to apply to the Directors of the said Company, with a view to ascertain whether or not they would be inclined to entertain a proposal from this Authority to purchase their works, and on what terms, &c." The motion was agreed to, and a Committee appointed.

WAKEFIELD GAS COMPANY.—The sixty-eighth half-yearly general meeting of this Company was held on the 14th ult.—Dr. Wood (in the absence of Mr. W. Statter) in the chair. The report of the Directors and the statement of accounts, which were taken as read, showed that the amount divisible amongst the Proprietors was £4744 8s. 7d., and it was unanimously resolved to pay a dividend of 12 per cent. on the original shares, 9 per cent. on the "B" 5th shares, and £8 8s. on the new shares, all clear of income-tax. The report stated that the works were in good order, and the price of gas had been reduced from the 1st of January last from 2s. 9d. to 2s. 6d. per 1000 cubic feet. The revenue account showed that the total receipts for the half year amounted to £12,524 15s. 11d.; the total expenditure was £7124 19s. 10d.; leaving a balance of £5399 16s. 1d. to be carried to profit and loss account.

NEW COMPANIES REGISTERED.—Among the joint-stock companies recently registered we notice the two following:—The St. Michael's Gas Company, Limited, has been formed, with a capital of £25,000 in £5 shares, to acquire the benefit of a provisional contract entered into between the Municipal Council of the City of Ponta Delgada, Island of St. Michael, Archipelago of the Azores, and Francisco Freire de Andrade Salazar d'Eca and others, for illuminating the city of Ponta Delgada with gas.—The Spongy Iron Water and Sewage Purifying Company, Limited, with a capital of £20,000 in £50 shares, is to purchase certain patents for improvements in the purification of water and sewage, and in apparatus and materials employed in connection therewith, and to grant exclusive licence for their use in domestic filtration to Mr. G. Bischof and Mr. J. G. Barry.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending Feb. 23, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.2	16.1	16.9	Station	closed	for	repairs	0.0	0.0	None.	In excess.
	Camden Town	17.4	16.8	17.1	15.2	12.2	13.9	0.0	0.0	0.0	"	"
	Dalston	17.2	16.6	16.9	10.6	9.2	10.1	0.6	0.4	0.5	"	"
	Bow	17.0	16.5	16.7	16.8	14.3	15.6	0.4	0.0	0.2	"	"
	Chelsea	17.6	16.3	16.7	18.3	13.0	15.0	0.4	0.1	0.2	"	"
	Kingsland Road	21.4	20.5	21.0	14.3	5.3	9.5	0.8	0.4	0.6	"	"
Westminster (cannel gas)												
South Metropolitan Gas Company . . .	Peckham	17.0	16.4	16.6	13.7	10.6	11.9	0.4	0.2	0.3	"	"
Commercial Gas Company	Old Ford	17.6	16.5	17.0	17.8	10.0	13.0	0.6	0.2	0.4	"	"
	St. George-in-the-East . . .	17.2	16.3	16.9	13.5	10.5	12.3	0.4	0.1	0.3	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

Share List of Gas and Water Companies.

Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	NAME.	Amount paid up per Share.	Last Divd. p. Ann.	Latest Quotations.
59000	£ 10	GAS COMPANIES.	£ s. d.	£ s. d.	£ s. d.	6200	£ 5	GAS COMPANIES.	£ s. d.	£ s. d.	£ s. d.	5000000	£ 10	GAS COMPANIES.	£ s. d.	£ s. d.	£ s. d.
10000	20	Alliance and Dublin	10 0 0	10 0 0	16½-17½	300000	100	Georgetown, Guiana	5 0 0	7 0 0	4½-4¾	1305000	Sk.	South Metropolitan.	100 0 0	12 0 0	200-205
5000	20	Anglo-Romano . . .	20 0 0	9 10 0	21-23	115000	100	Glasgow Corporation	100 0 0	9 0 0	223-228	12000	5	Do., "B"	100 0 0	11 5 0	178-182
1000	20	Bahia (Limited) . . .	20 0 0	6 0 0	15½-16½	100	100	Glasgow Gas	100 0 0	6 15 0	164-169	2864	10	Tottenham & Edmonton	5 0 0	10 0 0	8½-9
1500	20	Do., 1st pref.	20 0 0	10 0 0	25-27	100	100	Do., do.	100 0 0	100 0 0	186-190	1500	10	Do.	6 0 0	7 0 0	7-8
40000	5	Do., 2nd pref.	20 0 0	7 10 0	20-22	10	10	Grimsby Gas, A. . . .	10 0 0	10 0 0	16-17	1500	10	Wandsworth & Putney	10 0 0	10 0 0	14½-15
10000	5	Bombay (Limited) . . .	5 0 0	7 10 0	6-6½	7800	10	Hampton Court . . .	10 0 0	10 0 0	15-16	1500	10	Do.	10 0 0	7 10 0	12½-13½
5000	10	Do., fourth issue . . .	4 0 0	7 0 0	1 pm.	5000	10	Hong Kong (Lim.) . .	10 0 0	10 0 0	15½-16½	4000	10	Do.	10 0 0	7 0 0	11½-12
229700	..	Bournemouth	10 0 0	8 0 0	13½-14½	250000	100	Horseley	10 0 0	10 0 0	15½-16½	26000	5	Do.	5 0 0	10 0 0	9½-10
500000	..	Brentford	100 0 0	9 0 0	152-155	100	100	Imperial Continental	100 0 0	10 0 0	197-199	10000	5	Do.	3 0 0	10 0 0	6½-7
5400	20	Do., 5 per cent. pref.	100 0 0	5 0 0	100-105	100	100	Gas Association . . .	100 0 0	10 0 0	197-199	2100	5	West Ham	10 0 0	10 0 0	14-16
5000	20	Brighton	20 0 0	10 0 0	36-38	3500	10	Kingston	10 0 0	8 0 0	11½-12½	1000	10	Do.	10 0 0	10 0 0	14-16
14000	20	Brighton and Hove . .	20 0 0	10 0 0	34-36	561000	100	Lea Bridge	10 0 0	10 0 0	183-185	1000	10	West Kent	10 0 0	10 0 0	14-16
7282	20	British (Limited) . . .	20 0 0	10 0 0	34-35	1691000	100	Liverpool United . . .	100 0 0	10 0 0	183-185	1000	10	Woolwich, Plumstead, and Charlton	5 0 0	12 5 0	8-10
1500	10	Cagliari (Limited) . . .	20 0 0	8 0 0	19-20	3900000	Sk.	Do., B, per cent. . . .	100 0 0	7 0 0	140-142	1000	10	Do.	100 0 0	10 0 0	14-16
105180	Sk.	Colney Hatch	10 0 0	5 0 0	9-11	1500000	Sk.	London	100 0 0	10 0 0	182-187	1000	10	Do.	100 0 0	10 0 0	14-16
20000	20	Commercial	100 0 0	11 5 0	192-197	7622	25	Do., 1st pref.	100 0 0	6 0 0	128-133	1000	10	Do.	100 0 0	10 0 0	14-16
105180	Sk.	Do., new stock	100 0 0	8 0 0	141-146	26613½	Sk.	Do., A shares	25 0 0	6 0 0	30-32	1000	10	Do.	100 0 0	10 0 0	14-16
20000	20	Continental Union . . .	20 0 0	7 0 0	22-23	15000	5	Do., Debenture stock	100 0 0	5½ & 6½	..	1000	10	Do.	100 0 0	10 0 0	14-16
21000	20	Do., new	14 0 0	7 0 0	1-2 pm.	10000	5	Malta and Mediter-	5 0 0	3 0 0	21-23	1000	10	Do.	100 0 0	10 0 0	14-16
10000	20	Do., preference	20 0 0	7 0 0	25-26	10000	5	anean (Limited) . . .	5 0 0	7 10 0	5-5½	1000	10	Do.	100 0 0	10 0 0	14-16
750000	Sk.	Crystal Palace District	100 0 0	10 0 0	172-177	6000	5	Do., preference	5 0 0	7 10 0	5-5½	1000	10	Do.	100 0 0	10 0 0	14-16
1250000	Sk.	Do., 7 per cent.	100 0 0	7 0 0	128-132	30000	20	Do., preference	2 5 0	1 2 6	12-14 dis	1000	10	Do.	100 0 0	10 0 0	14-16
25000	6	Do., preference	100 0 0	6 0 0	119-123	8000	10	Do., preference	20 0 0	6 0 0	15½-16½	1000	10	Do.	100 0 0	10 0 0	14-16
7100	25	Do., ordin. 7 p. c. . . .	1 10 0	7 0 0	1-1 pm.	30000	5	Do., preference	10 0 0	6 0 0	5-6	1000	10	Do.	100 0 0	10 0 0	14-16
23400	10	Edinburgh	25 0 0	10 0 0	50-51	30000	5	Do., preference	5 0 0	9 0 0	6½-7½	1000	10	Do.	100 0 0	10 0 0	14-16
12000	10	European (Limited) . . .	10 0 0	11 0 0	19-20x	10000	5	Do., preference	5 0 0	9 0 0	14-15 pm	1000	10	Do.	100 0 0	10 0 0	14-16
35400	10	Do., new shares	7 10 0	11 0 0	6½-7½	10000	5	Do., preference	5 0 0	9 0 0	2-2½	1000	10	Do.	100 0 0	10 0 0	14-16
5360000	Sk.	Do., new shares	5 0 0	11 0 0	4-5 pm.	10000	10	Do., preference	10 0 0	10 0 0	6½-7½	5551800	100	Do.	100 0 0	9 0 0	280-290
1000000	Sk.	Gaslight & Coke A. . .	100 0 0	11 0 0	178-181	3000	10	Do., preference	10 0 0	10 0 0	17-18	7818000	100	Kent	100 0 0	9 0 0	280-290
2000000	Sk.	Do., B	100 0 0	4 0 0	78-82	3000	10	Do., preference	10 0 0	10 0 0	15-16	3261500	100	Lambeth	100 0 0	7 0 0	207-212
3000000	..	Do., C 10 per cent. preference	100 0 0	10 0 0	0 209-214	37500	20	Do., preference	10 0 0	9 0 0	15-16	442	100	Do., max., 7½ p. c. . .	100 0 0	7 0 0	178-183
1650000	..	Do., D do. do.	100 0 0	10 0 0	0 209-214	1500	32½	Do., preference	20 0 0	10 0 0	25-27	4475	100	New River	100 0 0	7 0 0	178-183
300000	..	Do., E do. do.	100 0 0	10 0 0	0 209-214	135000	100	Do., preference	32 10 0	12 0 0	..	400000	100	Do.	100 0 0	7 0 0	178-183
600000	..	Do., F 5 do. do.	100 0 0	5 0 0	103-107	99700	100	Do., preference	100 0 0	10 0 0	197-198	6668000	100	Do.	100 0 0	7 0 0	178-183
1300000	..	Do., G 7½ do. do. . . .	100 0 0	7 10 0	152-157	10597	5	Do., preference	100 0 0	10 0 0	195-197	3247000	100	Do.	100 0 0	7 0 0	178-183
		Do., H	100 0 0	7 0 0	134-138	2000	5	Do., preference	5 0 0	8 0 0	5½-6½	1265000	100	Do.	100 0 0	7 0 0	178-183
								Do., preference	5 0 0	7 10 0	5½-6½	15073	61	Do.	100 0 0	7 0 0	178-183

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 619.—MACAULAY, R., and BALLINTINE, J., Glasgow, "Improvements in gas-heated smoothing irons." Feb. 14, 1881.
 765.—WILLOUGHBY, F. S., Stockport, Lancs, "Improvements in galleries or holders for gas and lamp globes and shades." Feb. 23, 1881.
 789.—WEST, J., Manchester, "Improvements in machinery or apparatus for charging and drawing gas-retorts." Feb. 24, 1881.
 798.—ORD, R., Devizes, Wilts, "Improvements in gas-engines." Feb. 24, 1881.
 799.—GRADDON, J., Forest Hill, Kent, "An improved construction of gas-engine." Feb. 24, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3364.—AUBE, P., Paris, "Improved processes for manufacturing steel and lighting gas, and improved apparatus in connection therewith." Aug. 19, 1880.
 3575.—SINGLETON, T., Over Darwen, Lancs, "Improvements in taps or cocks for water and other fluids, steam, and gases." Sept. 3, 1880.

- 3626.—JACKSON, F., Nottingham, "Improvements in pipes and pipe joints." Sept. 7, 1880.
 3720.—HADDAN, H. J., Westminster, "Improvements in liquid meters." A communication. Sept. 13, 1880.
 4795.—DIETERICH, C. F., Baltimore, U.S.A., "Improvements in gas-making apparatus." Nov. 19, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 433.—SIMON, L. and R., "Improvements in and connected with gas-engines." Feb. 1, 1878.
 522.—YOUNG, W., "Improvements in the manufacture or treatment of illuminating gas and in the apparatus employed therefor, the said apparatus being also applicable for the treatment of gases other than illuminating gases." Feb. 8, 1878.

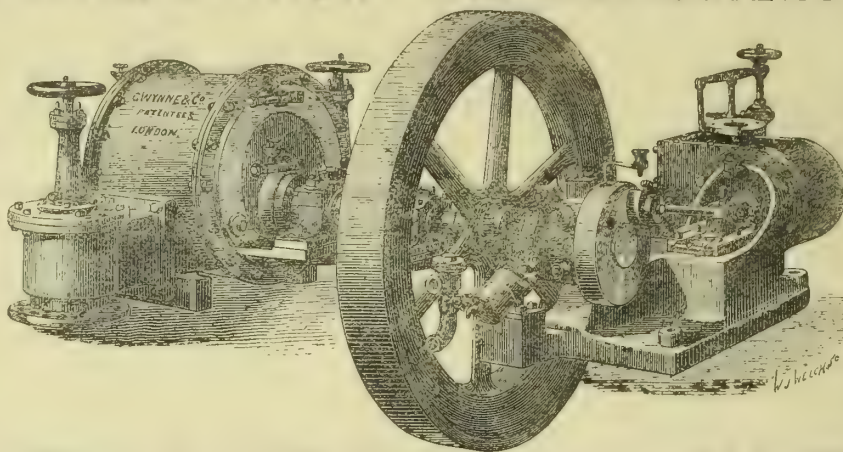
PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

- 500.—EVERETT, G. A., "Improvements in liquid meters." Feb. 7, 1874.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

TO CORRESPONDENTS.

- X. (Holland).—You had better apply to Herr Friederich Siemens, Dresden.
 J. G.—We have not any information about the burner used. The fuel was unquestionably ordinary coal gas, presumably consumed by some common form of heating burner.
 G. V.—Shall be glad to receive full particulars as to your proposals in regard to gas purification. Your letter does not give any information on the subject that would be useful to our readers.
 RECEIVED.—"Compte Rendu du Septième Congrès de la Société Technique de l'Industrie du Gaz en France."
 We are compelled to hold over till next week several reports of gas and water companies' meetings sent for publication by subscribers and others.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 8, 1881.

THE ASSESSMENT OF GAS-WORKS.

THE present is rather a stirring time with regard to the rating of gas undertakings. As might have been expected, the proceedings of the assessors are not always in accordance with the wishes of the owners of the properties upon the value of which they have passed judgment. The grounds on which valuation lists are compiled are frequently of a most inexplicable character, and all attempts to unravel the tangled thread of reasoning by which the annual gross and rateable value of any particular description of diffused property is arrived at, generally end in increasing the mystery. We use the term "diffused" in relation to property, because it seems difficult to otherwise classify those forms of rateable estate which do not, like dwelling-houses, possess a strictly localized value, but rather depend for general worth on their external connections. A site of some kind every rateable undertaking must necessarily possess, but when, as in the case of gas-works, the site and the structures upon it are of value chiefly in connection with the business which may be transacted therefrom as a centre, the question of finding the annual value of the concern as a whole, for the purposes of taxation, becomes exceedingly complex. Yet this is the problem which has frequently to be solved in different parts of the country, and, as we

have already said, there are a great number of such problems awaiting solution at the present time. Fortunately, many of the constant quantities involved in the determination of the rateable value of gas-works have been settled in past times, so that it is not necessary in all cases to begin a valuation of this kind from the first elements. Yet from a recent example, to which fuller reference will shortly be made, these fundamental principles can, on occasion, be expanded or contracted, or in other ways modified, to suit special cases, until there is almost as much uncertainty with respect to every fresh example as if there had not been any rules at all laid down. In short, to determine the extent to which known rules may be held to apply in any particular case, is almost as difficult a task now, after all our experience of valuation for rating, as though every principle were abrogated as soon as formed, instead of being preserved as a precedent.

As an illustration of the preceding remarks, let us take that freak of legal imagination known as the "hypothetical tenant." If there is one principle of valuation for rating more firmly established than another, it is that which deems the true annual value of a gas undertaking to be, not its value to its actual owners, but the rent which a possible tenant would give for the structures and premises of the concern, with a view to receiving the revenue which they are capable of earning. The fairness of this general rule is incontestable, and although it may occasionally appear to be but a clumsy expedient when applied to the valuation of concerns which are not, and are never likely to be, let out to tenants, yet it is strictly analogous to the generally accepted method of valuing houses, &c.; and in the cases of the many leased undertakings in the country it is the only possible manner of arriving at a true result. The practical application of this principle in all cases is, however, by no means easy. In making such an attempt, we are at once confronted with the fact that no two trading concerns, even when so apparently identical in their objects and procedure as gas undertakings, stand precisely on an equal economical footing. It is, of course, assumed at the outset that the hypothetical tenant is an eminently wise and cautious being, who, with the full knowledge of the facts of a case, offers a maximum rent, arrived at after a lucid process of statistical investigation of such facts. But then arises the difficulty as to the amount of allowance this prudent person is to be permitted to make, in his estimate, for considerations which cannot be discovered in the books of the concern. To put the point briefly, is the hypothetical tenant to be supposed to exercise the higher qualities of administration, or is he to be a mere automaton, competent only to work out sums in simple arithmetic?

In the number of the JOURNAL for the 21st of December last there appeared a report of the arbitration proceedings on the appeal by the Sheppy Gas Company against their revised assessment. The Sheppy Board of Guardians, acting as the Assessment Committee, had fixed the gross annual value of the Company's property at £1898, and the rateable value at £1496, instead of £622 10s. as formerly. The Justices before whom the appeal was brought appointed Mr. J. Clutton as Arbitrator to hear the parties, and report as to the assessable value of the works. The Company endeavoured to show that, owing to the dilapidated state of the plant and buildings, not more than about £720 per annum would be given for the property by a tenant, and to this amount they sought to have the assessment reduced. So much was said by both sides on this occasion with reference to the dilapidations, that the Arbitrator decided to inspect the premises before making his award. Having done so, he has now declared that the gross annual value of the works is £2531, and the rateable value £1263; thus exceeding the gross sum appealed against by no less than £633, while reducing the assessed rateable value by £233.

The result of the arbitration is therefore altogether extraordinary, but upon this subject we need not now particularly enlarge, as it is uncertain whether we have yet heard the last of the case. What we are more concerned with at present, for the enlightenment of those who are now, or may at any time be involved in difficulties similar to those which have not even yet ceased to trouble the unfortunate Sheppy Company, is to point out the eminently unsatisfactory character of such a defence as was perforce relied upon in their case. Whether the Company have eventually to submit to the increased assessment or not, it is clear that the principal arguments upon which their professional advisers were compelled to rely were most damaging to their own cause. It may be said that the Directors of the Company erred through ignorance, but that they did err is unquestionable. Much as we sympathize

with the proprietors of an overrated undertaking, we would not be understood to imply approval of gas-works being relieved from rating, simply because the responsible managers have allowed them in times past to sink into such a state of general decay that they require to be rebuilt in a hurry. There may be exceptional circumstances in the present case to account for the existing state of things; but while admitting this possibility, it is impossible to overlook the fact that neglect of the ordinary obligations of ownership is most difficult of palliation, and in many ways entails penalties which can never be entirely evaded.

We must, however, set aside for a moment the reflections that will naturally arise from the contemplation of such a case as the one in question, with respect to the precise amount of culpability that should be ascribed to the owners of an undertaking, who, having let their property sink into partial ruin, appeal for lessened rating on that account. It would be easy to show that if such neglect is to be rewarded in this way, an injustice would be done to those proprietors of similar establishments who might have to bear a proportionately high rating, because they have laid out money in keeping up their property to a fair standard of efficiency. Reflections of this nature, however pertinent, would be slightly unpractical. We take it that the Arbitrator in the Sheppy case was not called upon to inflict upon the Company a fine for their past misdeeds, but to determine what the property is now worth to a careful tenant. The dilapidations are admitted, and, without reference to the manner by which they came about, it may be asked whether the cautious imaginary individual who is invoked to show the actual market value of gas property, has been allowed in this case to exercise his full discretion as to the annual portion of his revenue he would prefer to appropriate for making good past mistakes. The example is altogether so instructive that, although we have dwelt upon it at some length, we have only touched upon a few of the difficulties it presents, and which may perhaps be more fully elucidated later in connection with this or some other case.

GAS AFFAIRS IN PARLIAMENT—THE BRIGHTON AND HOVE GAS COMPANY'S BILL.

UNLESS the present parliamentary session materially alters its character in respect of Private Bills relating to gas, it will be marked as an unusually tranquil, not to say dull period. One or two Bills, which may or may not be hotly opposed, have yet to be dealt with, but one after another all the proposed measures, the leading features of which have recently been explained in our columns, are quietly passing through the committee-rooms. On Wednesday and Thursday last the Brighton and Hove Company's Bill was before the House of Commons Committee, and although there was some skirmishing on the first day, on the following day the proceedings were very brief, and it was understood that the Bill would merely be watched through the House of Lords. The cause of the collapse of opposition to the Bill on the part of the Corporation of Brighton, was the consent by the Company to accept the reduced price of 3s. 3d. per thousand cubic feet as their standard under the sliding scale, the reduction to be made within three months after the amalgamation of the two Companies shall have been confirmed by Order in Council. The Company also promised to abandon the old works of the Brighton Company at Kemp Town within ten years of the contemplated amalgamation. We consider that the Corporation of Brighton have every reason to be satisfied with these concessions, although it would not be detrimental to the interests of the Company if the period for discontinuing the manufacture of gas at Kemp Town were even shortened. It would be easy to show the great economy that would be secured by expediting such a step. Whatever it is going to cost to move the seat of manufacture, it will be no more now than it will be in ten years' time; while if done speedily, there will be the certain yearly saving in working to be set off against the expenses of the removal. Looking at the question from this point of view, if there is to be any saving in manufacturing gas entirely at Portslade, or anywhere rather than Kemp Town, the sooner that economy is taken advantage of, and the latter site sold, the better for the Company.

THE ELECTRIC LIGHTING OF HULL POSTPONED.

THE electric light will not yet be visible in Hull. The Corporation of this busy seaport, it will be remembered, obtained last session an Act empowering them to light the streets and public places in the town by electricity. The passing of the Act was, somewhat unaccountably, hailed in the locality as an event of vast public importance, and great

things were expected of its administration, at the hands of those gentlemen of the Town Council who had been most clamorous for it. Hull would certainly be all the better for a good lighting up. Everybody believes this, as an abstract proposition; but the Town Council have not been long in finding out that an admiration of a brilliant light, and a disposition to defray the cost of the same, are distinct things, not always united in a body of ratepayers. It is easy to agitate and obtain legal sanction to the adoption by a Corporation of electric lighting, but actually entering into contracts for its supply is a different matter, and one which puts the sincerity of agitation on the subject of better street lighting to a severe test. We all know the usual origin of a desire for electric and petroleum street lighting experiments—the Local Authority have a difference with the Gas Company respecting the lighting contract, of about half-a-crown a year per lamp. Both parties prove obstinate, and the next step on the part of the public authority, after much debate, is the application to other lighting contractors for estimates, in order, as it is frequently said, to show the Gas Company that the town is not dependent upon them. When these tenders come in, we are much mistaken if most of the agitators are not secretly staggered at the difference, in the case of electric lighting, between the cost and convenience of the application of the new light and the old. But in too many cases a sacrifice of conscience is made at the shrine of verbal consistency, and rather than confess their haste and previous lack of information, the guardians of the ratepayers' interests calmly proceed to squander seven-and-sixpence or half-a-sovereign, to save that half-crown. However, at Hull wiser counsels have, for the time, prevailed, and although a minority of the Council were favourable to spending several thousands of pounds in lighting a portion of the streets, and (of course) the Town Hall, by the Siemens or Brush system, it was determined at a late special meeting of the Council to wait a little longer, and let the City of London first carry out the contemplated experiment, in which both those systems will be represented.

THE GAS ENGINEERS OF THE MANCHESTER DISTRICT.

THE members of the Manchester District Institution of Gas Engineers held their eleventh annual meeting in Manchester on the 26th ult., when Mr. Carr, the retiring President, delivered a short valedictory address on leaving the chair, which was subsequently taken by the President Elect, Mr. Chew, of Blackpool. The presidential address, which will be found in full elsewhere, was interesting, and was, moreover, redolent of strong common sense. The President never lost sight of the fact that he, a north countryman, was speaking to an audience of northern gas managers; and yet he was not parochial. If district institutions like this of Manchester are not strongly local, they fail of one of their objects; at the same time, so far from this local colour robbing them of general interest, it really, with proper management, heightens their capabilities of instructing a wider circle of observers. The President's brief though pregnant reference to the troubles of gas managers in the North during January last will find an echo in every part of the land. It is not too much to say that from the individual experiences of gas engineers throughout that trying time, a volume might be compiled—too technical, perhaps, for the general reader, but containing a surprising record of the ingenuity and fertility of resource which were in so many cases required in order that the greater plague of universal darkness might not be superadded to the troubles of the residents in our towns. The question of the advantage of retaining hydrocarbons in the gas, instead of sending them into the tar-tanks, was practically touched on by Mr. Chew, as were many other points of interest to a gas manufacturer. It might perhaps be rash to fix a date for the advent of the good time alluded to in the concluding paragraph of the address; but when it does come, it will be due in no small degree to the manner in which the efforts of gas engineers have been quickened by frequent conference, through the medium of these associations, with their professional brethren.

GAS AFFAIRS AT BIRMINGHAM.

THE Birmingham Corporation have adopted the annual report of the Gas Committee, to which we alluded a fortnight since, and have consented to a reduction in the price of gas of threepence per thousand cubic feet. It was remarked by Mr. Marris, in moving the adoption of the recommendation of the Committee, that this reduction can only be maintained if the course of trade continues to enable the Committee to buy their necessities cheap and sell their residual products for good prices. This is somewhat of a truism, for, rightly

speaking, every reduction in the price of gas, to court trade or to popularize its consumption, is of the nature of an experiment, and need not be considered by buyers or sellers as a permanent concession. It was observed that gas consumers of Birmingham—including, of course, those residing in the now independent outlying districts—have contributed upwards of £130,000 to the relief of the rates, since the acquisition by the Corporation of the undertakings of the two Companies. No less than a tenth part of this grand total, or £13,000, has gone already, paid out of last year's profits, for law expenses attendant on the disruption of the before-mentioned districts from the Corporation, and there is more to follow. Mr. Marris evidently felt that some excuse must be made for the continuance of the policy of relieving the rates at the expense of the gas consumers, for he delivered himself of the opinion that the distinction between gas consumers and ratepayers in Birmingham was rapidly narrowing, and that their interests were now practically identical. According to this showing, therefore, the ratepaying gas consumers of Birmingham like being tickled with the notion that they receive a yearly present of some £25,000 from the Gas Committee. There is no accounting for these popular delusions, and as this is a very pleasant one for the Town Council, things will probably go on as they are, until a new public shall arise who will prefer to pay all rates out of one pocket.

THE SOUTH SHIELDS GAS COMPANY AND THE "SWAN" ELECTRIC LIGHT.

THE South Shields Gas Company hold an honourable position among those Companies which supply gas at a very low rate. At the recent annual meeting of the Company, when profits amounting to £9388 were announced as the result of last year's working, and a dividend at the rate of £7 15s. per cent. per annum on the Company's stock was declared, it was also decided to reduce the price of gas, as from the commencement of the current year, by twopence per thousand cubic feet, making the lowest and highest net prices charged by the Company about 2s. 3d. and 2s. 7½d. per thousand cubic feet respectively. When the Company's new arrangements for saving working expenses come into full operation at the Jarrow works, it is confidently expected that further reductions in price will be possible. Some additional interest attaches to the proceedings of the Tyneside Gas Companies at this juncture, from their proximity to the local field of Mr. Swan's operations with the incandescent electric lamp. Sir William Armstrong's is a name to conjure by in this district, and his countenance of the talented Newcastle electrician's proceedings in regard to domestic electric lighting, would alone suffice to make the local gas shareholders alive to the possibilities of competition of this character. It is, however, pleasing to observe the friendly spirit which pervaded the references made to Mr. Swan at the meeting, and there can be no doubt that there are enough dark places in the world to give employment for all methods of lighting which can be invented and put in successful use by man's ingenuity. Many irresponsible persons, upon seeing an electric light for the first time, at once jump to the conclusion that gas must go out of use on an early date; and this mistaken notion is sometimes fostered, for plain reasons, by persons who should be better informed. We, on the contrary, can await the inevitable course of events, without demanding the instant extinction of every electric light in the country—to copy the action of threatened vested interests in the dark ages. At the same time, and while freely confessing that the process of evolution must go on unhindered with advancing time, we may be pardoned for expressing, on this and all suitable occasions, the conviction that, for the present, gas lighting shows as much vitality as its younger rival. It is said that "threatened men live long;" and we believe that the truth of this aphorism will be borne out in the matter of domestic illumination.

THE GAS-EXHAUSTERS AT THE SOUTH METROPOLITAN COMPANY'S WORKS.—In reference to our last week's notice of the new exhausting arrangements now in operation at the Old Kent Road Gas-Works, Messrs. B. Donkin and Co., the makers of the machinery in question, send some additional information respecting it. Each of the 30-horse power patent compound engines is intended to drive several exhausters, besides doing other work, and this involves a complication of shafting which would otherwise be avoided, and the power absorbed by which should in strictness be deducted from the record of the total work done. If this allowance is made, the new patent exhauster, making 80 revolutions per minute, passed 200,000 cubic feet of gas per hour, with an expenditure of 21 indicated horse power. Under equal conditions the older exhauster, making 62 revolutions per minute, passed 150,000 cubic feet of gas per hour, with 19½ indicated horse power.

Water and Sanitary Affairs.

As we anticipated last week, Lieut.-Col. Bolton's January report on the London Water Supply contains a large amount of information respecting the action of the Water Companies during the severe frost which occurred in that month. The Kent, East London, Southwark and Vauxhall, Grand Junction, Lambeth, and Chelsea Companies, erected a total of more than 2500 stand-pipes, the expense of working these, irrespective of their cost, being £2800. In addition, the New River Company erected 1330 stand-pipes, and the West Middlesex 1434; but the latter have not sent in any statement of the expense, and in the case of the former an expenditure of £1750 is put down as arising, not from the erection of stand-pipes alone, but also from the measures necessary to keep the river channel free from obstruction. As less than half the total number of stand-pipes set up in the Metropolis led to an outlay of nearly £3000, we may fairly calculate that the total expense on this account could not have been less than £5000. Statements have appeared in the daily papers, complaining that the stand-pipes were not sufficiently numerous, and that the public were not duly apprised where to find them when erected. Little or nothing has been said as to the difficulty of planting the stand-pipes in the streets, seeing that the ground was thickly encumbered with snow. The report concerning the New River Company says: "In consequence of the manner in which snow was 'heaped up in many places, and the necessity of avoiding 'obstruction to traffic, &c., the places of stand-pipes could 'not always be so chosen as to be within sight of every 'house intended to be thereby served; but the Company's 'men called, as a rule, upon all inhabitants not likely to see 'a provided stand-pipe, to inform them of the place and 'time of its erection." In the district of the West Middlesex Company, the man in charge of each stand-pipe had orders to walk up and down the street, calling out "Water." In Lambeth, "the turncocks were sent round to inform the 'public that the stand-pipes were fixed, and where to find 'them." Lieut.-Col. Bolton observes that the permanent stand-posts fixed on the kerbstones, and belonging to the parishes, might be utilized with great advantage during frost; but on the recent occasion there were no signs of any attempt being made in this direction. Of course, a little co-operation between the Vestries and the Water Companies would be necessary for this purpose, and such an arrangement is not very easily secured. The figures thus given as to the expense incurred by the London Water Companies in connection with the extraordinary frost which signalized the month of January, cannot be supposed to represent the entire charge. They merely show the current disbursements. There was an enormous waste of water, arising from the bursting of consumers' pipes and some of the smaller mains, in addition to the waste caused by taps being left slightly turned on to prevent freezing. The New River Company say that the cost of repairing their own pipes may be estimated at about £450, and their compensations in connection therewith may be put at about £350 more. The breaking of three and four-inch mains and service-pipes put the Grand Junction Company to an expense of about £400. The filter-beds of the various Companies also called for special attention, and the intakes had to be carefully watched in order that they might be kept clear of ice. Attention is now called to the fact that the small amount of earth on the top of railway bridges and over some of the sewers, prevents the laying of the water-mains at a proper depth, so as to protect them from the frost. Better protection is also required for communication-pipes. In the midst of all the difficulties consequent upon the severity of the weather, it is satisfactory to learn that only one instance occurred in which there was any deficiency of water at a fire. In this solitary case the fire broke out while a main was being repaired, and even then the mischief was limited to a very brief delay. The Companies received an immense number of complaints concerning stoppages in the domestic water supply, but in the great majority of cases the evil was found to arise from the state of the pipes and fittings within the houses. The Lambeth Company attended to nearly 500 such complaints. The Grand Junction received 983 complaints, and the Southwark and Vauxhall as many as 1200. A large number of consumers seem to have boundless faith in the power of the Companies to give them an unlimited supply of water under all circumstances. The Companies approach as near to this degree of perfection as they can, and we think it must be allowed that they have passed creditably through the recent ordeal. We should add that

Lieut.-Col. Bolton's report is a valuable document, and will serve as a useful record of an exceptional visitation.

The *Analyst* of the present month gives its second series of reports on the public water supplies of England. It is intended to include Scotch and Irish towns as well, and a commencement is already made in the case of Edinburgh. With one exception, that of Nottingham, analyses are given of the supplies of every one of the twenty large towns of which the rate of mortality appears in the Registrar-General's weekly reports. Taking a general review, it is found that the character of the water supplied in February to the towns reported upon was almost uniformly worse than that supplied in January. The difference is attributed in some degree to the effect of the heavy snow-fall which took place in the latter part of the first month. We presume we are to understand by this that the subsequent thawing of the snow had an injurious effect on the sources of supply. The water of King's Lynn appears to have been peculiarly unfortunate, being found to contain "bacteria, diatoms, and a leech." "Moving organisms" are reported at Newark and Whitehaven, and "vegetable debris, amœbæ, and diatoms" at Wolverhampton. The water of Bradford contained "amorphous peaty matter," and was of a "faint dirty yellow." A portion of the Oldham water, as also that of Plymouth, was "yellowish green, slightly opaque," that of Sheffield "turbid brown," though without deposit, and that of Worcester "brown opaque." Among the London analyses, we have one of the well water which goes to supply the fountains in Trafalgar Square, but some portion of which is said to be used for drinking purposes. Its colour, as seen in the two-foot tube, is described as "clear, pale, greenish yellow." The "greenish yellow" tint will be distinctly recognized by those persons who are familiar with the fountains. The quantity of chlorine in this water is said to be as much as 11.70 grains per gallon. In describing the colour of the water supplied by the West Middlesex Company, we question the taste as well as the correctness of Mr. O. Hehner in describing it as "urine yellow." The comparison is suggestive of that which is altogether remote from the fact, and is simply absurd. But the reports, taken as a whole, are extremely valuable, and are likely to become still more so as the plan undergoes development. In the present instance, we have the chemical analyses of more than fifty waters, comprehending nearly forty different towns. There is also a description of the sources of supply and the method of filtration, if any.

At a meeting of the Liverpool City Council on Wednesday last, it was resolved, in accordance with the report of the Water Committee, that Mr. Thomas Hawksley, C.E., should be engaged as Chief Engineer of the Vyrnwy water-works, at a commission of $2\frac{1}{2}$ per cent. Considerable discussion took place in reference to another proposal from the Committee—that Mr. G. F. Deacon, the Water Engineer to the Council, should be appointed to act in conjunction with Mr. Hawksley, with certain additions to his present salary. An amendment to adjourn the consideration of the subject was moved, but was lost by 23 votes against 14, and the report of the Committee was adopted. The opposition appeared to be based solely on pecuniary considerations, it being argued that Mr. Deacon would be largely benefited in his future professional career by having been thus associated with Mr. Hawksley, and would be sufficiently compensated by that advantage. On the other hand, it was urged that Mr. Deacon was so thoroughly identified with the Vyrnwy scheme, and with all its engineering details, that the Corporation ought by all means to secure a continuance of his services. At present he could leave by giving a month's notice; but by the terms of the proposed arrangement he would be required to remain for five years, after which period he would not be likely to leave until the Vyrnwy scheme was an accomplished fact. It was also shown that had it not been for the work already done by Mr. Deacon in preparing the plans and reports connected with the proposed works, Mr. Hawksley would have claimed a higher rate of commission. We are disposed to think the Corporation have acted wisely in the course they have adopted.

The Stockton and Middlesbrough Corporations Water Board are evidently in a position which is daily becoming more critical. The growing demand for water in their district, consequent upon the revival of trade, is such that it cannot be long before it will altogether exceed the resources which the Board have at their command. Unfortunately it happens that, although the revenue from the water supply has increased, still the profits are not sufficient to pay the interest on the money borrowed to purchase the works, and

consequently there is no fund from which to defray the cost of the extension which will soon be urgently necessary. It is suggested that if a slight increase were to be made in the charges levied on the ironmasters for their supply, the Water Board would obtain a profit. It is obvious that the people of Stockton and Middlesbrough must pay for their water supply in some shape or way. If the rental they pay for the water is insufficient, they must make up the deficiency out of the local rates. On the whole, it would seem better that they should pay for the water according to a scale that will make the supply remunerative. If this had been done at an earlier date, the Water Board would not now find themselves in the awkward dilemma of being called upon to increase the supply without knowing where the water is to come from, or the money to pay for it. Seemingly, they would have been happier if Middlesbrough had continued to languish, so that the demand for water might have been kept down. They have parliamentary powers for carrying out extensive works, but the scheme is declared to be too costly, and the compulsory powers of purchase will soon expire. The difficulty must be faced in some manner, and the Corporations of the two boroughs had better at once address themselves to the task.

PROVISIONAL ORDERS FOR 1881.

THE following applications have been made to the Board of Trade for Provisional Orders in respect of gas and water undertakings:—

The *Ashford (Kent) Water-Works Order* is intended to empower the Ashford (Kent) Water-Works Company, Limited, to supply water in the parish of Ashford and several neighbouring parishes, all in Kent. The capital of the Company is stated to be £20,000, with power to borrow £5000. The rates to be levied for water supplied for domestic purposes are from seven to eight per cent. on the annual value of property above or below £20 respectively, with extras. Water for public purposes is to be supplied to the Local Authority at the uniform price of 1s. 6d. per thousand gallons; and when supplied to consumers by meter the Company are to charge meter-rent not exceeding twelve and a half per cent. per annum of the cost of the meter.

The *Brentford Gas Order* is to enable the Brentford Gas Company to raise, by the issue of new shares, additional capital to the extent of £750,000, and to borrow an equal amount on mortgage or debenture stock. It is proposed to repeal a provision of the Company's Act of 1868 regulating the dividends on the ordinary capital, and a clause is inserted in this Order, providing that a ten per cent. dividend shall be payable on the Company's capital authorized in 1858 and 1868, and on the new capital. The borrowed money to be sanctioned by this Order is not to be converted into capital, and the new shares are to be issued under the auction clauses. The Company seek to have their initial price fixed at 4s. per thousand feet. Certain additional lands are to be taken for manufacturing gas and residual products; and the Company desire power to deal with the residuals of other gas undertakings, and to supply gas in bulk.

The *Chichester Gas Order* is chiefly to enable the Company to raise £10,000 additional seven per cent. capital by shares, and £2500 by borrowing. The new capital is to be issued under the auction clauses, and the sliding scale is to be imposed with an initial price of 5s. per thousand cubic feet. A clause is inserted to empower the Company to charge a fine of one penny per thousand cubic feet extra for every shilling forming part of the standard price on all gas accounts not paid within one month after demand.

The *Dyserth, Meliden, and Prestatyn Water Order* is to authorize the construction of works for supplying water in the localities named, and others in the county of Flint. The undertakers' capital is not to exceed £5000, with power to borrow £3000 in respect thereof. The contemplated works comprise a filter and clean water tank and certain lines of main.

The *Ely Gas Order* is to empower the City of Ely Gas Company, Limited, to maintain and continue their gas-works. The original capital of the Company is £12,000, of which £10,500 has been called up. The present Order is to sanction the raising of £12,000 additional capital by auction, and £6000 by borrowing. The sliding scale is to be introduced, with 5s. per thousand cubic feet as the initial price. The gas is to be of fourteen-candle power, supplied at the usual pressure.

The *Grays Thurrock Gas Order* is to empower the Grays Thurrock Gas and Coke Company to maintain and continue gas-works, with a capital of £10,000, and power to borrow

£2500. The price of gas is not to exceed 6s. per thousand cubic feet within a circle of one mile radius from the gas-works, and sixpence extra beyond that circle.

The *Harwich Water Order* is to authorize the maintenance of water-works, and the construction of additional works of water supply in Harwich, Dovercourt, and Ramsey. The capital of the undertakers is stated at £20,000, with power to borrow £5000 in respect of the same. The contemplated works include a well and pumping-station and storage reservoir, with line of main. The rates for domestic supply are set out in detail, and there are no prices defined for the supply of water to shipping or to the Local Authority. Meter-rents are not to exceed fifteen per cent. per annum on the cost of the meter. A penalty of £10 per day is to be incurred for default in the purity of the water supplied.

The *Henley-on-Thames Water Order* is to empower the Henley-on-Thames Water Company, Limited, to construct water-works, and to supply water to the town of Henley-on-Thames, and to portions of two neighbouring parishes. The share capital of the undertakers is to be limited to £20,000, with power to borrow £5000. The works to be authorized by the desired Order comprise a well and pumping-station, a service reservoir, and several lines of pipes. Rates of eight and seven and a half per cent. per annum are to be levied on dwelling-houses for a supply of water for domestic purposes, and it is provided that double the usual rates may be demanded in the case of schools. The supply of water to local authorities is to be charged for at a rate not exceeding 5s. per thousand gallons. A penalty of £10 per day is to be paid by the Company if the water should be of less purity than is required by the provisions of the Order. The undertakers seek power to sell the whole or any part of their interest in the undertaking to any public body, giving the Corporation of Henley the right of refusal.

The *Ilford Gas Order* is chiefly intended to authorize the Gas Company to raise additional capital. In addition to the capital which they are already empowered to raise by their Order of 1873, the Company desire to raise, under the auction clauses, the additional amount of £12,500 in shares, and to borrow £4000 in respect of same. The sliding scale is to be introduced, with 6s. 6d. per thousand feet as the initial price.

The *Kirkham Gas Order* is to authorize the Company to construct and maintain gas-works for Kirkham and adjoining places in Lancashire. The share capital of the Company is to consist of £15,000 original, and £5000 additional capital; with power to borrow £5000. Fifteen-candle gas is to be supplied at a maximum price of 7s. per thousand cubic feet.

The *Newhaven and Seaford Water Order* is to sanction the construction of works of water supply in the places named and their vicinity. The capital of the undertakers is fixed at £30,000, with power to borrow £7500. The works contemplated by the Order include a well and pumping-station, reservoir, and two lines of pipes. The Newhaven and Denton Water Order, 1880, and the East Blatchington and Seaford Water Order, 1880, are both to be annulled by the present Order. Rates of eight and seven per cent. are provided for domestic water supply, with the usual extras; the shipping in the port of Newhaven are also to be supplied with water at rates to be agreed upon.

The *Newport and Pillgwenlly Water-Works Order* is to empower the Company to raise £80,000 additional eight per cent. share capital, and to borrow £20,000 in respect of same.

The *Northfleet and Greenhithe Gas Order* is to empower the owner of the gas-works at Northfleet to amalgamate his undertaking with that of the Greenhithe Gas Company, Limited, under the title of the Northfleet and Greenhithe Gas Company, Limited. The several Orders obtained for the respective undertakings are to be repealed. The two concerns are to be amalgamated from and after the 1st of July next, with £14,000 of combined original, and £16,000 additional capital, to be raised under the auction clauses, and with power to borrow £7500. The sliding scale is proposed, with 5s. per thousand cubic feet as the initial price for fourteen-candle gas. A saving clause is introduced in the interest of the Conservators of the River Thames.

The *Pinner Gas Order* is to empower the Proprietors of the existing gas-works at Pinner, Middlesex (Messrs. C. C. and W. T. Walker), to construct and maintain gas-works in that place with a capital of £16,000, and power to borrow £4000 in respect of the same. Fourteen-candle gas is to be supplied, at an initial price of 7s. per thousand cubic feet, with the sliding scale.

The *Poole Water Order* is to empower the Company to

raise £12,000 of new ordinary seven per cent. share capital, and to borrow in respect of the same the sum of £3000.

The *Staines and Egham Gas Order* is to authorize the Company to raise £14,000 additional capital by auction of new shares, with power to borrow £6000. The sliding scale is included, with 5s. 6d. per thousand cubic feet for gas supplied in their present district, and 7s. per thousand cubic feet for gas supplied elsewhere, as the initial prices. A clause is inserted whereby unclaimed dividends shall be forfeited after three years. The Company also contemplate an extension of works.

The *Stone Gaslight and Coke Company's Order* is intended to empower the Company to maintain and continue their undertaking with £10,000 original and £10,000 additional capital, to be raised by auction, and power to borrow £5000. Fourteen-candle gas is to be supplied, at maximum prices of 4s. 6d. per thousand cubic feet within the township of Stone, and 5s. 6d. per thousand cubic feet outside that district.

The *Waltham Abbey and Cheshunt Gas Order* is to empower the Company to raise £25,000 additional seven per cent. capital, and to borrow £6250 in respect of the same. The new capital is to be raised by auction, and the sliding scale is to be imposed, with 5s. per thousand feet as the initial price for fourteen-candle gas. The Company desire to extend their works, and to be enabled to supply gas in bulk.

The *Woking and Horsell Gas Order* is to authorize the Company to make and maintain gas-works for the district of Woking, Surrey, with a capital of £15,000 in shares, and power to borrow sums equal to one-fourth part of the paid-up capital. Fourteen-candle gas is to be supplied, at the maximum price of 6s. 6d. per thousand cubic feet.

A Local Government Board Order is sought by the Corporation of the Borough of Bridgnorth, to sanction the acquisition by the Corporation of the Gas Company's undertaking—a proceeding which has been agreed upon between the parties. Fifteen-candle gas is to be supplied by the Corporation, at the maximum price of 5s. per thousand cubic feet. In respect of capital charges, the Corporation are to be enabled to form a reserve fund of £1000, by apportioning for that purpose a yearly sum not exceeding ten per cent. on the gas revenue. No surplus revenue is to be carried to the district fund when the price of gas to private consumers exceeds 3s. per thousand cubic feet. The public lighting is to be on the average meter system, and a separate account of it is to be kept; and the price of gas for public lighting is not to be more than ten per cent. under that charged to private consumers.

WE have been asked to notify that the London offices of Messrs. R. Dempster and Sons are now at No. 106, Cannon Street.

INSTITUTION OF CIVIL ENGINEERS.—At the meeting on Tuesday last, the monthly ballot resulted in the election as Members of the Institution of Messrs. Walter Fiddes, Engineer of the Gaslight Company, Bristol, and Charles Hunt, Engineer, Corporation Gas-Works, Birmingham. At the same time Messrs. Charles Clegg, Borough Surveyor, Colchester, Charles Stafford Ellery, Gaslight Company, Bath, Edmund Herbert Stevenson, Westminster, Fletcher Wilson Stevenson, Engineer, Gas-Works, Chester, and Sidney Evance Stevenson, Engineer, Gas-Works, Exeter, were elected Associate Members.

NEWCASTLE AND GATESHEAD WATER COMPANY.—At the annual general meeting of this Company on the 25th ult., the Chairman (Alderman Plummer), in moving the adoption of the Directors' report, stated that owing to the progress made with the Company's new reservoir on the Swinburn they had about 300 million gallons of water more than they had ever had since the Company came into existence. Their former storage was 1200 million gallons; and when the reservoir was completed it would give them about 1100 million gallons more—making a total of 2300 million gallons, and making allowance for the summer flow of the streams they would have storage for 300 days. The report was adopted, and a dividend of 6½ per cent. per annum was declared for the half year ending Feb. 1. The retiring Directors (Messrs. Allhusen and Brown) and Auditor (Mr. R. Foster) having been re-elected, a special meeting was held with the object of obtaining the Shareholders' sanction to the conversion of the Company's preference shares into stock, and to paying off the existing debentures as they became due, and creating debenture stock at 4 per cent. interest instead. Resolutions to this effect were carried, and the proceedings closed with a vote of thanks to the Chairman.

THE ALBO-CARBON LIGHT.—It is reported that some elaborate experiments have recently been made with the albo-carbon light by Mr. T. W. Keates, Consulting Chemist to the Metropolitan Board of Works, from which it appears that 5 cubic feet of gas burnt in a Bray's No. 1 burner, in connection with the albo-carbon apparatus, gave a mean light of 36·7 candles, showing a gain of 20·7 candles against a similar quantity of gas consumed in another burner unconnected with the new appliance. The latter when subjected to photometrical test gave 2½ times increase of light in favour of the albo-carbon process. The experimenter also found that, light for light, much less heat was evolved. A further photometrical test which has been carried out by Mr. J. Mander at the office of the gas inspector to the Great Western Railway Company affords the following data:—With gas at a uniform pressure of 9·10ths, a consumption of 2·5 cubic feet of gas through a Bray's burner, No. 1, gave an illuminating power equal to only 1·08 candles without enrichment; but on passing the gas through the albo-carbon apparatus, and slightly increasing the quantity used (to 2·7 feet), the illuminating power was 9·08 candles in 20 minutes after lighting, increased to 13·06 candles 10 minutes later. A consumption of 3·8 feet of gas through a Brönners burner, No. 4, gave an illuminating value of 8·02 candles.

MEASUREMENT AND CURRENCY.*

A BOOK which has already run through five editions, and is now entering upon the sixth in an enlarged and revised form, cannot be supposed to call for extended criticism. In the present case, a notice of the varied contents of Mr. Woolhouse's admirable little work would at once show that any book containing such a store of information must necessarily be valuable, however compiled, so long as it is correct. We cannot, however, pretend to convey anything more than a very general idea of what is to be found in this small volume, and our readers must therefore accept the assurance we now give, that everything relating to the currency, weights, and measures of the different peoples of the world, together with accounts of the ways in which most of them compute their time, will be found herein carefully put together for the use of the English student. Recent changes by foreign Governments in the systems of weights, measures, or coinage favoured by them, are carefully marked by the author. The spread of the French metric system is shown very remarkably by Mr. Woolhouse, and for this fact any one who has ever been plagued with the multiplication of the old continental systems cannot be sufficiently grateful. When it is remembered that in the little country of Switzerland alone there were, until recently, seven distinct methods of reckoning the value and dimensions of everything, the blessings conferred on the English visitors to that land by the metric system, since its adoption there, may be appreciated. Conflicting weights and measures always result in loss to the unwary, and the general advent of the metric system, with all its inconveniences, is preferable to the anarchy in such matters which once prevailed at our doors, and even among ourselves. It cannot be said that the British standards are the most rational in existence; and, in fact, they are so inconvenient that our own colonies have individually introduced systems of currency of their own, until it has come about that the flag of the most commercial nation in the world shelters a heterogeneous muddle of coins, weights, and measures, the relative computation of which must, in time alone, cause an annual loss of thousands of pounds sterling. In the work before us, the author gives tables comparing English with the principal standards of length used legally and generally throughout the world, so that time and labour may be saved in this respect. A considerable bulk of the book is taken up with measures of time. An index would materially help the use of Mr. Woolhouse's work as a book of reference for busy men, who may now have to turn over many pages in search of the tables of any particular country; and we trust he will be able, in a future edition, to make such a provision. In other respects both the matter and arrangement are satisfactory.

Communicated Article.

THE TRANSPORT OF MATERIALS FOR GAS-WORKS.

ILLUSTRATED BY THE PLANS OF THE
YORK, NEWCASTLE-ON-TYNE, AND BECKTON GAS-WORKS.

By V. WYATT,

Constructing Engineer to The Gaslight and Coke Company.

FOURTH ARTICLE—BECKTON GAS-WORKS.

These works have been described and delineated from time to time in the JOURNAL, but not in their complete and present form, and with especial reference to the railway and other communications for supplying and carrying on the gas industry of the place. The means for the transport and delivery of heavy material are of the most modern and comprehensive character, and what with the river pier, the quays, the port facilities, and the general railway and road arrangements, the manipulation and transfer of goods to and from the various parts of the works are effected with the utmost despatch, regularity, and economy at all hours of the day and night. It could only happen with such a powerful Gas Company as the one who possess and have had the courage and resources to build so great an undertaking, that such a gas factory were possible and feasible; having to supply, as these works do, the gas necessities of upwards of one-third of the Metropolis, or say nearly two millions of people. In laying out and constructing the details of the Beckton works, the writer had always present to his mind the almost unlimited demands, so constantly growing, of such a population as London alone presents, and therefore the different sections of the works have been schemed and carried out with such an amplitude of form, detail, and space, as to preclude as much as possible, in the future, the destruction and clearing away of the earlier lines of the establishment in making room for the extensions. All has been made and arranged to work in with great future growth, and a more than ordinary increase of output of gas and products for metropolitan wants.

The port of Beckton has been entirely created and evolved, as it were, from the mud-banks of the Thames, on part of the Essex Marshes, situated about a mile below Woolwich; and where are to be found all the river facilities approaching the Port of London, for the passage and reception of the largest vessels and steam colliers. The site is also of avail and service through all the months of the year; the severity of the season being but a slight impediment to the regular work of the port. As an instance of the open character of this port during the past winter, the derricks in the River Thames, constructed especially for the unloading of the household and other coals coming into the river, were stopped during the recent severe frost, whereas the Beckton pier and machinery for unloading

coals were in full operation, and serving every ship that came alongside.

The works completed at the port have been most efficiently carried out; and, for the trade carried on, at a very moderate cost, compared with ports where the same amount of business is done. There is the river pier, which has a frontage parallel to the River Thames of about 800 feet, and projects forward to the low-water line about 400 feet at right angles to the river wall or quay, which latter is about 1,700 feet long. The upper platform, from which the coal and heavy traffic are received and despatched on to the works, stands 28 ft. 2 in. above the ordinary spring tides of the Thames, usually denominated as T. H. W. (Trinity high-water mark), the standard datum of the Port of London, and about 48 ft. 8 in. above low-water mark of same tides. The vertical rise of tide corresponding to an ordinary spring tide level is 20 ft. 6 in. at Beckton port; but there are on several days of the year exceptional tides which oscillate between the above level and a height of 4 ft. 8 in. above this standard. Consequently there is at times at Beckton a range of tide, allowing for the extra recessing of low-water mark, of nearly 30 feet. The large tide which flowed on the 18th of January last, accompanied as it was with the great snowstorm, rose to the height of 4 ft. 8 in. above Trinity high-water mark. On this day the wind pressure was 51 lbs. per square foot, with a velocity of rather more than 100 miles per hour, putting to the severest test the gasholders and structures at Beckton. These, however, resisted the gale, and came off unscathed. This high periodical flood of tide water gives to Beckton, and all sites well down the river, great facilities for dealing with shipping and river craft of great tonnage.

The river pier has two decks—an upper one, at the level previously described of 28 ft. 2 in. above Trinity high-water mark, for the coal waggons and for the transit of trains; and a lower one, 12 ft. 6 in. below the upper deck, for the housing of the steam lifting and hydraulic machinery, and for other purposes. By an inspection of the plan which accompanies the present article, it will be seen that there are accommodations and berths at the pier for five steam colliers of largest type, ranging as they do in tonnages from 900 to 2400 tons. There are three ship berths on the front part of pier facing the river, and two inner berths, situated east and west of the centre line of the axis of the pier. The superstructure or upper deck carries three lines of single railway, parallel to the river front and to the ships when alongside; and the whole of the waggons on this level are taken from the locomotive trains as they arrive, detached and in piecemeal, manipulated at each end of the pier, east and west, over the three throw points and crossings, and adjusted and sent forward for loading under either the steam or hydraulic cranes. After the waggons are filled by the lifting machinery, they are marshalled off by curved routes on to their respective sidings, made up into trains of about 16 coal waggons each, in all carrying upwards of 80 tons of coal net to a train, and away they go, hauled by the locomotive, to any one of the stages of the twelve retort-houses, as the coals are signalled and wanted for carbonization.

The ordinary class of steam colliers arriving in the Thames are of about 1000 tons burden, and are discharged and let go in one tide; but the larger class of ships, which approach to and exceed a tonnage of 2000 tons, run into a second tide. The former class of ships are unloaded in from seven to eight hours when the wind and fog do not prevail to an excessive extent. The total capacity of the pier for unloading coal is very large, and probably it could transfer a bulk of 10,000 tons of coal in 24 hours from the ships into the waggons, and thence to the retort-houses—wind, weather, and supply of ships permitting. The power of the pier is only limited and controlled by the labour in filling the coal-buckets, in the ship's hold, and the manœuvring of the coal waggons under the cranes. The present output of coal in busy times reaches sometimes upwards of 22,000 tons per week of six working days; and before the pier was increased in accommodation from two berths to five, the output of coal reached 18,000 tons per week from two ships' berths only. The present maximum consumption of coals per day of 24 hours at Beckton being under 3000 tons at the busiest times, there is still a large margin of power at the pier for the rapidly growing factory wants of Beckton. A good margin of unloading power is absolutely necessary where weather and ships are important elements in the trade reckonings, and, in fact, this safety margin should never be less than 50 per cent. of the ordinary plant power required in the establishment. Besides the common coal and cannel imports at the pier, there are the import and export wants of the manufactured products department—such as pitch, anthracene, creosote, sulphate of ammonia, &c., which are growing rapidly, reaching an annual export at present of about 100,000 tons. These products are mostly handled at the middle berth of the front part of the pier, as the expedition with these is not of such vital importance as for the coal, and this berth is not so quickly operated as the others.

The vertical lift of the skips for unloading coal, &c., from the ships from extreme low-water line to a height sufficient to clear the coal waggons running on the upper deck, is about 60 feet; but beyond this run-out of chain there is required, to facilitate the transfer of the skip along the bottom of the ship's hold, a further 30 feet of chain, making in all a total length of chain run out, for the extreme range of tide, of about 90 feet. This great run-out, of chain at times involves excessive speed of machinery and gearing to do the duty in the required time; in fact, the duty amounts to more than one skip or bucket per minute during the time of unloading, which short space of time includes the handling in the ship, lifting, reversing, and unloading the skip into the waggon. The lift itself must be performed at the rate of 60 feet in 10 seconds, and even somewhat quicker than this. The machinery for performing this work is divided into two groups, the one at the east or down-stream end of the pier being on

* "Measures, Weights, and Moneys of all Nations, and an Analysis of the Christian, Hebrew, and Mahometan Calendars." By W. S. B. Woolhouse, F.R.A.S., F.S.S., &c. Sixth edition. London: Crosby Lockwood and Co.

the hydraulic system, and that at the west or up-stream end being the ordinary steam winches and cranes arrangement.

The reason of the present double system of hydraulic and steam working is that the western portion of the pier, being the first constructed, was arranged with steam machinery for two ships' berths only, and this has been operated most successfully by the six steam cranes for the past ten years and upwards. When the western extension of the pier was carried out and brought into use in 1879, it was deemed more in accordance with modern scientists' notions, and the economy of coal-lifts, to adapt the hydraulic system for discharging cargoes, but of the feasibility of this course more will be said hereafter. At the east end and central part of the pier the hydraulic machinery is the motor, as before stated, and it is placed on the lower deck of the pier, over the central and eastern divisions. It may be premised here that the front section of the pier, parallel with the river, is constructed with two decks, an upper one, 44 feet wide over all, and a lower one, 36 feet wide over all, spaced $12\frac{1}{2}$ feet vertically apart; the machinery generally for operating the pier, including the men's meal rooms, stores, and other offices, being on the lower deck, and the railways, cranes, and traffic plant being on the upper one.

The hydraulic machinery at the east end of the pier was originally arranged and intended ultimately to work the entire pier of from 15 to 20 cranes, as occasion required, for five ships at one time alongside; but up to the present time it is only utilized for three of the ships' berths, the older steam machinery at the west end being in full operation for the other two berths. The hydraulic system is composed of nine cranes, each crane having, as before stated, an extreme vertical lift of 60 feet, and a slack or run-out of chain for the ships' holds of 30 feet, making in all a total run-out of 90 feet, with a sweep or radius to the crane of 20 feet. Each crane is situated on the upper deck, and lifts in the one operation about 13 cwt. of coal net, which, with the weight of the bucket included, weighs a little over a ton. The ordinary working capacity of each crane is about 40 tons of coal per hour, and there being three cranes generally to each ship, the work done and discharged is equal to about 120 tons per hour, being at the rate of about one skip per minute per crane, allowing for the necessary shifting of buckets, reversing, tipping, &c.

The hydraulic cranes are operated by two horizontal high-pressure double-cylinder pumping-engines placed upon the lower deck, each being equal to 75-horse power actual. The cylinders are 16 inches in diameter and 2-feet stroke, worked by steam of 50 lbs. pressure per square inch from the boilers. The force-pumps are $4\frac{1}{2}$ inches in diameter and 2-feet stroke, working with a water pressure of 700 lbs. per square inch, which raises the accumulator. Each engine can be run at a speed of 60 revolutions per minute; and each engine was intended to perform two-thirds of the entire duty of the pier, when the tide is at low water—that is to say, to operate ten cranes in full duty; but this would be a somewhat exaggerated value of its power in practical use, the number of six cranes being nearer its actual performance. To produce the steam for these engines there are six Galloway boilers, placed also upon the lower deck of the pier, each 5 ft. 3 in. diameter and 22 feet long, with an internal flue 2 ft. 9 in. diameter, and four conical Galloway tubes in each flue. The boilers are worked with steam of 50 lbs. pressure per square inch.

The accumulator, which is situated at the eastern end of the pier, and the casing of which forms a lighthouse to guide the river craft, has a ram 17 inches in diameter, of 17-feet stroke, with the necessary relief valves and apparatus for governing the engine power by the rise and fall of the accumulator. It is weighted to give the necessary water pressure of 700 lbs. per square inch, by a dead load of pig iron slabs equal to a gross load of 75 tons, and sufficient to operate eight or ten cranes at one time in full work. If the hydraulic machinery had been utilized for the entire pier of from 15 to 20 cranes, it was contemplated to place a second accumulator at the western end of the pier, forming a similar lighthouse to the one at the east end of the pier, to guide the shipping in the river.

The nine hydraulic cranes are each controlled by a man in a crane-house on the upper deck of the pier. The pressure-pipes for the hydraulic system are 4 inches in diameter inside, with 5-inch diameter return pipes to the water-tanks in the engine-houses. The lifting-rams to the cranes, which operate by gearing placed between the two decks, are $7\frac{3}{4}$ inches in diameter, with cross-heads and sheaves to multiply ten to one, giving a stroke of 9 feet to the ram, equal to a total run-out of chain of 90 feet, as before stated. The cylinders for these rams are $8\frac{1}{2}$ inches in diameter. The lifting-chains are made up of $\frac{3}{4}$ -inch diameter best short links. The turning rams for reversing or swivelling round the coal buckets over the centres of coal waggons on the upper deck, are 4 inches in diameter, and multiply two to one, with a stroke of 4 feet, giving the crane a horizontal movement of one-third more than a complete turn. The cranes on the upper deck are of the tubular whip type, of wrought iron, to allow of the easy clearance of the waggons on the upper deck, and to prevent injury to the men moving on the platform of the upper deck. The ordinary Armstrong hydraulic crane, with its straight and unsightly jib and arrangements, is inapplicable to the Beckton pier routine, and is dangerously low in its details for expeditious work.

At the west end of the pier, which was the first portion of the pier finished, and brought into use in 1870, for the accommodation of two steam colliers at one time, the machinery for lifting the coals consists of six steam cranes. It may be mentioned here that the whole of the coal lifting at Beckton for about ten years, and until within the past eighteen months has been performed by these six steam winches and cranes; and upwards of 4,000,000 tons of coal discharged by them in this period. This machinery has worked equably and well during the whole time, without hindrances or delays of serious import, both for the day and night duty; and the six cranes have occasionally unloaded between 3000 and 4000 tons of coal from the

two berths in the 24 hours, discharging four steam colliers in the time. The machinery situated on the lower deck of the pier for this section, comprises six 1-ton capacity coal-lifting winches, worked in conjunction with the six wrought-iron whip-shaped cranes, situated upon the upper deck. The steam cranes were designed to lift the coal at the rate of 300 feet per minute, to enable one bucket of coal, of from 12 to 13 cwt. net, to be handled and cleared in one minute. The cranes are spaced similarly to those of the hydraulic system, with respect to the ships' holds, at two centres of 51 feet and one centre of 38 feet, to suit the hatchways of the ships. The chains are formed of links with $\frac{3}{4}$ -inch diameter iron, as at the east end of the pier. The steam winches have attached to them spirally grooved chain barrels, 2 feet in diameter and 2 feet long; and are actuated by annular wheels of 56 teeth, $1\frac{1}{2}$ -inch pitch, $5\frac{1}{2}$ inches wide, keyed on to them, and geared into shrouded pinions of 16 teeth, 5 inches wide, keyed on to the crank-shaft of the steam-engines. Each winch or hoist has a pair of small steam-engines, with cylinders $8\frac{1}{2}$ inches in diameter and 10-inch stroke; working cranks at right angles to each other, with link reversing motion, actuated by working shafts and connecting-rods from the lever cabins, or crane-houses, situated on the upper deck. On each of the crank-shafts is a small fly-wheel, the periphery of which is a brake, worked by a lever and treadle operated by the man in the lever cabin upon the upper deck. Each steam winch is self-contained, and quite independent of the others. The swivelling or reversing gear to each crane is actuated by a steam cylinder 7 inches diameter and 3-feet stroke, and is placed transversely to the centre line of the pier, being secured to the outside main girder of the structure. The cranes can swivel round either way, east or west, to suit the conditions of working the ships.

The six winches are supplied by steam from two 30-horse power Cornish multitubular boilers, each 18 ft. 10 in. long, exclusive of the smoke-box, and 5 feet in diameter. The furnace flue is 11 ft. 8 in. long and 3 feet in diameter, terminating in 53 tubes 3 inches outside diameter, and 7 ft. 3 in. long. There are two conical tubes to assist the circulation, crossing each other in the flue between the bridge and tube plate. The shell of the boilers is $\frac{3}{8}$ -inch thick, with end plates $\frac{1}{4}$ -inch thick, flue plates $\frac{1}{2}$ -inch, and tube plates $\frac{1}{4}$ -inch thick. The uptake or chimney is 66 feet long and 2 ft. 6 in. diameter, running under the upper deck, and through the centre of the light-house at the west end of the pier which guides the shipping. The steam-pipes from the boilers are 4 inches in diameter to supply the steam winches, having faced flanges and red lead at the joints, and brass wire gauze. From these 4-inch main steam-pipes there is a 2-inch steam-pipe leading off to each of the six winches; and 1-inch steam-pipes to actuate the swivelling cylinders, with stop-valves close to the main steam-pipe. All the steam-pipes are covered with canvas and composition. The exhaust steam-pipe from the winches and swivelling cylinders are gathered up into a main-pipe 4 inches in diameter, running under the floor of the lower deck, inclined to a centre cylinder at the west end of the pier, where it descends as a 3-inch diameter pipe into a condenser, sunk into the river below the low-water line. The condenser is an iron vessel 2 ft. 6 in. diameter and 3 feet high, traversed by 156 tubes, $1\frac{1}{2}$ -inch diameter outside, attached to one of the pier cylinders. The condenser permits a circulation of the river water through the same. The exhaust-pipe enters among the tubes. The condensed water is raised by a lifting pump $2\frac{1}{2}$ inches in diameter, worked by a donkey pump, into a tank 4 ft. by 2 ft. 6 in. by 2 ft. 6 in.—placed between the boilers as a reservoir to feed the same—by feed-pumps worked by the before-mentioned donkey pump.

The steam cranes, like the hydraulic cranes at the east end of the pier, lift up the iron skips or buckets of coal from the steam colliers alongside of the pier, containing about 13 cwt. of coal each, fitted with wheels on the bottom, so that they can easily traverse the holds of the vessels, and have bows and catches upon the top. There are small portable platforms, of a height to suit the coal waggons, upon the upper deck of the pier, where the men stand to operate and tip the coal buckets into the train waggons.

The steam cranes at the west end of the pier have, as before stated, been in constant use, day and night, since 1870, and have proved a formidable rival to the more modern hydraulic machinery at the west end of the pier since the completion of the latter. Their economy of fuel, great expedition in unloading the coal skips, and reasonable wear and tear, seem to defy the competition of the more expensive, complicated, and necessarily cumbersome hydraulic machinery. The steam machinery acts direct upon the load to be lifted with a length of chain to each crane, when fully run out, of 142 feet to the extreme vertical lift of 60 feet from low-water line to top of the coal wagon, whereas the hydraulic machinery with the same lift requires for each crane 300 feet of chain to be set in motion over the numerous sheaves of the lifting rams and cranes. The friction of the work done naturally follows the extra length of chain set in motion to lift the load; hence the fuel, steam, and wear and tear necessary to perform the same work by the hydraulic machinery is greater than with the steam cranes. These latter only want a few modifications and improvements in the details, the parts being made of a bolder, larger, and stronger type, and they would then form the most simple, expeditious, and economical type of plant for unloading material from ships alongside piers with either great or small lifts. With the winches there are no long water-pressure pipes, pumps, accumulators, complicated valve arrangements, heavy lifting-rams, with numerous sheaves cutting and carving into the lifting chains, liability to stoppage and breakage of pipes in frosty weather, and long rapidly-revolving chains, to call for an excessive power, noise, and probably more wear and tear in the long run.

[The remainder of this article, further describing the works, will appear next week.]

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE APPLICATION OF GAS TO HEATING THE TIRES OF RAILWAY WHEELS.

SIR,—In your issue of Jan. 18 is an account of an application of the above in the workshops of the Lower Silesian Railway. I may state that the same idea has been put to practical use for some years at the Worcester Locomotive Works of the Great Western Railway, by Mr. B. Giles, the Superintendent. The wheel to be heated is laid flat upon an iron plate, and the gas-pipe—1½ inches in diameter, pierced with a double row of holes, and made in two segments corresponding with the radius of the wheel—is laid against it. Tee pieces are let into the centre, to which a flexible tube is attached connected to the gas and air supply; and, the gas being turned on, air is admitted to the required amount. The air is taken from the blast supplying the forges, the pipe conveying it being passed through one of the fires to heat it.

The whole process is very rapid, economical, and clean. The same principle is applied to straightening bent axles, &c.

CHAS. E. BOTLEY.

Great Western Railway, Gas Department, March 1, 1881.

MR. E. GODDARD'S EXPERIENCE OF ABORTIVE COMPETITION WITH GAS.

SIR,—I have just read your interesting remarks about Mr. Goddard, in last Tuesday's JOURNAL, and your question, "How many schemes for superseding gas lighting has Mr. Goddard seen brought forward with much blowing of trumpets—to vanish into thin air one after another!" and it set me wondering whether he would kindly afford your readers the pleasure of seeing in print a list of the various companies he remembers, who started with the object of displacing gas. Such a list would, I venture to think, be most interesting, and not a little reassuring to investors in gas property, as I believe it would be copied into numberless papers for the digestion of the readers. In giving such a list, if a statement of the money invested, and lost, could be added, if not imposing too much labour on Mr. Goddard, I am sure the compilation would prove very valuable for reference, as hitherto I am not aware of such a record having been placed before the public.

S. SPENCER.

3, Queen Street Place, Cannon Street, E.C., March 5, 1881.

Parliamentary Intelligence.

HOUSE OF LORDS.
TUESDAY, MARCH 1.

The Select Committee on the Colne and Marsden Local Board Bill reported that they had not proceeded with the consideration of the Bill, having found that the petitioner had no *locus standi* before them.

The Committee on the Lower Thames Valley Main Sewerage Board Bill reported—"That it is not expedient to proceed further with the Bill."

THURSDAY, MARCH 3.

The Oban Burgh Bill was referred to a Select Committee, consisting of Earl Ducie (Chairman), Viscount Hood, Lord Clifford of Chudleigh, Lord Poltimore, and Lord Romilly; to meet on Tuesday, March 8.

Petitions against the Bray Township Bill were presented from (1) Corporation of Dublin; (2) Cesspayers, members of the Finance Committee of the County of Dublin.

FRIDAY, MARCH 4.

Petitions against the Bray Township Bill were presented from (1) Dublin, Wicklow, and Wexford Railway Company; (2) Earl of Meath; (3) Alliance and Dublin Consumers' Gas Company.

HOUSE OF COMMONS.

MONDAY, FEB. 28.

Requisitions to withdraw their petitions against the following Bills were presented:—Aberdeen Corporation, from House Proprietors (Thomas Clyne and others); Brighton and Hove Gas, from Vallance's Trustees.

TUESDAY, MARCH 1.

The Cambridge University and Town Gas and the Sheffield Water Bill, were reported.

The Bingley Water and Improvement, Bradford Water and Improvement, Holland (Parts of) and Sutton Bridge Water, and Goole and District Gas and Water Bills were referred to a Select Committee, consisting of Mr. J. G. Talbot (Chairman), Mr. H. Samuelson, the Marquis of Tavistock, and Mr. Ross; to meet on Tuesday, March 8.

The Egremont Local Board, Stalybridge Extension and Improvement, Fylde Water, and Cleator Moor Local Board Bills were referred to a Select Committee, consisting of Lord Eustace Cecil (Chairman), Mr. Brydges Williams, Sir H. Maxwell, Mr. Gurdon, and Mr. Bonham-Carter (Referee); to meet on Thursday, March 10.

WEDNESDAY, MARCH 2.

A requisition to withdraw his petition against the Aberdeen Corporation Bill was presented from George Christie Leslie.

THURSDAY, MARCH 3.

The Brighton and Hove Gas Bill was reported. A petition against the Matlock Water Bill was presented from Thomas Charles Bourne and George Robert Foster Haddelsey (as Devises in Trust and Executors under the will of William Lucas, deceased).

FRIDAY, MARCH 4.

The Paisley Burgh Bill was reported. Requisitions to withdraw their petitions against the following Bills were presented:—Cheltenham Corporation Water, from the Great Western Railway Company; Woking Water and Gas, from the Woking and Horsell Gaslight and Coke Company, Limited.

SATURDAY, MARCH 5.

A requisition to withdraw their petition against the Matlock Water Bill was presented from the Matlock Local Board.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, FEB. 26.

(Before the MASTER of the ROLLS.)

LLOYD'S BANKING COMPANY v. BARBADOS GAS COMPANY.

MR. CHITTY, Q.C., said this was a motion by debenture-holders asking for the appointment of a receiver; but there was also a petition in that day's list, asking for a winding-up order, though he doubted whether it would be reached. Probably the best way would be for the motion to come on with the petition. The desire of his clients was that the Company should go on, and if a winding-up order were obtained, his clients would probably have the carrying of it out.

The MASTER of the ROLLS said Mr. Chitty could take an order for a receiver, if it was not opposed, but it would not be drawn up.

MR. CHITTY said he would take the order. He understood the Company did not oppose the motion. Lloyd's Banking Company held a very large number of debentures, some having been deposited with them, and some transferred to them. It was the usual form of debenture charging everything.

The MASTER of the ROLLS said it would be an order for a receiver of whatever was comprised in the debentures.

Order accordingly.

ASSAULTING A GAS MANAGER.—At the Pentre Police Court, on Monday last week, a man named Thomas Isaac was charged with assaulting Mr. E. S. Pike, the Manager of the Ystrad Gas-Works, and also with having committed a breach of contract in contravention of the Conspiracy and Protection of Property Act, 1875. According to the evidence of the complainant, the defendant caused inconvenience by absenting himself from work on the 14th ult. When he presented himself on the following morning he was told his services would be no longer required until further orders. A few days after this the defendant appeared at the office on the works, and demanded the wages due to him; but complainant refused to pay him. Defendant then swore that the complainant should not leave the office until he had paid him what was due to him, and on the complainant attempting to leave the office the defendant, a powerful man, sprang upon him, and a violent struggle ensued, hence the assault complained of. Defendant was fined 40s. and costs for the breach of contract, and bound over, himself in £20 and two sureties of £10 each, to keep the peace for six months towards Mr. Pike and all Her Majesty's subjects.

Miscellaneous News.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Eleventh Annual and Forty-fifth Quarterly Meeting of this Institution was held on Saturday, the 26th ult., at the Mitre Hotel, Manchester—Mr. W. CARR (Halifax), the President, in the chair.

The minutes of the previous meeting having been read and confirmed, Mr. R. Shadbolt, Manager of the Fleetwood Gas-Works, and Mr. R. Smith, Manager of the Heywood Gas-Works, were elected members.

The HONORARY SECRETARY (Mr. Robert Hunter, of Stalybridge) then read the annual report of the Committee, which was as follows:—

Gentlemen,—Your Committee, in presenting their report for the past year, have the pleasure of congratulating the members on the continued prosperity of the Institution; eight new members having been elected during the year. The Committee, however, regret that the Institution has lost one of its earlier members, by the death of Mr. Roberts, of Altrincham, who was well known to most of the members, and whose sudden death all must deplore. The list has been still further reduced through three members having entered upon other occupations than that of managers or engineers of gas-works, and who, in consequence, cease to be members of the Institution, in accordance with the rules. The number now on the roll is 83, which the Committee consider very satisfactory.

Many excellent papers have been read during the year, viz.:—

"On Gas Purification." By Mr. J. G. Hawkins, of Wigan.

"On Three Months' Experience in the Working of the Electric Light." By Mr. Chew, jun., of Blackpool.

"On the Impurities in Coal Gas as used for Illuminating Purposes, and the Means of Eliminating Them." By Mr. John Collins, F.C.S., F.G.S., Consulting and Analytical Chemist, Bolton.

"On Coal Seams—their Stratification and the Gas-Producing Properties of their different Sections." By Mr. Eastwood, of Batley.

"On the 'Standard' Washer-Scrubber of Messrs. Kirkham, Hulett, and Chandler." By Mr. Harrison Veevers, of Dukinfield.

"On Retorts." By Mr. John Chadwick, of Oldham.

"On Tower Scrubbers." By Mr. W. A. Walker, of Elland.

In addition to these, Mr. Ball, of the New Wortley Gas-Works, Leeds, prepared a paper on the subject of "Eliminating the Light Oils from the Tar, and Retaining them in the Gas," which, from want of time, was unavoidably postponed. The Committee rejoice that Mr. Ball will read that paper at this meeting. At the August meeting, Mr. Newbwing exhibited and explained detail drawings of a purifying-house and purifiers, as designed by him for the Heywood Gas-Works.

At the May meeting the members and a number of visitors assembled at the Ashton Gas-Works, where they were met and entertained by Mr. Clarke. After an inspection of the works, the members proceeded to the Mossley works of the Stalybridge Gas Company, over which they were conducted by the Honorary Secretary and his assistant in charge of the works. The members then proceeded to view the new water-works in course of construction at Greenfield for the supply of the Ashton, Stalybridge, Dukinfield, and Mossley districts, by permission of the Joint Water Committee for those districts. Mr. Bateman, the Resident Engineer, met the members, and personally conducted them over the works. The respective visits made were of the most agreeable and instructive nature, and much benefit was derived by all those present on that occasion.

In concluding their report, the Committee beg to tender their thanks to the members generally for the support and encouragement they have received during the year, more especially to those gentlemen who have contributed papers; and they would respectfully solicit the assistance of the members in retaining the position now held by the Institution, by contributing papers or subjects for discussion.

The two members of Committee whose term of office expires at this meeting are Mr. J. G. Hawkins and Mr. H. Veevers. Mr. G. E. Saville having left the profession, a third member of Committee must be elected to serve for the unexpired term of one year.

MR. C. EASTWOOD (Batley) moved, and MR. G. SMEDLEY (Buxton) seconded the adoption of the report, which was approved.

ELECTION OF VICE-PRESIDENT.

The PRESIDENT said the next business was the election of some one to fill the office of Vice-President. This was an appointment which generally meant a sort of preparation for another office, which he supposed was, next to that of the Honorary Secretary, the most important in connection with the Institution. The Honorary Secretary had a resolution to propose, and although it was competent for any one to move any other resolution, the Committee hoped the gentleman who would be named by the Honorary Secretary would be unanimously elected.

The HONORARY SECRETARY thought very few words would be required from him in support of the nomination he had to make, which was that of Mr. John Chadwick, Manager of the Oldham Corporation Gas-Works. He thought no member more suitable could be selected, and he had confidence that Mr. Chadwick would do honour to the chair.

MR. A. C. FRASER (Bolton) seconded the nomination.

MR. J. BRADDOCK (Manchester), in supporting it, remarked that he had had a life-long acquaintance with Mr. Chadwick, and was satisfied that his

abilities, which were of a high order, and his amiable disposition rendered him pre-eminently qualified to discharge the duties of the office with credit to the Institution.

The PRESIDENT said he was glad that Mr. Fraser had seconded this proposition, although a Member of the Committee would have been ready to do so, if he had not risen. The Committee had considered the likely candidates, and were satisfied that Mr. Chadwick—looking at him “on the large,” as the Americans said—was about the best man that could be selected. He (the President) personally concurred with the Committee in their opinion. He had not had the advantage of Mr. Chadwick's acquaintance for so long a period as Mr. Braddock, but his lesser experience had led him to the same conclusion—viz., that he was in every way fitted to be not only Vice-President, but to occupy, as they hoped he would some day, the more important position of President of the Institution. If he devoted himself to his new duties as he had to other matters he had taken in hand in connection with the Institution, he believed they would have in him a very good Vice-President, and at some future time a very good President also.

The resolution was carried by acclamation.

The PRESIDENT, rising again, said: I have now to leave the chair, and introduce Mr. Chew as President. He is a gentleman whom you all know very well, and he was elected, as you also know, at our last meeting. He will have a very early opportunity of speaking for himself, and I will not therefore occupy your time by saying anything further in his praise, for we shall all have opportunities of judging of his abilities in a more practical way. Personally I may say I leave the chair with feelings both of relief and regret. I feel relieved because it takes away some of the work and some of the responsibility which have fallen upon me during the twelve months I have occupied this position—responsibility which ought to come, and which generally does come, I think, to any one who occupies a position of this sort, in trying to enhance the interests of the Institution under any possible circumstances. I leave the chair with regret, because I have experienced in my term of office exhibitions of good-will and friendship from members of the Institution which I had no idea existed towards myself. Some of the pleasantest associations I have ever experienced in my professional life have come to me while I have been President of the Institution. I have certainly received the most cordial support from the members who have attended the meetings. They have given me nothing but help and sympathy, and it must at all times be a pleasure to any one to feel that he has the esteem of his friends and those with whom he desires to stand high. For these reasons I leave the chair with some little regret, because I feel that the opportunities for your sympathy will perhaps be removed, and I shall have to seek exhibitions of it elsewhere. Still I am glad to have seen the past year's meetings so successful and so useful as they have been; and I hope that, in time to come, they will not only be as good but a great deal better, and that we shall go on improving with all the speed we may. I have now the pleasure of introducing Mr. Chew as the President, and Mr. Chadwick as the Vice-President of the Institution.

Mr. Chew then took the chair, and Mr. Chadwick the vice-chair.

ELECTION OF OFFICERS.

The PRESIDENT (Mr. Chew) intimated that the next item of business was the election of Treasurer.

Mr. CARR said that Mr. Paterson had discharged the duties so efficiently in the past, that the Committee had come to the conclusion that it would be impossible to get a better Treasurer. He had pleasure in proposing the re-election of Mr. Paterson, who, he hoped, would continue to serve the Institution in this capacity for a great many years to come.

Mr. D. CLARKE (Ashton-under-Lyne), in seconding the motion, observed that Mr. Paterson had always kept the Institution out of financial difficulties, and the duties of the office had invariably been discharged most satisfactorily.

The resolution was carried.

Mr. NEWBIGGING (Manchester) said he rose with very great pleasure to propose a resolution which he thought would be accepted unanimously. It was that Mr. Hunter, their long-tryed Honorary Secretary, be re-elected to his office. Mr. Hunter had had the confidence of the members during the four or five years he had held the position, and under his management the Institution had gone on progressing, and he (Mr. Newbigging) was sure that so long as Mr. Hunter was willing to retain this honourable and important position, they would be anxious to secure his services.

Mr. S. BARRATT (Manchester) seconded the proposition, and fully endorsed every word that the mover had said with reference to it.

The PRESIDENT, before putting the resolution, said a good secretary was the soul of an institution, and he thought there could only be one opinion respecting the manner in which Mr. Hunter had discharged the duties. He trusted his services would, on some future occasion, be properly and suitably recognized.

The resolution was carried with applause.

The HONORARY SECRETARY thanked the meeting for the confidence they had shown in re-electing him. He had some little difficulty in allowing himself to be nominated again. He knew a feeling prevailed that there was too much of a clique about the Committee, and that the management was left too much in certain hands. This was the feeling prevailing in certain quarters; he did not say it was felt by the majority of the members—indeed, he believed he had their confidence; and he could only say he should endeavour to do his duty as he had done in the past.

The VICE-PRESIDENT here acknowledged the compliment which had been paid him in his election to office. He said he should endeavour to discharge the duties to the best of his ability, and he only hoped that at the close of his year of office they would not have any cause to regret their vote.

Mr. CARR next proposed the election of Mr. Eastwood as a Member of the Committee. Mr. Eastwood would, he remarked, do credit to the Committee and to himself in this position, and would, he was sure, do his best to see that the meetings were not altogether unproductive.

Mr. W. W. HUTCHINSON (Barnsley) seconded the nomination, and it was agreed to.

Mr. D. CLARKE then proposed the election of Mr. Smedley as a Member of the Committee. He said he was an old and energetic member of the Institution, and would no doubt prove a great acquisition to the Committee.

Mr. CARR seconded the resolution, in the absence of Mr. Coles, who was anxious to have taken the opportunity of doing so.

This resolution was also passed.

Mr. H. VEEVERS (Dukinfield) moved the election of Mr. T. L. Sheppard (Farnworth) as a Member of the Committee for one year. In doing so, he observed that it was necessary, in the interests of the Institution, that these matters should be settled in Committee, and he was very much pained and surprised to hear that there was believed to be any cliqueism about it. Everything had been done, not for the benefit of any individual member, but in the interests of the Institution at large.

The VICE-PRESIDENT seconded the proposition, and it was carried.

On the motion of Mr. BARRATT, seconded by Mr. SMEDLEY, Mr. D.

Cockcroft (Littleborough) was elected one of the Auditors; and, on the proposition of Mr. C. EASTWOOD, seconded by Mr. LORD, Mr. W. W. HUTCHINSON was appointed as his colleague.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I have to tender you my sincere thanks for putting me in the position I occupy to-day. I can only say that if I succeed in giving as much satisfaction in presiding over your deliberations, and you give me the same amount of support that has been accorded to my predecessor, I shall be amply repaid for any little service I may be able to render. I feel that it is a considerable honour to be selected to occupy the position of President over a society like this, numbering, I believe, some 80 or 90 members, working at a profession in which I have been engaged for the last 30 years, and numbering amongst them some of the most eminent gas engineers of the day.

I believe the object of this Institution is to further the interests of the members who belong to it, and also that of the companies and corporations whom they serve, by increasing the common fund of knowledge, acquired by the preparation, reading, and discussion of papers bearing upon the science of the manufacture of coal gas; and to foster a kindly and brotherly feeling towards each other, engendered by meetings and conversations, where many a point of difficulty may be got over by simply asking each other's opinion. A man may think himself exceedingly clever, and perhaps he may be the cleverest man in his own parish; but when he comes to meet the best men from other parishes, he soon finds in what he is deficient, and in what he excels; and if he be a sensible man, he takes a more correct measure of himself for the future, remembering that there are few, if any, men who possess all the talents. This is, I think, the moral of this Institution—that some of the members have great talents, but have not all; others, though not so gifted, are anxious to become more so; and thus, by mutual association, the whole are benefited, and a higher stage in progress is attained.

Gas engineers and managers of the present day are mostly composed of two classes of men—first, those who have raised themselves from the humblest positions in the trade, by the force of their practical skill and industry, and who have not had the advantage of a technical education in early life, but who, like Brindley and George Stephenson, have had to overcome their difficulties by an immense amount of labour, caused by the want of technical education; secondly, those who have had all the advantages of a theoretical education, which has been within the reach of most young men during the past 20 years. Well, gentlemen, I know of no profession where a combination of theory and practice is more necessary than that of a gas manager. Theory is book-learning; practice is manual labour and experience. Theory is speculation; practice is the rule-of-thumb. Theory is the study of principles; practice is mere dexterity in the use of tools. Theory is thinking; practice is doing. Practice is follow my leader; theory strikes out boldly a new departure. The purely practical man picks up his theory when it is forced upon him without study; the theoretical man often loses himself in his dreams of how a thing should be done, but cannot attempt to do it. It is the want of a combination of this knowledge of theory and practice, that causes so many of the new patents which are brought under the notice of gas managers from time to time, never to be heard of again. In my opinion, the present race of gas managers, as a body, are quite up to the requirements of the time, and are keenly alive to the necessity of keeping pace with the progress of science and the age in which we live. The younger members of the profession must keep well in mind the keenness of the competition that will have to be met hereafter, and prepare themselves for it by the study of mechanics, drawing, and chemistry, and by acquiring sound commercial knowledge, which combined with practical energy, self-denial, and perseverance, are the true elements of success.

I will now say a few words on the present condition of the manufacture of gas, compared with what it was 25 years ago, as some people assert that no progress has been made in gas making. I suppose that the proper test of the progress of any manufacture is the cheapness of the article manufactured, compared with its price at some previous period; also the extent of the increase in the article consumed. At the time I have named, it was my fortune to be employed at one of the largest, if not the largest, gas manufactories in this part of the country. So far as I remember, there were then about 25,000 consumers. I believe there are now over 70,000. The price of gas was then from 5s. to 6s. per 1000 feet; it is now 2s. 11d. per 1000, and were it not for the large profits that are being made by the corporation, and devoted to other purposes outside the interest on the capital, gas might be sold for much less. The same thing applies to all parts of the country. Will any one say after this that no improvement has taken place? Take the price of calico, woollen cloth, iron, coal, or any of the great manufactures, and I think coal gas will compare favourably with them, whether it be in the reduction that has taken place in the price, the increase in the consumption, or the usefulness of the article in every-day life. Coal gas is one of the great factors that have contributed to make this nineteenth century famous in the world's history.

The improvements that have been effected in the course of the past 25 years have not been of a revolutionary character, but have been of a safe and sure kind—no backward steps have been taken. One has improved a little, another has followed it up, in all the various branches of gas manufacture and distribution. And all this knowledge and experience has been well diffused by Institutions like this and the Parent Association, and through the columns of the organ of our trade, to which I think I may say we all owe so much, and whose weekly visits on Wednesdays I always look forward to with pleasure. I am sure that the JOURNAL OF GAS LIGHTING ought to be, if it is not already, occupying the first place in every gas manager's library. While on this topic, I must not forget to mention those two splendid volumes on gas manufacture known as “King's Treatise,” recently issued, in the preparation of which our worthy Past-President, Mr. T. Newbigging, has had so large a part.

I now come to a subject that I know has had the earnest attention of most members of this Institution for some weeks past, and that is cheap coal. Many gentlemen in this room will retain in their memory for some time to come the month of January, 1881, as a month when there was no coal in stock—Wigan on strike—and from 10' to 20' of frost. Naphthalene was found where it was never known before. Gas-pipes were frozen up in hundreds of places; and complaints—well, the sooner we forget them the better, if we wish to sleep at nights. I do not think coal will be much higher in price, notwithstanding all the striking. I look forward for years to come before we can overtake the supplies provided by the opening of new coal mines, brought about by the last coal famine, which at that time we thought a great calamity, but which is now telling in our favour.

One of the most important factors in the production of cheap gas is the amount of capital upon which interest is paid. While thinking over this, I took the trouble to look over the capital expended per million feet made at 50 works under the management of members of this Institution, leaving out the largest works, such as those of the Manchester Corporation. I found that 5647 million feet of gas were made with an average

capital expenditure of £745 per million feet. The interest on this sum, if charged at the rate of 10 per cent. per annum, would cost, in round numbers, 1s. 5d. per 1000 feet. I may say further that the highest capital was at the rate of £2353, and the lowest £455 per million feet, so that in the highest the cost per 1000 feet would be three times the average, and the lowest a little more than half, if the same rate of interest were paid in each case. This will account in a large measure for the great variations there are in the price of gas in different towns within an area of 100 miles of this place, and no amount of skilful management can ever overcome and make up the vast quantity of dead-weight capital some works are burdened with. How often do we hear towns quoted to us where gas is sold at a very low price, and we are asked, "How is it you cannot produce gas at the same price?" coals being nearly alike in price. I know of large towns in this district which are often quoted as low-priced towns, where the capital employed in gas manufacture is half paid off out of the profits, and consequently it does not cost more than 3d. or 4d. per 1000 feet to pay the interest. I am not now referring to those towns where the gas is sold at cost price. To my mind this question of capital should be brought more prominently forward than it is.

This brings me to the question of the analyses of their working accounts made by different managers from time to time, for the purpose of seeing what progress they are making in comparison with former periods, and also ascertaining how they compare with their brother managers in like particulars. In doing this I have hardly ever found two works or managers making the analysis in the same way, each seeming to have a method of his own of going about it. Now, I think this could be overcome if the plan adopted by the JOURNAL in dealing with the accounts of the Metropolitan Gas Companies each year were followed; that is to say, showing the total capital, income, expenditure, and profit per ton of coal carbonized. The income is shown under five heads, the expenditure under fourteen, and in addition to this there is a small table showing the coke, breeze, tar, ammoniacal liquor, and gas made per ton of coal. This is the form I have used for some years past, and have found it very satisfactory to myself. The last "Analysis of the Metropolitan Gas Companies' Accounts" (that for the year 1879) may be found in the JOURNAL for Aug. 31, 1880. If this method became more common amongst us, comparison with the accounts of those who cared to publish them would be much easier for all.

I now propose to say a word or two on such improvements of gas apparatus as have come under my observation during the last year or two. The first to be noticed is the new system of carbonizing coal in what I will call Siemens's furnaces. I believe a very considerable advance has been made in the economy of the fuel used for heating the retorts, and as a consequence more coke has been put into the market for sale, thereby increasing the amount received for residuals; but, on the other hand, it must not be forgotten that a very large sum will have to be expended in the erection of these furnaces, and our experience of them as yet hardly warrants their adoption in works making less than 50 million cubic feet per annum. Messrs. Siemens Bros. claim that from 25 to 30 per cent. of the fuel now used would be saved under their plan. I trust that the efforts now being made in this country will, in the long run, be successful, and that the theoretical quantity of heat contained in the fuel will be fully developed in the interior of the furnaces. Mr. West's improvements in the drawing and charging of retorts, for which so much is claimed, is now on its trial under the most favourable circumstances; and after working for a year or two longer it will be seen whether 10 per cent. more gas than now, and of the same quality, can be produced from a ton of coal, and this with a greatly reduced cost of, I believe, 30 or 40 per cent., for the work and maintenance of the apparatus used, compared with the existing plan. White's valves, used in connection with the West apparatus, are a distinct invention, and can be used separately on existing hydraulic mains. The latter can be employed to retain the tar and liquor, or, as I have for some time used it, with a perfectly dry main; the tar and liquor being taken off as soon as made. We are promised a paper on this subject to-day by Mr. Smedley; I therefore reserve until then any remarks I have to make upon this working.

Another subject that has excited a good deal of attention of late is the one we are to have introduced to our notice to-day by Mr. Ball, in a paper prepared for our last meeting, but which the time at our disposal did not permit of being read—viz., as to the desirability of separating the tar from the gas at the earliest point possible in the manufacture, and retaining in the gas the light oils or naphthas that now go to enrich the tar. Mr. H. Leicester Greville contributed two excellent papers on this subject to the JOURNAL last year,* and I have no doubt you will bring the whole of your experience to bear on the discussion to-day.

A good deal of improvement has latterly been taking place in the construction and erection of large gasholders, and principles held to be thoroughly sound by the most eminent engineers 15 or 20 years ago, are now sent to the wind, and holders of a size not then thought of are being erected in several large towns in this country.

Another important subject to managers is that of the residual products other than coke. Gas tar, as you all know, commands very good prices; but if you, by other improvements, rob the tar of some of its most valuable oils and naphthas, it will become of less value to the manufacturing chemist. I am speaking within my own experience when I say that when working the retorts and apparatus with the best results, so far as the gas is concerned, I have only been able to get from one ton of tar from 10 to 15 gallons of light oil below a specific gravity of 920, water being 1000; whilst, on the other hand, when working with less advantage as regards the gas, I have obtained 30 gallons of light oil, and this is the oil we require in our gas, and which the chemist deems most valuable in his still. With respect to the ammoniacal liquor, I have great faith in the price keeping up. The demand for sulphate of ammonia is ever on the increase. Even at present prices it is the cheapest and most valuable manure known, and when in the near future we have free trade in land and scientific farming, the demand will be greater, unless—which does not seem very probable—artificial ammonia can be made.

I have now to say a few words in reference to gas-engines and stoves, the use of which we all desire so much to be extended, in order that the consumption of gas in the daytime may be increased. In my town only about 7 per cent. of the consumers use gas-stoves, and these are their own property. Lord Redesdale declined to give us power to let out stoves on hire, alleging that it was an interference with the rights of private trade; but if we could have done this, we should have had a dozen stoves where we now have one. The only difficulty I have found is in the fitting of the pipe from the meter to the stove. People generally want the stoves fixed in the back part of the house, often very far from the meter, and not easily accessible for gas-pipes, the house service-pipe being in most cases too small for the supply of a gas-stove, unless a greatly increased pressure is put on the mains. But I think it is wise, and I have myself adopted the plan in every case, to put in a larger pipe, free of cost, where it is likely there will be a fair consumption of gas by the stove. Good gas-stoves and gas-engines will work satisfactorily, when the supply-pipe is sufficiently large, with 11-10ths of pressure on the main.

* See JOURNAL, Vol. XXXVI., pp. 334, 414.

I have nearly exhausted the subjects to which I think it will be of interest to you to listen, but I cannot conclude without making a few remarks on one or two other matters which, although not in connection with the manufacture of gas, are still closely allied to it. The first is the Noxious Vapours Bill, and the report made by Dr. Ballard last year to the Local Government Board on the nuisances arising from the manufacture of gas. From these I deduce that it is becoming a matter of the first necessity that we should, as far as possible, retain within our own walls those fine particles of soot so often met with in the neighbourhood of large gas-works, and that we should so conduct our purification operations that neither the taint of ammonia nor the smell of sulphuretted hydrogen should travel far with the wind in any direction. I believe that laxity in respect to these matters will not long be tolerated anywhere.

With respect to the electric light, it is making a fair amount of headway in a variety of places where it can be used to advantage. The apparatus is becoming less costly, so far as the first cost is concerned, and a good deal of competition for business is going on amongst the various makers; but, so far as my own experience goes with respect to the electric lighting at Blackpool, where I think I may say we have one of the largest displays of electric lighting in this country, I am quite convinced that it will not supersede gas for illuminating our houses, but that it is well adapted for the lighting up of docks and large public works, and in some instances for street lighting, when the authorities can afford to be a little more lavish with the light than they are at present. Even in this event I believe gas will hold its own as soon as the novelty of the new competitor has worn off. I have not seen anything, either in Mr. Swan's or any other lamp yet brought out, that will seriously interfere with lighting by coal gas. A far more formidable competitor is found in American oil at the present price of 1s. per gallon, particularly in small towns, where gas is high in price, and where no facilities are afforded to the working population to use it. I think this is a great question, and one deserving of our serious attention, how the difficulty is to be overcome of supplying the smallest cottages with light at a cost of, say, 6s. or 8s. per annum at the utmost, and at the same time make a profit out of the transaction. The difficulty hitherto has been the extra trouble of collection and the risk of bad debts. The loss by leakage and the extra service-pipes are secondary considerations. I have no fear whatever about this object being eventually brought about, and every house and the smallest cottage within reasonable distance of a main being supplied with gas, if only the directors of gas companies and the gas committees of corporations offer inducements to their managers to push business in every direction, and not sit down and be thankful when they have a good dividend. A business that is at a standstill will soon go the wrong way, and although most gas managers have a keen love for their business, irrespective of pecuniary reward, still, like all other men, they must live by the use of their talents; and when a manager finds that by his energy and ability the success of his company has been increased—full dividends made for the shareholders, and cheap gas supplied to the consumers—he has a right to expect that his talents should be rewarded in proportion to that success, and in my opinion directors who cannot see this are not wise in their generation.

In thinking over the past year, I cannot overlook what I will call a new departure in the selling price of gas. The Corporations of Leeds and Halifax are content to sell their gas at 1s. 10d. and I believe 2s. 2d. per 1000 feet, paying only the interest of the money borrowed on capital account at the rate current in the open market, which, as you are aware, is about 4 per cent. I do not know that either of these corporate gas undertakings is remarkable for the lowness of its capital account. Therefore I think great credit is due, not only to the respective Gas Committees for their courage in taking this step, but also to their Engineers, Mr. H. Woodall and Mr. W. Carr, who, I have no doubt, have contributed mainly to bring about this state of things. I trust that ere long other corporations will follow in their footsteps, and not take so much of the hard-earned gas profits, and spend it lavishly in other departments of corporation work. Indirect taxation always contributes to wasteful expenditure. "Easy come, easy go," is an every-day proverb. In these days of cheap money, when corporations are borrowing at from 3½ to 4 per cent. for gas supply or any other purpose for which they may require it, it is not sound policy, nor is it just, that the increase in the consumption of gas should be prevented by the price being kept up, so as to enable the suppliers to spend the money in making sewerage works, paving streets, &c. These are, no doubt, necessary things to be done; but I fail to see why there should be a tax put on gas in order to carry them out, when, if the public required the improvement, the necessary money might be raised on loan, and a rate levied to pay the interest. Parliament has made a law by which few, if any, gas companies are allowed to raise capital at a higher rate of interest than 7 per cent., and, by the imposition of the auction clauses, very little more than 5 per cent. can now be obtained for money invested in good gas stock.

In conclusion, gentlemen, I may say that I feel confident the time is not far distant when, by improvements in our furnaces, we shall be enabled to take out of ordinary coal 11,000 cubic feet of 16-candle gas, and distribute this gas to the consumers with a leakage account not exceeding 3 per cent.; when we shall be enabled to control the interior fittings of houses, and, by the aid of good and cheap burners, give a better and more satisfactory supply of gas to all classes; and where a fair amount of capital is used and only a reasonable interest on that capital is required, I believe gas will not be sold in one place only, but in many, at 1s. 10d. per 1000 cubic feet.

Mr. CARR moved a vote of thanks to the President for his address. It was not customary, he said, to discuss the address of the President, but there was in it a reference to Halifax which was hardly correct, and which, with the permission of the meeting, he would set right. In speaking of the practice that obtained at Leeds, the President had classed that town with Halifax; but the comparison was scarcely a fair one. In Halifax they took 1 per cent. out of the profit beyond the interest on capital, so that they did not sell gas at absolutely the lowest price. He did not know that he should be out of place in saying also that he was very much pleased with the address, and that he thought every member present must be pleased with it. It was not one of those scholastic harangues over which they fell asleep; in some parts it was very racy, and it glanced over the whole field of controversy. Some parts were exceedingly interesting and suggestive, and would, he trusted, be productive of papers for discussion at some of the forthcoming meetings. It did this it would have attained the highest point at which an address could aim.

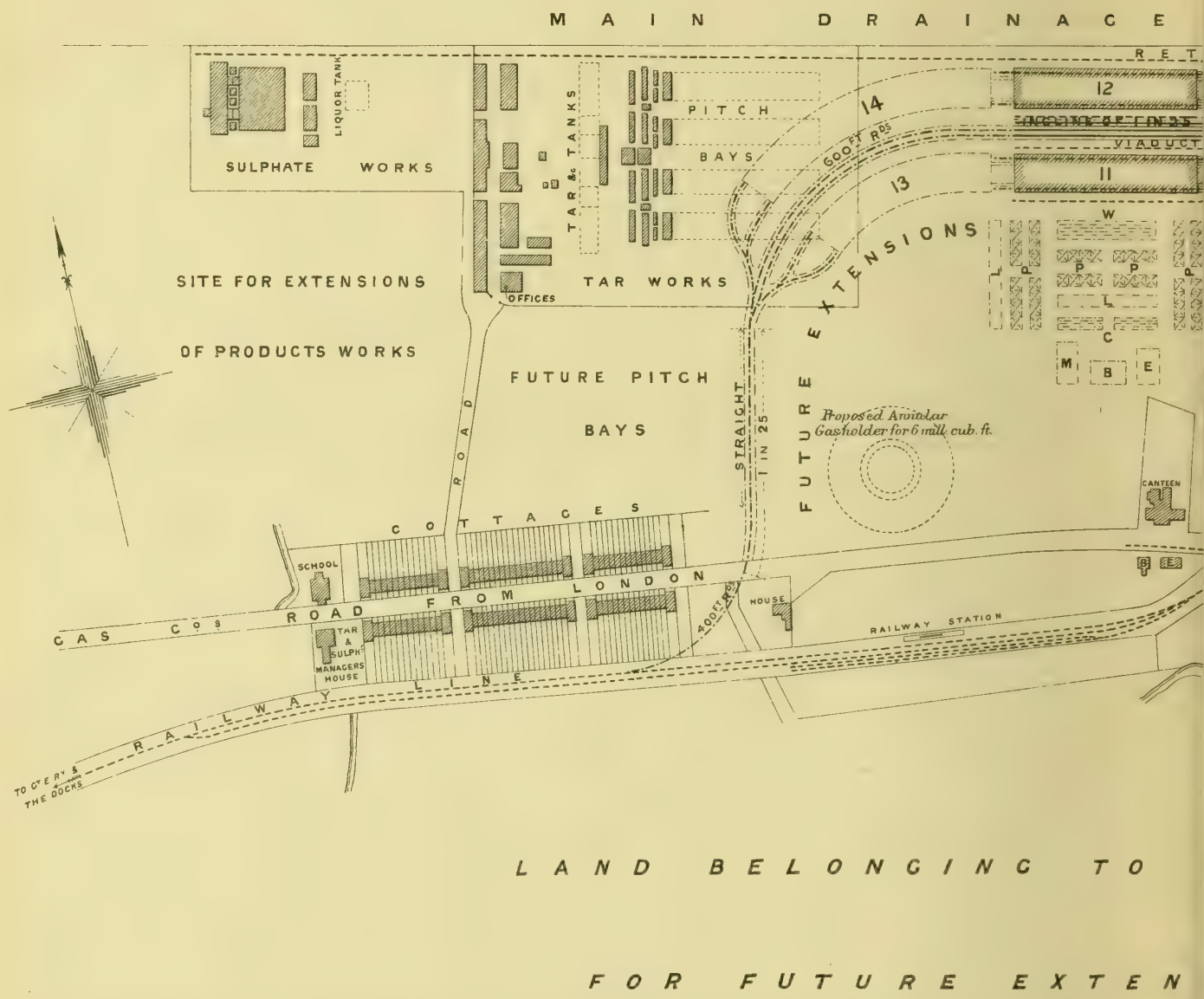
Mr. FRASER seconded the motion, which was put by the Vice-President, and carried unanimously.

[We reserve until next week the publication of our report of the subsequent proceedings.]

THE first annual general meeting of Kirkham, Hulett, and Chandler, Limited, has been held, at which a dividend of 10 per cent. was declared.

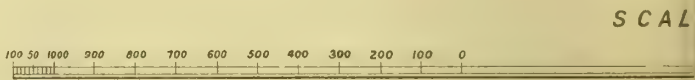
THE GASLIGHT AND COKE

General



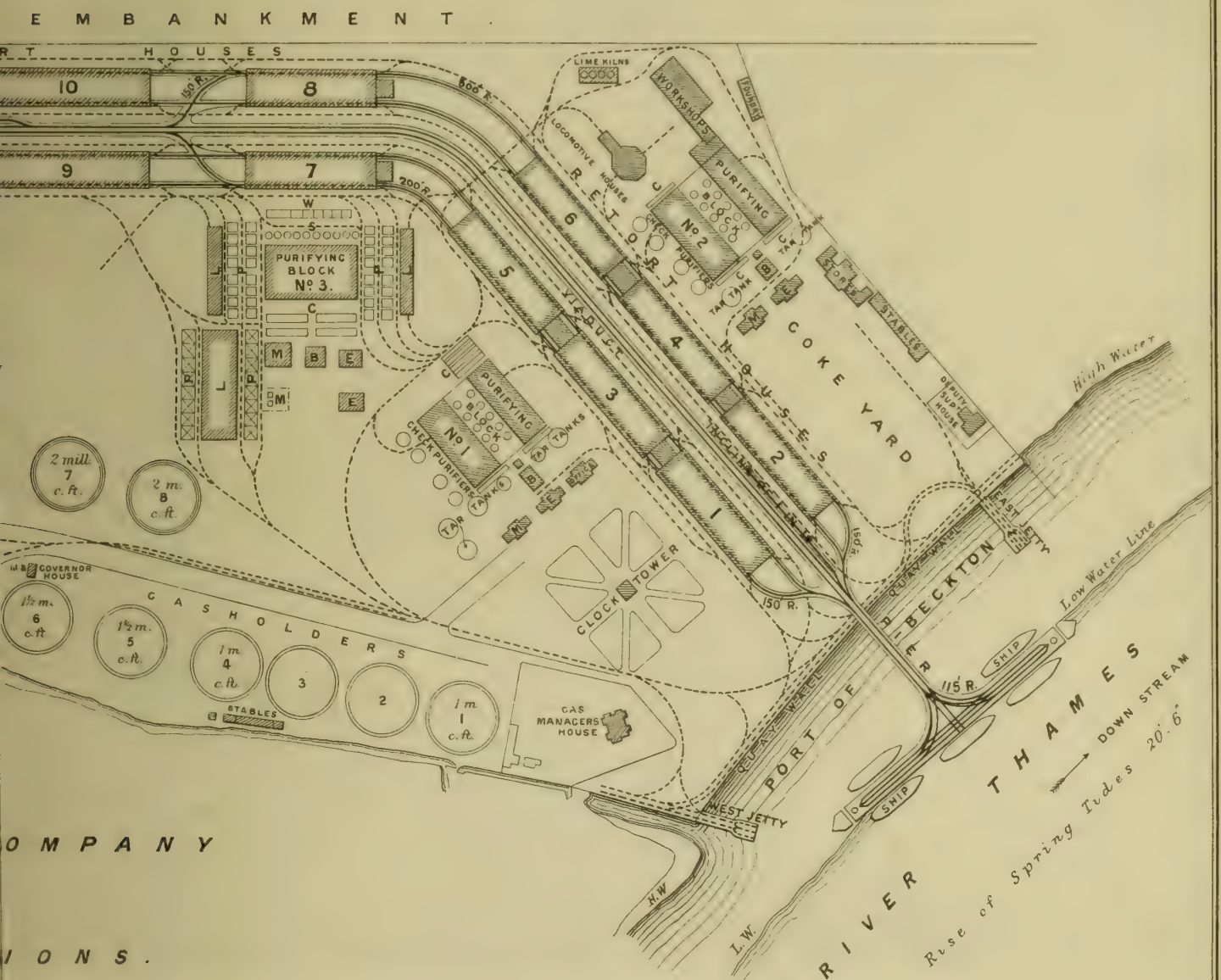
NOTE. B means Boiler House.

- C " Condensers.
- E " Exhauster House.
- L " Lime Shed.
- M " Meter House.
- P " Purifiers.
- S " Scrubbers.
- W " Washers.



COMPANY'S BECKTON WORKS.

Jan, 1881.



NOTE. The high level Railways are shewn in strong lines thus \equiv being 23' 8" above T.H.W./high water. The low level Railways are shewn in dotted lines thus \cdots being at T.H.W. level. Future Extensions are shewn in dotted lines thus \cdots .

V. WYATT, CONSTRUCTING ENGINEER.

Jan^y, 1881.

GAS-ENGINES.

By Mr. C. GANDON, Assoc. M. Inst. C.E.

[Abstract of a Paper read before the Society of Engineers on Monday, March 7, 1881.]

The Second Ordinary Meeting of the Society of Engineers for the present year was held last night, when a paper on "Gas-Engines" was read by Mr. C. Gandon, Engineer of the Crystal Palace District Gas Company.

The paper pointed out that the use of coal gas as a motive power is of comparatively recent origin, and that this is not a matter for surprise, seeing that its introduction for lighting purposes dates only from the commencement of the present century. As early as the year 1794 a patent was taken out in England for producing an inflammable vapour-force by exploding vapours of spirits of tar or turpentine in closed vessels; and between that date and 1860 various other inventions were patented for obtaining motive power by the explosion of different mixtures, gaseous and solid. But although carburetted hydrogen is mentioned by some, it appears that the idea of utilizing coal gas, as made for lighting purposes, for working steam-engines was only first practically introduced in the "Lenoir" gas-engine, patented in 1860, and first introduced into this country at the Exhibition of 1862. A general description of the "Lenoir" engine was given, and it was pointed out that among the drawbacks to its use was the damage done to its working parts by the sudden and violent nature of the explosions, and also the necessity for the use of electricity for the explosion of the charges of gas and air with which it was worked. In more modern gas-engines the necessity for electricity has been avoided by the employment of jets of gas for igniting the charges; two jets being required, as the one in contact with the charge is extinguished by the explosion, and the other or permanent jet serves to re-light it.

The "Otto and Langen" gas-engine was then described. In this the effects of the sudden explosions are avoided by utilizing, in the first instance, the force of the explosions to compress the air on one side of the piston; and this compressed air, during the return stroke of the piston, is made to communicate motion to the working parts of the engine. The chief improvement, however, which has been made in the construction and working of gas-engines is due to the compression before ignition of the charges of mixed gas and air, by means of which a larger proportion of air can be used than would form an explosive mixture at ordinary atmospheric pressures; and the force thus developed is gradual and continuous, instead of sudden, and a consequent economy in the gas consumption and convenience in working is obtained.

Several gas-engines constructed on these principles were described in the paper, among which the "Otto" silent gas-engine appeared to the author to be one of the most successful. Its general principles were described and illustrated by diagrams, and it was stated that its consumption of gas is at the rate of about 21 cubic feet per horse power per hour. These engines are comparatively noiseless in working; their parts few and simple; and, beyond cleaning, they require little or no attention.

It was further pointed out that on account of the heat generated by the explosions it is necessary that the cylinders of gas-engines should be jacketed and surrounded by water, and that advantage had been taken of this in one engine, called the "Eclipse," in which the water, instead of being allowed to escape when heated, is stored in a separate chamber, by which steam is generated from it, and this steam is used as an auxiliary to the gas for working the engine.

Attention was also drawn to the "Bischopp" gas-engine, chiefly on account of the small sizes in which it is made, ranging from one-half man, or one-eighth horse power upwards. This engine, although not comparatively economical in its consumption of gas, is remarkable for its simplicity and small size, by reason of which it is available for purposes for which it would otherwise be impossible to apply mechanical power.

The author, referring to comparisons which have been made between the cost of working gas and steam engines, observed that the practice has generally been to take the total cost of working in each case, including labour; and that when this is done the comparisons are invariably in favour of gas-engines. But it is to be observed that such estimates are not reliable. A gas-engine requires little or no attendance, and the results of the comparisons would depend mainly upon the amount estimated for this in the case of the steam-engine with which it is compared. For a small engine, it would in most cases be unfair to estimate the whole time of one attendant, while as the size increases the proportionate cost of attendance would diminish; but with a gas-engine there is very little variation. Instances were given where estimates have been made in this manner showing steam-engines to be from two to seven times more expensive in working than gas-engines, although when the fuel alone is regarded the gas-engine is in all cases the more expensive. Such estimates were, the author said, doubtless made with every care, and might be true for particular cases; but they proved that it was impossible to frame a comparison which should be generally true.

Examining the cost of the fuel alone, it was shown that gas must necessarily, both in theory and practice, be more costly than solid fuel, but that when the cost of labour, wear and tear, and first cost are also considered, the conclusion arrived at by the author is that for engines of small sizes gas will in all cases be the more economical, and that, even with larger engines, if the same economy cannot be always maintained, circumstances will, in many cases, render gas-engines the most advantageous and convenient, particularly where the intermittent use of an engine is required.

MR. SCOTT-MONCRIEFF'S SYSTEM OF CARBONIZATION.

In regard to the controversy raised by the paper recently read before the Society of Arts by Mr. Scott-Moncrieff—which, with the discussion, and various comments, have appeared in our pages—Mr. J. A. C. Hay, of the Royal Arsenal, Woolwich, has written a letter more especially in reply to Mr. Scott-Moncrieff's letter published in the JOURNAL of the 15th ult., p. 272. In the course of this letter Mr. Hay writes as follows:—

Mr. Moncrieff alleges that when in difficulties the Manager of the gas-works at Woolwich Arsenal had used a "short extraction." This is entirely incorrect; in every case he allows the coal—whether common gas coal or cannel—to remain in the retorts just as long as is necessary for extracting all the gas from it (and not one-third only, as recommended in Mr. Moncrieff's scheme); and the length of time necessary for this operation depends entirely upon the character of the coal—for common gas coal about 6 hours, and for cannel about 4 hours.

Mr. Moncrieff then alleges that the fuel resulting from the short extraction is superior, and that I confirm this by stating "that the coal used was volatile cannel, and that on a long extraction it contained very little heating properties, and was not used under the retorts." Now, my letter of Jan. 29 [see ante, p. 227] contains no such statement, but the very opposite, for I most distinctly pointed out that it was the coke from the ovens, worked during a 4-hour or short-time charge, and with a volatile cannel coal, which contained very little heating property, and consequently was not used as fuel under the retorts.

Mr. Moncrieff then asks, do I mean to say that the fuel was worse under a short extraction than under a long one. Not having tried his scheme of "short extraction," I am unable to answer this question. What I state is that the coke resulting from the 6-hour charges, for which we always em-

ploy common gas coal, usually Pelaw, is of good quality, and possesses fair heating properties, and makes a very good fuel; whereas that resulting from the 4-hour charges, for which we invariably use a cannel coal, is simply worthless as a fuel.

Mr. Moncrieff then asks, do I mean to deny that the best gas comes off during the first two or three hours, and do I deny that it comes off most rapidly during that period. I am not aware that I have made or denied any statement in regard to either of the above questions, and, as I am only concerned at present with the statements made by Mr. Moncrieff in regard to the Royal Arsenal Gas-Works, I do not think it necessary to widen the subject under discussion. At the same time, in reply to his last question, I do most distinctly deny ever having adopted the scheme which he advocates in his paper, even to meet a few exceptional emergencies. My endeavour has always been to get, profitably, as much gas as possible out of the coal, and to leave little or none in the coke; whereas in Mr. Moncrieff's scheme he advocates taking only a little out of the coal (about 3000 cubic feet per ton), and leaving a very large portion (between 6000 and 7000 cubic feet) in the coke.

Now, although I shall be pleased to adopt any plan that has been practically tried and proved, and which will enable me to manufacture a better and cheaper gas, I hope for the present, and until Mr. Moncrieff has something better and more reliable to put before us, to retain "sufficient intelligence" to deter me from attempting to convert good profitable gas-works into establishments for partly carbonizing coal and manufacturing a gaseous coke or smokeless fuel, of such doubtful value that, in the condition in which it would come from the retorts, the mere handling and exposure to the weather for a short time would, I believe, convert it into a heap of breeze or rubbish.

THE SHEPPY GAS-WORKS VALUATION.

It will be remembered that at the East Kent Quarter Sessions, last October, an application was made to the Justices by the Sheppy Gas Company, to reduce the valuation of their works and plant by the Sheppy Board of Guardians, acting as the Assessment Committee. The new valuation made for the parish by Messrs. Castle and Sons had raised the rateable value from £622 to £1496; while the Company, to avoid an appeal, had offered to submit to their gross annual value being advanced to £1000. This offer of a compromise not being favourably entertained by the Guardians, the case for the Company was opened by Mr. Michael, and Mr. A. W. Marks, the Secretary of the Company, proceeded to give evidence, in the course of which the Chairman of the Quarter Sessions (Lord Brabourne) suggested the advisability of referring the matter. This course was agreed upon, and Mr. John Clutton was appointed Arbitrator. The hearing of the case before him was taken on Monday, Tuesday, and Saturday, the 13th, 14th, and 18th, of last December; and, at the close of the proceedings, Mr. Clutton arranged to defer his decision till he had had an opportunity of inspecting the works. Subsequently Mr. R. P. Spice, on behalf of the Company, met and conducted him over the works, enabling the award to be completed.

Mr. Clutton makes the gross value of the undertaking £2531; and the rateable value, £1263. Mr. Castle's figures were: Gross, £1898; rateable, £1496; so the Company get a reduction of £233. The costs are reserved until the Quarter Sessions in April.

[Full reports of the proceedings in this case were given in the JOURNAL, Vol. XXXVI., pp. 650 and 970 et seq.]

BIRMINGHAM CORPORATION GAS SUPPLY.

At the Meeting of the Birmingham Town Council on Tuesday last—the Mayor (Alderman Chamberlain) in the chair—the report and accounts of the Gas Committee, which appeared in the JOURNALS for the 22nd ult. (p. 307) and the 1st inst. (p. 352) were brought up and taken as read.

Mr. MARRIS then moved—"That the recommendation of the Gas Committee, that the balance of profit and loss account be appropriated as follows:—viz., £25,000 to the borough improvement fund of 1880; £6000 to the new offices account; and £26,009 2s. 9d. to the sinking fund—be approved." In doing so he said this would be followed by a resolution to reduce the price of gas 3d. per 1000 cubic feet, and it would be convenient for him to speak upon both at the same time. The Council would reasonably have expected some falling-off in the revenue of the gas department through the transfer to West Bromwich of the consumption of that district, amounting to nearly 63 million cubic feet for the half year. Notwithstanding this surrender, however, their net profit had been £5843 4s. 5d. more than in the previous year; the amount being £57,009 2s. 9d. against £51,165 18s. 4d. If to this was added a sum of £13,000, paid out of the revenue of the year for the expenses of the arbitrations, it would make a total of £70,009 2s. 9d., or more than double the profit made in 1876, the first complete year of the Corporation management, and an increase for this year over last of £18,843 4s. 5d. It would doubtless be interesting to the Council to hear in what manner this had been obtained. The increased receipts from the sale of gas amounted to £3000, that was although West Bromwich had gone since the 1st of July. The receipts from the sale of coke showed an increase of £6000; tar, £6000; ammoniacal liquor, £1000. The Council had saved on the cost of coals, £11,000; on the expenses of purifying, £1300; on wages, £1500; and on bad debts, £250. The ordinary law charges were also less than the previous year by about £1000. These items gave a total of increased returns or saving of expenditure of £31,050. From this they must deduct £11,000 for increased repairs, and £1000 increased taxation, a considerable part of which was for the additional amount charged to them for income-tax. This left an increased profit of nearly £19,000. The increase in the sale of gas had been 30,359,000 cubic feet; but allowing for the loss of nearly 63 million feet, previously alluded to, in the West Bromwich district, the total increase on the present districts supplied had been 93,131,000 cubic feet, or 3½ per cent. He was not going to argue that this was a satisfactory increase; but considering the state of trade in the town, and the number of houses that had been practically void during the last year or two, it was very good. They hoped to obtain an annual increase of 5 per cent., which they considered as the normal rate. The past year seemed to have been a rather curious one. In the early months they had a steady increase, with a large and unusual increase in the summer, which the Gas Committee believed was almost entirely due to the consumption of gas for cooking purposes. The object the Committee had in view in encouraging the use of gas cooking and heating apparatus was being realized, and they hoped that in time they would more and more closely approximate the summer to the winter consumption. When December came there were a series of light days which greatly reduced the advance made in the former part of the year. Nearly all the large gas-making concerns which had published their reports seemed to have had similar experience. The Committee had thus only 3½ per cent. increase of consumption to report. This increase appeared to have been almost entirely in the sale at the lowest price to the large consumers. Comparing the consumers in each scale in 1880 with 1876, while there had been with the consumers burning over 100,000 feet per quarter an increased consumption of 33 per cent., and with those burning over 25,000 feet an increase of 12 per cent., there

had been a positive falling-off in the consumption on accounts burning less than 25,000 feet per quarter. Many of the small consumers might have considerably decreased their consumption owing to the badness of trade, and the large number of small houses which had been void had, no doubt, also some effect. With regard to the subject of leakage, which the Committee had frequently mentioned in their former reports, they had reason to believe that the expenditure which the Council had authorized in the reorganization of the mains was bearing fruit. The leakage last year was less by 1½ per cent., the official return being 7 per cent., against 8½ per cent. in 1879. With regard to the coke, they had got past the period when they were accustomed to hear terrible predictions as to the stock in their yards. There was little to say about it except that it was still too cheap, and until the iron trade revived he saw no prospect of their getting more money for it. At present the winter surplus was not at all too much for the summer trade, and they had every reason to believe that the yards would again be cleared this summer. During the winter the Committee endeavoured to stimulate the domestic consumption of coke, and it was steadily increasing. They had received for coke during the year about £1000 more than they thought they should. On the receipts had been £6000 more than the previous year. This was mainly due to the new contracts, which for the future would be based upon the prices obtained for the products of the tar—a basis that was fair both to the Committee and to the contractors. The £1000 more produced from the sale of ammoniacal liquor was due to the increased make, and not to any alteration of price. The new contract with Messrs. Chance Brothers for the ammoniacal liquor produced at the Windsor Street works would not come into operation until the 1st of October next. The Committee hoped that this contract would realize about £8000 per annum, a small proportion of which would come into the profits of the current year. The Committee had saved about £11,000 in the cost of coal, which was partly due to the lower price for the first half of the year, as compared with 1879, and partly to the new railway into the works, and the labour-saving appliances for bringing the coal to the point at which it was to be utilized. The coal had yielded nearly 300 feet of gas per ton more than in former years, which meant a saving of about 11,500 tons of coal, or over £5000. Mr. Chamberlain last year made a calculation as to the net price of coal to the Corporation, after deducting what they obtained for the coke. In 1871 it was 2s. 5d. per ton net; in 1878, 5s. 1d.; and in 1880, 8s. 6d., or 1s. 1d. more than it cost the late Birmingham Companies, when they were selling gas at their lowest price. The reduction under the head of wages was effected without reducing the price paid for any description of labour. The loss from bad debts at present only amounted to 8s. 8d. per cent.—a figure which, he thought, many members of the Council would be glad to realize in their private businesses. The total amount of bad debts in 1880 was £2000, as compared with £4115 under the same head under the management of the Companies in 1875. The additional expenditure on capital account had been met by the sum received from the sale of the West Bromwich works, and the account had actually been reduced by £11,000, although the Committee had expended £59,500 in additions to their plant. As to the item of £13,000 law costs in connection with the arbitrations, it was one which the Committee could not help. There would yet be a further small sum in respect of the Smethwick arbitration. With regard to the appropriation of the profits recommended in the resolution, he wished to point out that the £26,009 to be carried to the sinking fund was in addition to the £4075 which they were obliged to carry to the fund under their Act of Parliament. These appropriations would raise this fund to nearly £100,000. As to the proposed reduction in the price of gas, the wisdom or folly of the course recommended by the Committee depended entirely upon their prospects for the future. The reduction proposed would make the prices charged 2s. 3d., 2s. 5d., 2s. 7d., and 2s. 9d. per 1000 feet. The lowest price charged by the Companies, and that only for a short period, was 2s. 3d., 2s. 5d., and 2s. 7d. per 1000 feet. This reduction of 3d. per 1000 feet would involve a loss of about £30,000. In justification of the Committee's recommendation, he might mention that the accounts showed that £70,000 might be safely looked for as the profit next year. New contracts for residuals and other sources of income would probably make this £80,000. Taking £30,000 for the sinking fund and £25,000 for the improvement fund would leave £25,000 surplus, whereas a reduction of 3d. required £30,000, or £5000 deficiency. The Committee trusted that this £5000 would be made up by an increased sale. This, of course, did not leave any margin for the £5000 which they hoped to carry to the credit of the new offices account for the next four or five years. It was for this reason that he had already asked the Council to set aside £6000 from the profits of 1880. Year by year the number of gas consumers who were not ratepayers was decreasing, and he believed that the interests of the ratepayers and consumers were now practically identical. If the recommended reduction were sanctioned, the price of gas would be, with the exception of the smallest consumers, as low as was ever the case, even for a short time, under the Companies, the illuminating power being at the same time very much higher. The net cost of coal in 1871, when the Companies reduced the price of gas to the minimum, was 2s. 5d. per ton, the purchase price of the coal being 9s., and the resulting coke, 11 cwt., at 12s. per ton, realized 6s. 7d. The net cost to the Corporation for 1880 was 3s. 6d., coal having been purchased for 9s. 4d., and the selling price of coke averaging 6s. 10d. for 11 cwt., being a difference of 1s. 1d. against the Corporation, which represented on 300,000 tons an annual sum of £16,250, or 1½d. per 1000 cubic feet. The proposed reduction could not be maintained if there were any important advance in the price of coal before the next contracts were made. It was, therefore, impossible for the Committee to pledge themselves to maintain the reduction of price for a lengthened time. A shilling per ton advance in the price of coal would land them in an extra expenditure of £15,000; but they were of opinion that the consumers were entitled to the reduction at the present time, even if it should only be for six months. In conclusion, he compared the price of gas in Birmingham with that of twelve large towns where gas was sold most cheaply the preceding year, and from which returns had been obtained for the year just past—namely, Derby, Nottingham, South Shields, Bradford, York, Walsall, Wolverhampton, Sheffield, Plymouth, Newcastle-on-Tyne, and Leeds. Taking into consideration the meter-rents charged in other places, the illuminating power of the gas, and the conditions under which the concerns were worked, he said he was justified in saying the Corporation of Birmingham were supplying the consumers at prices as low as, or lower than those of any gas undertaking in the country. He could only hope that the reduction in price would lead to a large increase of consumption.

In reply to questions, Mr. MARRIS said the amount of the sinking fund was in excess of that required by the statute; interest being carried to profit and loss account. The reduction of wages was effected by employing improved methods of locomotion in the yards, and in different labour-saving appliances, and was not obtained by reducing the wages of any class of workmen. The £13,600 law expenses were paid out of the profits of the year, but there would be a further sum, although undoubtedly not a very large one, to be paid when the arbitrations were concluded.

The resolution was put and carried.

Mr. MARRIS then moved—"That the Committee be instructed to reduce the price of gas 3d. per 1000 feet."

Mr. BEARD compared the Birmingham gas undertaking with that of Manchester, in order to show that the large profits made were due to the high prices charged rather than to good management.

Alderman AVERY thought it would be more generous, if not more just, if a proper appreciation were shown to the Committee for the admirable and successful manner in which they had conducted their operations. It was useless to compare Birmingham with Manchester, as in the latter place the gas undertaking was acquired 40 years ago.

The resolution was then put and agreed to.

In moving the adoption of the report, Mr. MARRIS gave a description of the proposed new offices of the Gas Department, and said he thought the building would be a very satisfactory one, provided it was successfully carried out. During the past 5½ years the Committee had made a profit on the gas of £259,000, and this was independent of the £20,000 per annum they were required by Act of Parliament to set aside for a sinking fund, which now amounted to nearly £100,000. Of the profits, they had appropriated to the relief of the gas consumers, by the reduction of the price of gas, £94,000; in reduction of the rates, £130,000; cost of the new offices, £6000; and the amount carried to the reserve fund, £50,000. He congratulated the Council on the results of the gas undertaking.

Mr. JOHNSON seconded the motion.

Mr. BRINSLEY wished to know whether the lighting round the Town Hall was to be continued as it was at present. The ratepayers would like to know the cost of it.

Alderman KENRICK said that the annual cost of the lighting, according to the Committee's report, was £650. The object the Committee had in view in illuminating the locality was to show what could be done by gas. It was thought that no good attempt had been made to show what could be done by gas, and the experiment was a trial against the electric light. The Committee had demonstrated to the gas consumers that with proper burners, properly arranged, a much better effect could be obtained by gas, for the same cost, than by any other kind of lighting that could be produced.

Mr. MARRIS said the Committee did not pledge themselves to continue the lighting experiment round the Town Hall. It had answered its purpose in showing what gas could do as against the electric light. The total cost of the experiment was £1500.

The motion for the adoption of the report was then carried.

THE RICHMOND (SURREY) SELECT VESTRY AND THE GAS COMPANY'S BILL.

At the last Meeting of the Richmond Select Vestry the following report, dated Feb. 22, of the Gas Bill Committee was presented:—

The Committee presented a report to the Vestry on the 21st of December last, recommending (*inter alia*) that a petition should be presented against the Bill, which report having been received and approved, a petition against the Bill was subsequently prepared and presented accordingly. The Committee have from time to time consulted Mr. R. P. Spice, C.E., the Engineer appointed by the Vestry to assist the Committee, and have also had several interviews with the Directors of the Gas Company upon the clauses of the Bill and the alterations which the Committee considered and were advised should be made therein.

The Committee have now the satisfaction of being able to report that they have finally agreed with the Gas Company upon all the questions at issue between them, which arrangement the Committee recommend to the Vestry for adoption, that the petition against the Bill may now be withdrawn.

The result of this settlement may be briefly stated as follows:—1. Maximum price per 1000 feet to private consumers in Richmond to be 4s., but the actual price to be charged to consumers in Richmond is to be reduced to 3s. 6d. from Christmas next, as per agreement under seal of the Company. 2. Public lamps in Richmond to be charged, as from Midsummer next, £4 5s. per lamp per annum, subject to an increase or reduction of 5s. per lamp per annum for every increase or reduction of 3d. per 1000 cubic feet to the ordinary consumer within the said parish; such charge to include the providing and use of the lamps and all proper lamp-posts, lamp-irons, burners, and fittings connected therewith, and lighting, cleaning, &c. The lamps to be lighted from sunset to sunrise, and the burners used therein to consume not less than 5 cubic feet of gas per hour. 3. Illuminating power to be 15 candles instead of 14, as at present. 4. Vestry's testing apparatus at Vestry Hall to remain, and to be the testing-place for the purpose of all legal proceedings. 5. New capital to be £40,000 instead of £60,000. 6. New preference capital to be £10,000 instead of £15,000; and interest thereon limited to 5 per cent. 7. Dividends on new share capital not to exceed 7 per cent. 8. Auction clauses introduced as to sale of shares. 9. Interest at 5 per cent. to be paid on moneys deposited with the Company as security for gas supply or use of meters. 10. Products manufactured at works to be only such as produced on the works, and no tar to be distilled thereat.

Major BULL, who moved the adoption of the report, said he hoped the Vestry would think the Committee had done their duty. They had in the first place to consider the interests of the gas consumers, and secondly to see if fair terms could be arranged, so as to avoid an appeal to a costly tribunal with an uncertain result. In referring to the terms mentioned in the report, he said that the price proposed (3s. 6d.) would be a reduction of 3d. per 1000 feet. This would necessarily vary with the price of coals, for it was hardly to be expected that, during a coal famine or the prevalence of strikes, the Company would carry on their business at a loss. As to the public lamps, of which there were about 300 in the parish, the Company had consented to a reduction from £4 10s. to £4 5s. per lamp. It was thought that the proposed new capital would give the Company too long a lease, and therefore the amount had been reduced. The auction clauses were introduced to enable the public to take up some of the shares, instead of leaving them all to the present Shareholders, and the arrangement as to the residual products manufactured by the Company would, it was hoped, cause an improvement with reference to the smells arising from the works, about which complaint had been made. He thought they might thank the Directors of the Company for the conciliatory way in which they had met the Vestry, and for the concessions they had made.

Mr. OLDER seconded the motion, expressing satisfaction that they had escaped from the great parliamentary and legal expenses with which they were threatened.

Mr. MAXWELL said he did not feel so grateful for these small mercies, as he did not see that they had much to be grateful for. He thought they had made a very good bargain for the Company.

Mr. WOOTTON thought the Company had given the Vestry very substantial benefits, and they ought all to be very glad that they were not going to have the great expense of a parliamentary contest. He thought the Directors had met them in a very liberal spirit, and had given them everything they could really expect.

The motion having been adopted *nem. con.*, Mr. R. A. Smith, on behalf of the Company, handed in the following undertaking:—

In Parliament—Session 1881.

RICHMOND GAS BILL.

In consideration of you, the Vestry of the Parish of Richmond, the Urban Sanitary Authority of the said parish, consenting to the maximum price of gas being fixed by the Bill at 4s. per 1000 cubic feet, and withdrawing from opposition to the Bill, we, the Richmond Gas Company, hereby undertake and agree that, in the event of the Bill passing into law, the price to be charged for gas to consumers in the parish of Richmond, who shall burn the same by meter, shall not, from and after Christmas, 1881, exceed 3s. 6d. per 1000 cubic feet, unless, and until, and so long only as an increased price is, by reason, or in consequence of an increase in the price of coal or other materials, necessary to enable the Company to pay their maximum dividends.

Given under the common seal of the Richmond Gas Company, this 22nd day of February, 1881.

SOUTH SHIELDS GAS COMPANY.

The Annual Meeting of this Company was held on Monday, Feb. 28—R. WALLIS, Esq., J.P., in the chair.

The SECRETARY (Mr. J. H. Penney) read the notice convening the meeting, after which the report of the Directors and the accounts for the past year were presented. The report stated that the receipts for the twelve months were £30,552 0s. 1d., and the payments £21,163 19s. 11d., the balance to profit being £9388 0s. 2d. After payment of the interim dividend and interest, there remained to the credit of the profit and loss (net revenue) account, an available balance of £5485 12s. 10d., which the Directors proposed to apportion as follows:—For half year's dividend to Dec. 31, 1880, £4223 13s.; to the reserve fund, £593 3s. 10d.; and the balance of £668 16s. to be carried to the credit of the current year's account. There was an increase in the sale of gas over the previous year of 8,946,800 cubic feet. The report concluded: "The Proprietors will be entitled to a dividend at the rate of 4½ per cent. for the half year. This, together with the 8½ per cent. paid for the last interim dividend, makes 7½ per cent. for the year."

[The Company's capital consists of £101,444 of stock, including premiums; and £19,800 of mortgage bonds, at 4 and 4½ per cent. The expenditure on works and plant last year was £9314, raising the total on Dec. 31 to £132,399. The reserve fund amounts to more than £7000.]

Dr.	Revenue Account, for the Year ended Dec. 31, 1880.		Cr.	
Coals, including dues, &c.	£6,958	18 5	Sale of gas—	
Purifying materials, &c.	856	14 6	Common gas	£20,205 8 9
Salaries of Engineers, and Officers at works	995	18 0	Public lighting and other contracts	3,716 0
Wages and gratuities	2,329	12 0		
Repair and maintenance of works and plant	2,862	10 10	Rental of meters	£33,921 9 3
Salaries of Inspectors, &c.	350	5 7	Residual products—	1,323 11 9
Repair and renewal of mains and service-pipes	1,512	15 6	Coke, less labour and cartage	1,843 17 8
Repairing, renewing, and re-fixing meters	430	5 5	Tar	1,807 16 7
Lighting and repairing lamps	1,077	16 5	Sulphate of ammonia	954 0 1
Rents, rates and taxes	1,890	12 5	Rents	80 0 0
Directors' allowances	276	3 0	Transfer fees	3 7 6
Salaries of Secretary, Accountant, Clerks, &c.	914	13 4	Fittings, account, lamp services, &c.	617 17 3
Collectors' salaries	249	12 0		
Stationery and printing	161	15 3		
General establishment charges and incidentals	206	6 4		
Auditors	46	0 0		
Bad debts and discounts	14	0 11		
Total expenditure	£21,163	19 11		
Balance	9,388	0 2		
	£30,552	0 1		£30,552 0 1

The CHAIRMAN moved the adoption of the report and accounts. He said there was only one omission, which he hoped some gentleman in the meeting would supply. They would perceive the balance-sheet was drawn up in the form prescribed by modern gas legislation; and this had entailed an enormous deal of extra work on the Secretary. He knew that Mr. Penney was a gentleman who had the entire confidence of the Company, and in every relation of life his conduct was deserving of the highest praise. If the meeting wished to acknowledge his long services, and his large increase of work—say by the addition of £50 per annum to his salary—it would meet with the entire and unanimous approval of the Directors. The Company's works were in the most perfect state of repair, and the whole of the new plant at Jarrow was now in operation. The profits of the year had not been made by any parsimonious, cheese-paring economy, but by a bold policy of adopting everything that was new, and calculated to economize the working of the Company. The Chairman then dwelt on recent advances made in the direction of introducing the electric light, about which he appeared very sanguine. On the other hand, he said: It is no figure of speech to say gas is yet in its infancy. I am always proud to remind you that this Company was the first prominently to draw public attention to the different purposes to which gas could be put, by holding an exhibition of gas-engines, gas-stoves, and other appliances. The movement has been taken up by other companies in the great centres of England and Scotland, and gas is daily becoming used for other than lighting purposes. This movement has certainly gone on rather slowly—prejudices have to be overcome, internal fittings altered and enlarged, and then come it must; and where at the present time not one household in a thousand uses gas for any purpose whatever besides lighting, every one will have his gas cooking and heating stove. Gas then will be supplied at a price which will defy all competition. To facilitate this movement, I would suggest that this Company be at the cost of putting in the fittings to any house requiring gas for cooking and other purposes, either at cost price or for nothing. In the year 1857 the price of gas charged by this Company was 4s. 6d. per 1000 feet; at the present time the average price is 2s. 5½d. per 1000 feet, and with all the improvements in manufacture at our Jarrow works, we shall soon be in a position to supply it cheaper still—as I have just said, supply it at a price to defy all competition.

Mr. JOHN HENDERSON seconded the motion, which was carried with applause.

Mr. H. NELSON moved the payment of the dividend recommended in the report.

Mr. J. L. HALL, J.P., seconded the motion, which was carried unanimously.

On the motion of Mr. J. M. MOORE, J.P., seconded by Mr. H. T. DUNCAN, a vote of thanks was passed to the Directors, to which Mr. T. L. ARMSTRONG, J.P., responded.

Mr. J. BOWMAN, acting on the suggestion contained in the Chairman's speech, moved that the salary of Mr. J. H. Penney, the Secretary of the Company, be increased £50 per annum.

Mr. W. R. SMITH, in seconding the proposal, bore testimony to the worth of their Secretary.

Mr. J. L. HALL, and others, having supported the motion in eulogistic terms, it was carried amid hearty applause.

Mr. PENNEY responded in a suitable speech.

The retiring Directors (Messrs. R. Wallis, W. Anderson, and J. L. Hall) and Auditor (Mr. R. Chapman) were then re-elected, and the proceedings terminated.

BRIGHTON GASLIGHT AND COKE COMPANY.

The Ordinary General Meeting of this Company was held at the London Offices, Moorgate Street Chambers, E.C., on Thursday, the 24th ult.—Mr. JOHN MILES in the chair—when the following report was presented by the Directors:—

Notwithstanding an unusually bad autumn season at Brighton, the outcome of the past six months shows a moderate increase in rental. The condition of the works is satisfactory, and, though at considerable outlay, the recent alterations in the purifying department have answered the purpose intended.

Though not strictly within the limits of a report on the six months' working to Christmas last, it may be satisfactory to the Shareholders to know that during the snowy

weather, and especially on the 18th of January last, in consequence of the excellent arrangements made by our Manager at Brighton, there was no difficulty in supplying the large extra quantity of gas required.

It has probably been noticed by the Proprietors that a Bill in Parliament, promoted by the Brighton and Hove Gas Company, is now pending, applying for powers to amalgamate with or purchase the Brighton Company, and that it has passed its second reading. In order that the interests of this Company may be protected, Counsel have been instructed to watch the progress of the Bill, and no arrangement between the two Companies will be decided on without the consent of the general body of Shareholders.

The Directors recommend the declaration of a dividend on the paid-up capital of the Company of 5 per cent. for the half year ending Dec. 25 last, less income-tax, together with a further payment in respect of arrears of dividend of 4s. upon each fully-paid share, and 2s. 9d. on each share of the 1874 issue, on which £14 has been paid.

Profit and Loss Account, for the Half Year ending Dec. 25, 1880.

Coals	£12,949 6 8	Gas and meter rental	£24,688 5 9
Materials for purification	883 12 0	Coke, &c.	4,760 12 0
Wages	2,479 6 7	Interest and discounts, and old stores	214 10 2
Rent, rates, and taxes	496 1 2		
Salaries, Collectors' commission, Directors, & Auditors	1,583 9 6		
General charges	634 14 10		
Wear and tear	3,776 2 8		
Bad and doubtful debts and allowances	150 0 0		
Law and parliamentary	500 0 0		
Balance	6,760 14 6		
	£29,663 7 11		£29,663 7 11

The report was adopted, and the dividends recommended declared.

The retiring Directors (Messrs. Miles and Forrest) and Auditor (Admiral R. A. Powell, C.B.) were re-appointed; and a vote of thanks was passed to the Board for their attention to the affairs of the Company.

A similar compliment was paid to the Auditors; and it was also resolved—"That the best thanks of the meeting be given to Mr. Rutter, Mr. Liddall, and the other officers of the Company."

A vote of thanks to the Chairman for presiding terminated the business of the meeting.

READING GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 24th ult., when the Directors recommended, and it was agreed, that full dividends should be paid on all stocks and shares of the Company. The report then proceeded as follows:—

In pursuance of the resolution adopted at the last half-yearly general meeting, your Directors offered for sale, by public auction, in September last, 700 £10 shares, bearing a dividend not exceeding 7 per cent., and the prices realized conclusively testify to the confidence the public have in the Company.

The works referred to in the last report have been pushed forward with as much expedition as the unfavourable weather, which has brought a succession of floods and frosts, has allowed. The bridge over the Kennet is approaching completion. The land recently acquired is in process of being raised to the necessary level. The nature of the subsoil has been most carefully tested by Mr. Baker, the Company's Engineer, with the view of determining the capacity and character of the gasholder and tank to be placed therein. Mr. Baker having prepared the requisite plans and specifications for the works, your Directors will submit at the meeting the necessary resolutions for raising the additional capital required, either by new shares or loan.

The general management of the business of the Company has been conducted to the entire satisfaction of your Directors. The make of gas per ton of coals has been high, and the percentage of loss by condensation and waste unusually small—the result of the recent careful revision and renewal of consumers' service-pipes.

The Gas Analyst and Examiner of the borough has constantly reported the result of his tests to have been satisfactory, both as it respects the illuminating power and purity of the gas.

The receipts on capital account to Dec. 31, 1880, were—

Stock limited to 8 per cent.	£20,000
Preference shares at 5 per cent.	5,000
Ordinary shares at 7	45,000
Mortgages at 4, 4½, and 4¾ per cent.	12,000
Premiums on sales of shares	9,081
	£91,081

Of which amount, there was expended up to June last, £85,354; the subsequent outlay being—for new buildings and plant, £2585; for purchase of land, &c., £5200; for expenses connected with the Company's new Act of Parliament, £1017; and for expenses of issue of new shares, £117. There is thus a balance in hand of only £188; but the Company have power to raise £7000 more in shares, and £8000 by borrowing.

The revenue account shows that last half year the manufacture of gas cost £11,714; distribution, £1971; lighting, &c., public lamps, £254; rates and taxes, £474; management, £806; bad debts, &c., £83; or a total of £15,303. The receipts were from gas, £14,332; residuals, £3477; sundries, £99; or a total of £17,908. This left £2605 to be carried to profit and loss account, the balance of which available for distribution was £12,107.

Besides the undivided profits shown above—the dividends for the half year amounting to less than £2500—the Company have a reserve fund of £6000, and a contingency fund of £1222.

The quantity of coal used last half year (common mixed) was 8122 tons, the resultant products (apart from the gas) being—coke, 8123 chaldrons; tar, 98,518 gallons; ammoniacal liquor, 139,482 gallons.

IPSWICH GASLIGHT COMPANY.

The Annual General Meeting of this Company was held on the 21st ult.—Mr. S. A. MAW in the chair—when the report of the Directors and the accounts for the year ending Dec. 31, 1880, were presented.

The CHAIRMAN, in moving the adoption of the report, said the Company's business during the past year had resulted in a profit of £6822, which allowed of dividends of 10 and 7½ per cent. being paid to the Shareholders, leaving a balance of £487 to be carried forward. The Directors had, as the Shareholders were aware, been for some years engaged in the rebuilding of the works. The alterations and extensions were now finished, and the entire works were in first-class order.

Mr. S. WESTHORP seconded the motion, and it was carried, and the dividends recommended were declared.

The retiring Directors (Mr. J. C. Cobbold, Mr. T. C. Cobbold, M.P., and Dr. A. H. Bartlett) and Auditor (Mr. W. Bantoff) were then re-elected, and a vote of thanks was passed to the Chairman for his services.

On the motion of Mr. W. J. ANDREWS, seconded by Mr. W. B. JEFFRIES, a vote of thanks was unanimously accorded to the Secretary and Engineer (Mr. E. Goddard).

Mr. GODDARD, in reply, thanked the Shareholders for the expression of their confidence. He said he had been 39 years in their service, and hoped, should his life be spared another year, to make up 40 years, and then to withdraw, if they would allow him to do so. The past had been a trying season for the gas-works, and there had been great difficulties to contend with, but he believed the measures now adopted would be such as to give satisfaction to the town at large, and to considerably reduce the cost of manufacture. It was a remarkable fact that during the last half year the consumption had not been so great as in the corresponding period of the previous year, and the London Companies had had a similar expe-

rience. He had no doubt, however, that the consumption would again reach its former standard. He had taken considerable interest in the concern from the time he was first connected with it, and he felt sure the Company had nothing to fear from the introduction of electricity as a lighting agent.

The proceedings then terminated.

BATH GASLIGHT AND COKE COMPANY.

The working of this Company for the half year ended Dec. 31 last, as shown by the published accounts, was, the Directors say, of the usual favourable character; but the balance of profit was not so large as that of the corresponding period of the previous year, which is accounted for by an increase in outlay of £980 3s. 5d. The gas-rental from private consumers showed an increase of £382 7s. 2d., and from public lamps £31 15s. 10d. This was satisfactory, considering the exceptional mildness of the season, which operated unfavourably on the sale of coke and breeze. The other residuals—tar and ammoniacal liquor—slightly increased. There was a falling-off in some other receipts of the half year, leaving the increase in income at £84 13s. 5d. The balance of profit and loss account available for dividend was £6355 10s. 4d., and enabled the Directors to recommend the payment of maximum dividends on the whole of the paid-up capital of the Company, amounting to £6112 10s. The balance of capital account was reduced in the half year to the extent of £1960 7s. 11d. paid for new machinery and buildings, leaving £7431 14s. 7d. Other extensions and works are now receiving the consideration of the Board.

The half-yearly meeting of the Company was held on the 25th ult., when the Directors' report, from which the above is taken, was presented and adopted. A few of the items in the accounts are noted below.

The Company's receipts on capital account to date are as follows:—

£40,000 of 8 per cent. stock.
95,000 „ 7 „ „ shares.
25,000 „ 7 „ „ „
12,500 „ 5 „ „
15,000 „ debenture stock at 5 per cent.

£187,500

out of a total authorized amount of £225,000, the balance of which will be raised by 7 and 5 per cent. shares.

The principal items in the revenue account were £13,363 for manufacturing charges, £1414 for distribution, £571 for public lighting, £980 for rent, rates, and taxes, and £1594 for management; against receipts from sales of gas of £19,524, from meter-rental of £388, and from residual products of £4554. The balance carried to profit and loss account was £5976 as the net profit on the half year's working.

The coal used in the six months amounted to 15,985 tons; but no statement is given of the gas made, sold, &c. The residuals were—10,648 tons of coke, 1196 tons of breeze, 681 tons of tar, and 438,000 gallons of ammoniacal liquor.

CROYDON COMMERCIAL GAS COMPANY.

The Directors of this Company reported to the Shareholders, at the Annual Meeting last Wednesday, that there was a considerable increase in the revenue derived from the sale of gas and residuals during the past half year.

The Company have £51,600 of 10 per cent. (standard rate) shares, and £117,500 of 7 per cent. capital; with power to raise £60,900 of the latter kind. They have borrowed £5000 at 4 per cent.; and are authorized to obtain £15,000 more in the same way. Premiums on shares sold have realized £5658 12s. 8d. The expenditure on capital account to June last was £177,462; and £12,970 was added in the past half year. Concerning £12,180 of this latter sum, the Directors state that it was expended principally in completing the new gasholder and other large works, and in erecting a building and apparatus for the manufacture of sulphate of ammonia, from which they hope to reap an additional profit.

The revenue account for the six months to Dec. 31 shows that manufacturing charges amounted to £15,684; distribution expenses, £705; public lighting, £428; rent, rates, and taxes, £1161; management, £1437; sundries, £248—total, £19,663. On the credit side, sales of gas realized £23,881; rental of meters and stoves, £614; residuals, £5257; sundries, £52—total, £29,804. There was thus a balance of £10,141 to carry to profit and loss account; as to which account the Directors say: "After placing £750 and £845 to the reserve and insurance funds respectively, the balance available for dividend is £12,088 17s. 9d., enabling the Directors to recommend the declaration of the prescribed dividends of 10 and 7 per cent.; and an addition thereto (under the parliamentary sliding scale) at the rate of 2 per cent. per annum—all less income-tax." The reserve fund will now amount to £18,420; and the insurance fund to £5786.

The coal and cannel carbonized during the six months were 12,303 tons; the gas made being 132,296,000 cubic feet. Of this quantity there remained unaccounted for only 6,103,900 feet. The residuals were—coke and breeze, 149,913 four-bushel measures; tar, 86,491 gallons; ammoniacal liquor, 249,601 gallons.

The Directors, in the course of their report, state that "the 50 mortgage debentures of £100 each, offered to the Shareholders, have been taken up at prices ranging from £100 to £101 2s. 6d.;" and that "the reports of the Gas Examiner of the Croydon Local Board of Health show that during the half year the illuminating power of the gas has been above the parliamentary standard; and, as to purity, entirely free from sulphuretted hydrogen and ammonia."

RICHMOND (SURREY) GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 24th ult.—Mr. F. CHAPMAN presiding.

The SECRETARY (Mr. E. B. Blott) read the notice convening the meeting, after which the report of the Directors was presented. It congratulated the Shareholders on the satisfactory results shown in the accounts, and recommended that a dividend be declared of 5 per cent. on the original capital, and 4½ per cent. on the new capital, making for the year 10 per cent. on the original capital, and 9 per cent. on the new.

[The revenue account showed the following expenditure:—Manufacture of gas, £7467 13s. 5d.; distribution, £527 9s. 7d.; public lamps, £175 14s. 2d.; rents, rates, and taxes, £329 1s. 9d.; management, £696 19s. 8d.; and various small items, which, with the balance of £3505 9s. 8d., made a total of £12,771 7s. 7d. The receipts were:—Sale of gas and rental of meters, £10,298 3s. 2d.; residual products, £2262 8s. 3d.; rents, £74 11s.; transfer fees, £2 15s.; services, £133 10s. 2d.; total, £12,771 7s. 7d.]

The CHAIRMAN, in proposing that the report and statement of accounts be adopted, informed the Shareholders of the arrangement that had been come to with the Vestry in the matter of the new Bill—noticed in another part of to-day's issue. The various concessions that had been made they considered to be an honourable compromise. It would save further unpleasantness and expense, and with the arrangement that had been entered into the Bill would now pass as an unopposed measure.

Mr. WHITELEY seconded the motion, which was unanimously adopted.

It was then resolved that a dividend be declared of 5 per cent. on the original capital, and 4½ per cent. on the new capital.

The CHAIRMAN next proposed the re-election of Mr. Clarke as a Director of the Company.

This was seconded by Mr. WHITELEY, and unanimously carried; and it was also resolved that the vacancy on the directorate created by the death of Mr. Macrae be at once filled up, Mr. Chancellor being elected.

Mr. Stanbury having been elected an Auditor in place of Mr. Pugh, who had resigned, it was resolved to present the latter gentleman with the sum of £50.

The proceedings terminated with a vote of thanks to the Chairman.

The death, referred to above, of Mr. John Gordon Macrae took place, on the morning of the meeting, at his residence, York House, Richmond, in the 66th year of his age. Mr. Macrae suffered from dropsy, and had been confined to his house during the last four months. He was for several years one of the Directors of the Richmond Gas Company; and, at a Board meeting held the following day, the Directors passed a vote of condolence to Mrs. Macrae and family upon their bereavement.

SUTTON (SURREY) GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Thursday, the 24th ult.—Mr. C. E. Amos in the chair—when the report of the Directors, drawing attention to the continued prosperity of the Company, was presented. It stated that the revenue account for the past half year showed a considerable increase on almost all items of receipts; and this rendered it possible to set aside the sum of £300 for a renewal suspense account, to help to meet the unusually large expenditure which must occur during the present year in connection with the contemplated alteration and extension of works.

[The Company's original (10 per cent.) capital, all paid up, amounts to £25,000; and £2000, of the £35,000 authorized of 7 per cent. additional capital, has also been issued. None of the borrowing powers of the Company, which they possess to the extent of £13,750, have yet been exercised. There was not any additional expenditure on capital account last half year. During this time, on revenue account, an outlay of £2454 was incurred for manufacture of gas; the other expenditure bringing the total up to £3734. The receipts from sales of gas were £4371; from residuals, £747; total receipts, £5362. The balance—£1628—added to the undivided profits in hand left £2929, out of which the Directors stated that they had decided to set aside £250 towards a reserve fund, and to recommend dividends of 10 and 7 per cent. respectively, less income-tax; carrying the balance forward to next account.]

The CHAIRMAN moved, and Mr. C. R. MEAD seconded, the adoption of the report.

The resolution was carried unanimously; after which the retiring Director (Mr. C. Newton) and Auditor (Mr. B. T. Harding) were re-elected, Mr. W. Stevens being appointed a Director in place of Mr. W. W. Thorn, deceased.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Guildhall Tavern on Friday, the 25th ult.—Mr. J. F. BONTEMS presiding.

The SECRETARY and ACCOUNTANT (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were then presented. The report stated that the balance of the profit and loss (net revenue) account for the half year ending Dec. 31 amounted to £4533 3s. 7d., out of which the Directors recommended the declaration of a dividend, free of income-tax, at the rate of 5½ per cent. per annum on the "A" stock and shares, and 4½ per cent. per annum on the "B" stock. The Directors also reported that a further reduction of 3d. per 1000 feet was made on the 1st of January to those consumers who were then being charged 6s. 9d. per 1000 feet.

Dr.—Revenue Account, for the Half Year ending Dec. 31, 1880.

	Gas.	Water.
Coals	£1497 18 6	£395 14 7
Purifying	67 1 2	
Salaries of Engineer, &c.	87 10 0	87 10 0
Do. inspectors and clerks	115 6 9	45 1 0
Wages	316 0 5	221 15 9
Repair and maintenance of works and plant.	271 4 10	436 17 1
Do. mains and services	51 11 4	84 3 10
Repairing and renewing meters	62 17 5	
Public lamps—lighting and repairing	93 9 8	
Rent, rates, and taxes	106 6 3	110 17 3
Directors' allowances	100 0 0	100 0 0
Salaries of Secretary and Accountant, &c.	62 10 0	62 10 0
Collectors' commission	48 15 5	44 12 9
Stationery and printing	35 18 7	35 18 7
General establishment charges	67 8 7	72 1 1
Auditors' fees	5 5 0	5 5 0
Law charges	22 19 0	17 1 3
Bad debts and allowances	69 12 6	103 7 9
	£3081 10 5	£1822 10 11
Balance to profit and loss account	2712 7 8	1381 9 5
	£5793 18 1	£3204 0 4

Cr.—Revenue Account.

Sale of gas—	
Private rental	£4434 9 9
Public lighting	307 3 2
	£4741 12 11
Rental of meters	112 10 10
Residual products	917 18 4
Rents	21 16 0
	£5793 18 1
Sale of water	£3183 15 4
Rents	20 5 0
	£3204 0 4

The CHAIRMAN said he should not detain the meeting long, but he had been accustomed to draw a few comparisons between the half year reported upon and the corresponding period of the previous year, and the Shareholders would perhaps expect him to do so on this occasion. The balance of profit for the half year was £4533, against £3827 in the corresponding half of 1879. This was not a very large increase, but it was progress in the right direction, and therefore so far the Board met the Shareholders with satisfaction. The gas and meter rental for the half year was £4854, against £5091 in the corresponding period of 1879. This showed a slight loss, but it must be remembered that the Company had reduced the price of gas by 3d. per 1000 feet. Those consumers who used to pay 6s. now paid 5s. 9d. per 1000 feet, and this reduction accounted for perhaps the larger portion of the decrease; but the Directors hoped that in time it would be made up by an increase in the consumption of gas.

They had again reduced the price from the 1st of January to 5s. 6d. per 1000 feet, and they trusted that this continued reduction would bring in a large number of consumers, and that they would get beyond their former receipts. The water-rental was reported at £3183, as compared with £2829 in the corresponding period of 1879, so that a considerable advance had been made. For the residual products they had received £918, as against £802. The capital expenditure in the last half year was £140 for gas, against £171 in 1879; and for water, £1130, as compared with £3602. This was a larger outlay than took place in 1879, but by this expenditure they would effect a considerable saving, which would lead to an increase in the profits. The general expenditure for gas in the present accounts appeared at £3081, as against £3298 in the same period of 1879; and the water expenditure had been in the past half year £1822, against £1421. This increase was all accounted for by the work that had been done for the benefit of the plant. The total capital expenditure to the date of the accounts was—on gas, £71,525; on water, £77,733. Mr. Lass had furnished him with a large number of returns, chiefly relating to the details of the manufacture and distribution of the gas. These returns would be very useful if any questions should be asked on these subjects; but it was not desirable that he should read them all, as it would take too long, and the Shareholders would scarcely understand them. He had, however, taken from them a few figures, and found that in 1874 no dividend was paid, but this was soon after the amalgamation of the Companies, and the business was at that time in a state of chaos. The dividend had since increased almost year by year, till now it reached $\frac{5}{4}$ per cent. on the "A," and $\frac{1}{4}$ per cent. on the "B" stock. This was, so far, satisfactory. Some of their friends seemed disposed to laugh at the Company increasing the dividend by $\frac{1}{4}$ per cent.; but he thought the laugh came from those gentlemen who were enjoying large dividends—10 per cent.—and who thought very little of $\frac{1}{4}$ per cent. increase. He, however, believed the Shareholders generally would value $\frac{1}{4}$ per cent., and that they would rather have this increase than none, if they could not afford to make it more. It was, too, not only the Shareholders who had to be considered, but the customers also. The Directors reduced the price of gas 9d. per 1000 last year, and 8d. per 1000 this year in those districts where the consumers had been paying 6s. per 1000 feet. They had further to consider their staff, and to pay them a little more if their work increased. Therefore, if they could get $\frac{1}{4}$ per cent. for the Shareholders, reduce the price of gas 6d. per 1000 feet where it needed reduction, and meet the fair claims of their staff, he thought they did pretty well for the half year. He found from Mr. Lass's figures how their rental had increased from time to time. The gas-rental for the whole year 1874 was £6222, while for 1880 it was £9120, showing an increase of £2898; and the water-rental in 1874 was £2592 as against £6278 for last year—an increase of £3686. The gas capital during the same time had increased from £61,374 to £71,525, or by £10,150; but the Shareholders would see that the rental had increased in a greater proportion than the outlay, large though it had been. In 1874 the water capital was £37,172, while in 1880 it was £77,733, being an increase of £40,560; but for this outlay they had a return of £3686. It had therefore answered their purposes very well to incur this expense; and while they knew they had been laying down many miles of excellent mains, erecting a new engine, making a new well, and effecting large improvements at the works, which would tell not only for the past but for the future, he thought the Shareholders need not regret the outlay of capital since 1874. The new engine, of which the Shareholders had heard so much at different times, was now, and had been for some time, at work. It was an excellent engine, and did its work extremely well. Although the supply was so much larger than it used to be, four hours a day were saved in the service of the water. The Company saved this much in the consumption of fuel and in wear and tear of machinery, and yet supplied a good deal more water than before. Their Engineer told him that this would save nearly 300 tons of coal a year, so that those things which had cost so much money and taken up so much time were coming into good service, and he hoped that at the end of another half year the Company would be able not only to maintain their ground, but make a little further progress. He concluded by moving the adoption of the report and balance-sheet.

The DEPUTY-CHAIRMAN (Mr. James Glaisher, F.R.S.) said he would second the motion as he had done on previous occasions, with much pleasure, because each year had shown progress, and the past year was not different from the others. The water-rental last year showed an increase of £900, and there was every prospect that the current year would show a similar increase; and he almost felt certain that the year following would be better. The severity of the weather in January and this month (February) would help the current half year as to the gas. Taking all in all, and seeing how great was the saving of coal daily by the use of the new engine, and further how completely the Company now had the district under their command, rendering it impossible for there to be any delay in supplying the whole locality with water, he thought very bright prospects were held out for the future, perhaps brighter than in any previous year.

Mr. WAKEFIELD, referring to the difficulties of supplying gas in the Company's district under existing circumstances, said he was sure of the advisability of making the reduction in the price, but was a little disappointed that the increase in the consumption had not been sufficient to recoup the Company for the decrease. He knew, however, that those who lived in the neighbourhood were doing what they could to extend the consumption by making known to their friends the advantages of using gas for cooking and heating purposes. As to the electric light, his own opinion was that it could not be used in houses; but some remarks on the subject from the Chairman might perhaps ease the minds of those Shareholders whose opinion was the reverse of his (Mr. Wakefield's). The Company had the uncontrolled supply of the district as to water, and it was a district which was increasing yearly. If requests were made to supply water beyond their district, as they undoubtedly would be, he thought the Company should be guaranteed 10 per cent. for more than three years, or that they should charge a higher price. As Mr. Glaisher had pointed out on a previous occasion, the Company had a most ample supply of water. He considered everything in connection with the Company was very satisfactory, and he looked confidently to the future.

Mr. CLARKE asked whether the Directors were turning their attention to cooking and warming by gas, as no electricity could interfere with this, and he was quite sure that in the future the employment of gas for these purposes would add largely to the revenue of all gas companies.

Mr. SPORNE did not think that at Barnet they need take up the scare about the electric light. Even when used in large centres the light cost much more than gas. The report must, he thought, give entire satisfaction to all the Shareholders.

The CHAIRMAN, in reply, stated that so far as he was concerned, he did not know enough of the electric light to express any confident opinion. He only knew that the Commissioners of Sewers tried to get the electric light arranged in the City to commence on the 1st of January; then it was to commence on the 1st of February, and now he thought it was going to be commenced some time in March, but possibly it might be the 1st of April before they got it into operation. He would be able to tell them more about the light then. The Directors had not lost sight of the suggestion conveyed in the remarks of Mr. Clarke, but they felt that while

they charged 6s. per 1000 feet for their gas, they would not be likely to make much progress in its use for cooking purposes. As they reduced the price they would look out for more custom in this direction. With regard to water supply, he did not think the Company supplied water outside their district, with only a guarantee of 10 per cent. on the outlay for three years.

The motion was then put, and carried unanimously, and the dividends recommended in the report were declared.

The retiring Directors (Messrs. Massey, Pontifex, and Wilkinson) and Auditor (Mr. J. I. H. Gibbins) having been re-elected,

The CHAIRMAN announced that there were 700 shares remaining unallotted, and they would now be offered *pro rata* to the Shareholders. They were the last shares the Company had authority to issue.

On the motion of Mr. STUBBS, seconded by Mr. WAKEFIELD, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the compliment, and submitted a resolution thanking the Engineer, Secretary, and staff generally for their services.

Mr. CECIL seconded the motion, and it was carried unanimously.

The SECRETARY and ACCOUNTANT, in reply, expressed his readiness to furnish any Shareholder with statistical information as to the Company. Being in the habit of constantly working up gas companies' statistics, he was able to state that the working of the Barnet Company, taken all round, was remarkably good.

The ENGINEER and MANAGER (Mr. T. H. Martin) also replied.

Mr. WRIGHT having acknowledged the compliment on behalf of the staff, the proceedings terminated.

BOURNEMOUTH GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held at the London Offices (90, Cannon Street, E.C.), on Friday, the 25th ult. Mr. R. HUDSON presided, and moved the adoption of the Directors' report on the transactions of the past half year, the following being the principal items in it:—

The further expenditure of capital which appears in the accounts is almost entirely on the new works at Tuckton, which are now completed, but they have not yet been connected with the Company's mains.

Your Directors have much satisfaction in being able to point out that the gas-rental has recovered most of the reduction caused by the price of gas being lowered 6d. per 1000 feet at the beginning of 1880; the amount to the credit of the revenue account being only £174 4s. 10d. less than in the corresponding half year of 1879.

There is an estimated sum of £200 charged for professional services, in resisting an attempt to make the Company pay a most exorbitant increase in the rates for the parish of Kinson, where the Company's works are situated, the valuation proposed having been almost one-third of the gross valuation of the whole parish. Your Directors are glad to say that they have succeeded in getting the valuation considerably reduced; and, as they are advised that it is still much too high, they intend to pursue the matter still further.

The balance to the credit of the profit and loss account is £6456 3s. 11d., and deducting therefrom £1356 7s. 7d., brought forward from last half year, there remains the sum of £5099 16s. 4d., as the net profit on the working of the half year, which is the largest result yet achieved by the Company in a similar period.

Your Directors are enabled, therefore, to appropriate the sum of £500 to create a reserve fund, and have much pleasure in recommending that dividends be declared at the following rates *per annum*, viz.:—10 per cent. on the original shares, and 7 per cent. on the "B" shares (less income-tax); and that the balance be carried forward to the next account.

Mr. C. R. MEAD, in seconding the motion, said he wished to give the Shareholders some information as to the working of the Company's business; and, in doing so, would (he trusted for the last time) call their attention to the state of affairs when, in February, 1878, they elected him to a seat at the Board. At that time the dividends had been reduced from 10 to 6 per cent.; the whole of the money derived from the premiums on sale of shares was lost; a suspense account was created, and a sum of £3422 10s. 9d. under this head had been spent for repairs that should properly have been paid for out of revenue; besides which large sums of money were spent for repairs of works, and yet the works were in such a bad condition, that it was not possible to make gas economically. The reconstituted Board had, however, altered all this, and he trusted the Shareholders would not consider as excessive the three years spent upon it. In that time all the works had been put in thorough repair; the £3422 10s. 9d. paid off; the price of gas reduced so as to effect a saving of about £1100 *per annum* to the consumers; £500 had been placed to a reserve fund; the dividend increased from year to year until it now amounted to 10 per cent.; and, beyond this, the Directors had determined to make a further reduction in the price of gas in the course of the present year.

The motion was then put and carried unanimously; and the retiring Directors (Messrs. Hudson and Whiteley) and Auditor (Mr. Frank Mead) were re-elected. It was also resolved to add £100 *per annum* to the Directors' remuneration, and increase the fees of the Auditors by £20 a year; cordial votes of thanks to the Directors, Auditors, and other officers of the Company terminating the meeting.

The paid-up share capital of the Company is £107,170, out of a total authorized amount of £250,000; and there are £25,000 of loans, £37,500 remaining to be borrowed. The premium on shares sold having realized £1257, there is a balance in hand on capital account of £6255. The additional expenditure last half year, referred to in the Directors' report, was £3255. From the revenue account it appears that in the past six months the manufacture of gas and pumping of water cost £3821; distribution, £440; rents, rates, and taxes, £512; management, £946. The receipts were, from sales of gas and meter rental, £6590; water-rental, £3732; gas residuals, £856; sundries, £72. The balance, carried to profit and loss account, was therefore £5630. During the half year 2316 tons of coal and cannel were carbonized, producing 24,901,000 cubic feet of gas, 2079 chaldrons of coke and breeze, 19,314 gallons of tar, and 38,782 gallons of ammoniacal liquor. Of the gas made, 23,315,400 feet were accounted for, 23,082,200 feet being sold.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

The Thirty-third Annual Meeting of this Company was held on Thursday, the 24th ult.—Mr. ROBERT VINI in the chair.

The SECRETARY (Mr. J. W. Sutherland) read the notice of meeting; and the Directors' report was taken as read. It stated that the gross income of the Company for the past year was £48,883 18s. 1d.; and recommended the payment of a dividend of 5 per cent. on the ordinary and preference stock of the Company, for the half year ending Dec. 31, making, with the interim dividend paid in September, 10 per cent. for the year; also that interest at the rate of 5 per cent. be paid on the amount called up on the shares allotted on the 3rd of September, 1875. In regard to the works, the report stated: "There has been a large increase in the expenses charged to revenue during the year, owing to extensive repairs to the engine and well at Humbleton Hill, to the cost of working the new station at Dalton, and to increased charge for rates and taxes. In consequence of the continued development of the district on the south bank of the Tyne, your Directors, by the advice of their Engineer, have deemed it necessary to construct a covered reservoir at Hebburn Fell, capable of holding 2 million gallons of water. Satisfactory progress has been made

with the work, and it will be completed and ready for use in the course of six months."

The CHAIRMAN, when moving the adoption of the report and accounts, went over the items in the latter, explaining the increase or decrease in each case. As to extensions of works, he said he was happy to be able to announce that at length the Dalton works were completed. This had been the longest, and certainly the most important work the Company had ever undertaken. It had lasted longer than they expected, but this arose from two causes—first, to obtain water they had to go to a greater depth than was anticipated; secondly, in the sinking operations they had come in contact with a very hard bed in the limestone, almost as hard as flint, and they had had a great deal of trouble to get through it. However, they would find the result was satisfactory. Then, too, they had the Hebburn reservoir nearly completed. Some people thought they were rather premature with this work, which would cost more than £10,000; but the demand they had for water on the Tyne was so large, and so many thousands of people were depending upon them, not only for water for drinking purposes, but for their manufactories, that they felt there should be no intermission in the supply. Any interruption would have thrown thousands of men out of employment in a single day, and he thought, therefore, that they had done right in getting the work completed. They had added 5397 yards of new mains during the year, as against 3340 yards in the previous year; they had also put in 988 additional services, which meant that they had as many new customers, as against 773 in the previous year. The number of their customers was thus increasing year by year, and they had now more than 50,000 separate accounts on their register. The expenditure on the Dalton works—£150,000—included the laying of the large main connecting the shaft with the reservoir at Ryhope. They had pumped during the year the enormous quantity of 1676 million gallons of water, being 120 millions more than they ever pumped in a year before. This was very satisfactory, because it showed they had been selling so much more. The daily average had been 4,600,000 gallons, which was an increase per day of about one-third of a million. He had little doubt when they met again they would find that the daily average had run up to about 5 million gallons. They found the demand was still steadily going on; more services were wanted, and consequently they would have to lay more mains. An improvement was also going on for the purposes of trade—that was for water sold by meter. During the last year they had sold 600 million gallons of water in this way. In consequence of the great accession to their supply at Dalton, they had 3½ million gallons per day added to their resources, so that they could go on for a long time to come without any further serious outlay. They had just completed another period of ten years in the history of the Company, and he was curious enough to look back to the income for the year 1850, after they had been three years in operation. He found it was then less than £4000; in 1860 it had risen to £16,230; in 1870 to £29,650; and in 1880 to £48,883, being an increase during the last ten years of £19,229. They had now water enough to enable them to supply 2 million gallons more per day, and when it was remembered that they received something like £11,000 a year for every million gallons of water delivered daily, it would be seen that if they could sell this extra 2 millions they would have an increase in income of £22,000 a year. This would come on steadily. They must wait quietly; if they increased their daily delivery by half a million of gallons during the year it would be very satisfactory. In concluding his speech, the Chairman read a letter which he had received from Mr. Thomas Hawksley, the Company's Engineer, in the course of which he said: "I must congratulate you and the Board and the Shareholders on the splendid success of the undertaking, which, notwithstanding all the additional outlay, is able to meet all its charges and expenses with an undiminished dividend. Few undertakings have received a similar development, or have achieved a similar result. I have also to express my satisfaction at the completion of the Company's new works at Dalton and Hebburn, by which the system adopted at Sunderland of constant supply at high pressure has not only been perfected, but also rendered secure for many years to come. So large is the yield of the Dalton well, that I have no doubt the Company is now able to supply a population of 400,000 persons, with all their trades and manufactures besides. The new reservoir at Hebburn, now about to be brought into use, will render the Tyneside service safe from all ordinary accidents and contingencies."

Alderman GLOVER seconded the motion, which was agreed to. Mr. G. R. BOOTH next proposed, and Mr. J. HENDERSON seconded, the payment of the dividends recommended by the Directors; and this was agreed to.

The retiring Directors (Messrs. Robson, Grimshaw, Matthew, and Tone) and Auditor (Mr. T. C. Squance) were re-appointed; after which some conversation ensued on the subject of water waste during frosty weather.

Dr. BERWICK then moved a vote of thanks to the Chairman and the Board of Directors for their efficient management of the Company during the year.

The Rev. A. GILBERT seconded the motion, and it was carried by acclamation.

The CHAIRMAN, in replying, said it was 30 years that day since he was elected a Director of the Company. He considered it a great compliment to have continued a Director for 30 years, and Chairman for nearly 20, of a large Company like this; and for the Shareholders to have confidence in the persons who had the management of their property was a very great thing.

The proceedings then terminated.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, March 4, 1881.

Tar, 40s. to 42s. per ton at works.

Ammonia liquor, 6° Twaddell (sp. gr. 1.03), 24s. per ton.

" sulphate (white), £20 to £20 10s. per ton.

" " (good grey), £20 per ton.

" muriate (white), about £36 per ton.

" " (grey), about £30 per ton.

" " (brown), £26 per ton.

Muriatic acid, £1 5s. to £1 10s. per ton.

Sulphuric acid (brown vitriol), about £3 per ton.

Tar Products.—Anthracene in fair demand at 3s. 6d. per lb. Benzol, 6s. per gallon, also in fair demand. Solvent naphtha, 11d. to 1s. per gallon, very low.

CARDIFF GAS COMPANY.—The eighty-eighth half-yearly meeting of this Company was held on Monday last week—Mr. C. W. David presiding. The report of the Directors and statement of accounts for the half year ending the 31st of December last having been presented by the Chairman, and taken as read, it was resolved that the same be adopted, and that a dividend for the half year at the rate of 10 per cent. per annum on the "A" stock, 8 per cent. on the "B" stock, and 7 per cent. on the paid-up capital created by the Company's Act of 1870, be declared. The thanks of the meeting were voted to Mr. H. Bowen, the Managing Director, and also to the Chairman and Directors, for their attention to the interests of the Company.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

In the last number of the JOURNAL, Mr. F. W. Hartley has taken some pains to convince me of the truth of the old proverb that "it is great folly to think of being wise alone." Thoroughly convinced as I am of a "want of fulness of knowledge," I would in all humility prostrate myself at the feet of this meter Gamaliel, and learn from him not only words of wisdom—for much he speaks and learnedly—but also that I may acquire a modicum of that reverential awe which he entertains for those "gentlemen of high scientific attainments" who deal with the destinies of the meter trade in the Standards Department. Raising myself from the dust, I do not know whether I may now be permitted to do more than kiss the rod by which correction has been administered; but if I may be allowed humbly to say a word or two in self-defence, I would deal with a little detail which really seems to have escaped Mr. Hartley's observation. Mr. Hartley has been good enough to inform me that I have a limited knowledge of "the difficulty of measuring gaseous volumes with absolute exactitude," and that, therefore, I ignorantly ask "that gas-meters shall be more perfect than the instruments by which they are to be tested, which latter may differ among themselves to the legalized extent of 1 per cent." It may be the result of some mental obliquity on my part, but it occurs to me that Mr. Hartley has overlooked the fact that I was dealing with a part of the question which required no reference to those scientific giants in the Standards Department, who have found it absolutely necessary to permit the degree of error mentioned. When I stated that meters are now made which "do not require a range," I referred to the range of error which is due to change of water-line. It was not my intention to convey the absurd idea that meters could be made to work without any percentage of error at "normal temperature," for that would have supposed the possibility of their being "more perfect than the instruments by which they are to be tested." I was dealing with a practical question, and I naturally expected to be understood in that sense. The question is simple enough. When the original Sale of Gas Bill was framed, it was found that a 5 per cent. range of error was the least that was practicable without excluding wet meters almost entirely from use. Even dry meters were, then as now, only supposed to register without error; and although some dry meter makers indicated a desire that the range should be less than 5 per cent., this was not carried into effect, and subsequent experience has doubtless proved that a range of error for dry meters is quite necessary. This, I trust, will explain the sense in which I used the word "supposed," and which seems to have tickled Mr. Hartley so much. But the real question is whether a 5 per cent. range of error is now necessary, and should be longer permitted? I have already said that there are many sorts of compensating meters, which by no means require such a range as 5 per cent., and that there are meters which do not require a range of error. Of course Mr. Hartley will now understand that I do not exclude the error in the testing instruments which in the Standards Department even "gentlemen of high scientific attainments" must permit; nor do I exclude the corresponding necessity for a similar allowance in the testing of meters. What I think ought to be objected to is, that a range of error necessary 22 years ago, when the Sale of Gas Act was passed, should be allowed to continue, and that in the proposed amendment Bill, no provision for the reduction of the range should find a place. I would ask whether it can be right that a range of 2 per cent. against the consumer should be allowed in meters which do not permit any error against the seller of gas? And further, considering that this range of 2 per cent. against the consumer is for the above reason not just, and should therefore be reduced, would it not be equally right to disallow a considerable portion of the 3 per cent. which is now permitted against the seller? The causes of error referred to by Mr. Hartley as affecting the testing instruments, apply, as he observes, with even greater force to the "comparatively rough testing of meters," and ought to be allowed for as he contends; but these causes will apply to meters of all kinds, and ought not to be urged as a reason against considerably reducing the allowance for error through changes of water-line, now that meters are made in which error from this cause need not occur.

While upon the subject of meters and meter testing, I may mention that during the past week Mr. Chaney, from London, has paid a visit to the meter makers in Edinburgh. I infer that the purpose of his visit was practically to test the Edinburgh style of stamping meters, and I gather that he has not been very favourably impressed with the system, mainly on the ground that it does not afford such facilities to the public as the Sale of Gas Act contemplates. Indeed, I hear that Mr. Chaney was refused admission to two of the works. For the credit of the Edinburgh meter makers, I trust this latter rumour is without foundation. Apart altogether from considerations which may have influenced Mr. Chaney, I would point out that in Scotland at any rate there is no pressing necessity for district testing-stations, otherwise than for the convenience of the makers, because it very seldom happens that any member of the public cares to look for such an establishment. This may be accounted for by the fact that a very limited number of consumers possess meters of their own, and such as are in this dignified position, are usually exceedingly cautious about touching them, at any rate so long as they do not exaggerate the quarterly account. Then Edinburgh does not cover a very great space of mother earth. Taking the Corporation Buildings, where there is a central office, and where the chief inspector attends daily, one could easily walk to the utmost boundary line of the city within half an hour, and in two-thirds of that time to those limits wherein reside the bulk of the population. I question whether in Edinburgh during the past year half-a-dozen meters not made on the premises, have been stamped at the whole of the district offices. This, it will be seen, is a material point to consider, if there should be the slightest desire on the part of those in official quarters to alter the present system. I know I shall be met with the objection that the public interest must be guarded, and that the terms of the Sale of Gas Act must be carefully carried out. The first part of the objection I consider to be, and I think the statement I have made proves it to be, purely sentimental. On the other part I would only say that while every respect must be paid to the law of the land, the question is immediately raised whether the spirit of the Act has not been sufficiently complied with by placing offices at the establishments of the meter manufacturers. If I leave out of view the two establishments to which it is alleged admittance was refused to Mr. Chaney, I may assert that the public have all the facilities they desire, and that the Magistrates are carrying out the Act of Parliament, as they are bound in the interests of the ratepayers to do, in the most economical manner. It would be a very simple matter for the Magistrates to issue an order to the two meter makers under consideration (always, of course, on the assumption that they are guilty), compelling them to follow the example of the majority, and throw open to the public the testing offices at their works.

If in Scotland natives have so much to complain of with respect to the pollution of the atmosphere, and the consequent danger to life, Londoners must have a terrible bill of fatality to meet. I have been led to make this remark from reading the report of a speech by Professor Fleeming Jenkin,

delivered in Bradford last week, and the evidence given in the action by the Lord President of the Court of Session against the Shotts Iron Company, to which I directed attention in the last issue of the JOURNAL. Professor Jenkin, as is well known, is a sanitary reformer who has very pronounced views on this all-important subject. In Edinburgh he was the means of founding an Association, the members of which obtain, at a merely nominal figure, the advice of very eminent engineers as to the sanitary condition of their dwelling-places. An Association similar in nature to this has recently been established in London, and a third has sprung into existence at Bradford. It appears that the engineers in London have found out graver defects in the first twenty houses inspected in that city than are found in a year in Edinburgh. "Stopped drains and large holes leading gas from the soil-pipes straight into the houses, occur almost in a majority of cases in London." This is surely a bad enough state of matters. The people are attacked in their houses by foul gases, and if they seek refuge outside they are forced to inhale sulphur compounds with which the atmosphere is charged; and one really pauses to wonder that human lungs can perform their natural functions, and keep the body free from disease. In the case of Lord President Inglis, Professor Dupré, of Westminster Hospital, was examined for the defenders, and in his evidence he contrasted the condition of London with that of Glencorse, the estate of his lordship. From the Professor's statements it appears that in London, in the four months beginning with November, 3 million tons of coal are burned, with the consequent liberation of about 60 tons of sulphurous acid. Calculating London as covering 100 square miles, there would be an hourly vomiting forth on every square mile of that city of 2752 cubic feet of sulphurous acid. This, it was contended, is about six times as much as is to be found within a mile radius of the ironstone bings, the fumes of which are said to have played such havoc with the Lord President's plantations. On the merits of the question in dispute in this action, Professor Dupré, Dr. Odling, Dr. Voelcker, and Dr. Stockhardt (Professor of Chemistry and Privy Councillor to the King of Saxony) are agreed that in the plantations no trace of deleterious effects from sulphurous or sulphuric acid are to be discovered. Lord Rutherford Clark has taken time to consider his judgment; but here it is looked forward to with not a little anxiety as well as interest.

On Tuesday evening a graceful compliment was paid to Mr. Alexander Mitchell, formerly Assistant Gas Manager at Dundee, and now Manager of the gas-works at Bury St. Edmund's, by presenting him with a massive marble timepiece, a case of mathematical instruments, and a gold pencil case, the value of the gift, from no intrinsic point of view, being greatly enhanced by the fact that it is the spontaneous outcome of the kindly feelings entertained for Mr. Mitchell by the employees of the gas-works at Dundee. Mr. W. Miller, the foreman at the works, presided, and Mr. Strachan, chief clerk in the town office, made the presentation. Mr. Mitchell acknowledged the compliment, and in doing so said that it was with regret he parted from his friends at the Dundee Gas-Works. I see also that the Gas Commissioners have awarded Mr. Mitchell £50 in respect of his services as interim Manager for two months.

The Directors of the Elgin Gas Company, among the last acts of their existence, made presents of articles of jewellery to the wives of the Chairman and Secretary of the Company, as a slight recognition of the efforts of their respective husbands to conduct the business of the Company successfully. The Town Council of Elgin, who recently acquired the works, have ordered the Manager to report to the Committee on the hours the men at the works are employed. It is said that the men work 84 hours a week.

As I mentioned last week, 89 applications were made for the office of Gas Manager and Treasurer at Arbroath. The Committee of Management of the Gas Corporation met yesterday to deal with these applications, and the result of their labours has been the selection of three gentlemen as a short list—namely, Messrs. R. S. Carlow, Port-Glasgow; D. C. Niven, Dunoon; and W. Taylor, Elgin. These gentlemen were recommended to the Town Council, and the appointment, it is expected, will be made next week.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

I am given to understand that very considerable interest has been excited by the announcement I made in my last week's "Notes" in regard to the "new departure" resolved upon by the Glasgow Corporation Gas Committee in the way of applying the newest improvements in Dr. Siemens's heat-regenerative system at the Dalmarnock Gas-Works. In my "Note" referring to this matter, I said that one gas producer is, in the first instance, to be used in producing gaseous fuel to work only two ovens of retorts, whereas the fact is that there are to be four ovens of seven retorts each, worked from one gas producer. In due course I hope to be able to report from time to time how this novel feature in gas-making practice is succeeding.

The lecture on "Coal Gas," recently referred to in the JOURNAL as having been delivered before the Dumbarton Mechanics' Institution, by Mr. James McGilchrist, has been re-delivered at Old Kilpatrick. In concluding, the lecturer remarked that the quality of gas, as supplied on that occasion by the Old Kilpatrick Gas Company, was excellent; but he believed that the Directors were standing very much in their own light by keeping up the price at what appeared to be the unreasonably high rate of 8s. 4d. per 1000 cubic feet. He believed that they would realize a larger dividend to the Company, besides conferring a deserved boon on the consumers, if a material reduction were made in the price. It need scarcely be said that the audience very greatly appreciated the lecturer's remarks on this point. Many of the householders of Old Kilpatrick who formerly used gas have given up the consumption of that illuminant since the price of paraffin oil was so much reduced, and are now burning this substance instead; and it is not surprising to learn that heating and cooking by gas are unknown in the district, which would scarcely be the case were the price of gas reduced to a more reasonable rate.

Three weeks ago I briefly took notice of the fact that the annual meeting of the Kilmacollm Gas Company had been held, and it falls to me now to supplement the information given on that occasion by mentioning that the price of gas has been reduced from 8s. 4d. to 7s. 6d. per 1000 feet.

Mr. S. Dalziel, Manager of the Kilmarnock Corporation Gas-Works, reports that the gas sold during January, 1880, amounted to 5,762,900 feet, realizing £1320 12s. 10d., whereas in the corresponding month of the present year the sales rose to 6,169,650 cubic feet, of the value of £1413 17s. 6d. In the eight months ending with January, 1881, the sales realized £5538 4s. 0d., as against £5181 1s. 4d. in the corresponding eight months of 1879-80.

At the Justice of Peace Small Debt Court held in Glasgow yesterday about 30 householders were sued by the Magistrates of the burgh of Glasgow to recover accounts due by them for gas consumed in their respective houses, the sums ranging from 10s. to 30s. The greater number of the defenders failed to appear when their names were called, and decree was consequently granted for the sums sued for.

The strange and unaccountable conduct of the Dalry Gas Company's Directors in giving their Manager peremptory notice of dismissal after faithful service over a period of 16 years, as noticed in the Shareholder's

letter which I quoted last week, has excited a very strong feeling against them. Other letters on the subject have appeared this week, one of them being from an ex-Director, who urges that a public meeting of the gas consumers be at once held to take action in the matter.

Certain claims for loss of life and property, caused by the recent gas explosion in Henderson Street, have been sent to the Glasgow Corporation Gas Committee, but in the meantime the Committee decline to admit any liability in the case. This matter was incidentally brought under consideration at last Thursday's meeting of the Town Council, when it was stated that the Committee declined at present to discuss it either in the minutes or before the Council; and that, being a legal question, it was being investigated privately in every way possible.

A proposal from Messrs. Crompton and Co. to light the Glasgow City Hall by electricity has been remitted to the Bazaar and Markets Committee of the Town Council. It is stated that the electric light is also being tried in various cotton factories and other manufacturing establishments in Glasgow and other parts of Scotland.

Business was done on Wednesday in Glasgow Corporation 9 per Cent. Gas Annuities at £226 12s. 6d. up to £226 17s. 6d.

The Glasgow pig iron market has been very much depressed this week, and a very large amount of business has been done daily at receding prices. Many holders have cleared out freely, with the result that prices have declined during the week to the extent of 1s. 5d. per ton, thus showing that there is not a sufficient amount of investment to take off the iron that is now available. Makers' prices have been reduced this week, but there is no increase of business, and merchants continue to undersell the makers considerably. Down to 48s. 7d. cash was accepted yesterday. The manufactured iron trade is rather dull, and orders are somewhat keenly competed for, while decided reductions in price are being submitted to. The steel works are busy, with good prospects.

There is a good demand for coal of almost all qualities, and the shipping department is very satisfactory; the inquiry, however, may now slacken somewhat, in consequence of the strike in the English mining districts having ceased. For household sorts the demand is a shade less active. Good first qualities of coal are now selling in Glasgow at from 12s. to 13s. 6d. per wagon of 24 cwt., delivered; second quality at 11s.; and Ayrshire diamond coal at 14s. 6d. The f.o.b. wholesale prices are tolerably firm—splint coal, 7s. to 7s. 3d. per ton; main coal, 6s. 3d. to 6s. 6d.; and Ell coal about 7s. per ton.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of Lancashire is now returning to something like its normal condition. Work has at length been fully resumed at the pits, and colliery proprietors are again in a position to book orders for local supplies of coal. Buyers, however, are very cautious about entering into any very large purchases until they are able to judge more accurately as to the prices which are likely to rule in the market, and there has been no great pressure of orders. Prices naturally are higher than those prior to the strike; but there is considerable doubt as to how far an advance can be actually maintained, and already there has been a slight giving way on the prices first quoted after the resumption of work. The average quotations now current in the market are about as under:—Best Wigan Arley at the pit's mouth, 10s. to 10s. 6d.; Pemberton four-foot and inferior Arley, 8s. to 8s. 6d.; common round coal, 6s. 6d. to 7s.; burgy, 5s. to 5s. 10d.; and slack, 4s. to 4s. 6d. per ton. For the sake of comparison, it may be of interest to quote the prices of coal prior to the strike. In December best Wigan Arley could be bought at the pit's mouth at 8s. 6d. to 9s.; Pemberton four-foot, at 6s. 6d. to 7s.; common round coal, at from 5s. 3d. to 6s. 6d.; burgy, 4s. to 4s. 3d.; and good slack, 3s. to 3s. 6d. per ton. It will thus be seen that the strike has been followed by an advance in prices of from 1s. to 1s. 6d. per ton, but there is every probability that as the winter demand for house coal falls off some concessions will have to be made, and that the only class of fuel upon which any material permanent advance will be maintained will be engine fuel, which will necessarily be scarce, owing to the usual winter accumulation of stock having been cleared away during the strike.

The iron trade continues extremely dull. Very few inquiries have been reported in the market during the past week, and prices are again weaker. Lancashire foundry pig iron delivered into the Manchester district could be bought at 46s. per ton, less 2½ per cent., and bars are offered at under £6 per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade continues fairly active, and the market is more animated in so far as forge qualities are concerned. For all classes of domestic coal there is yet a brisk call from the London and other large consuming markets. Prices remain firm, but without alteration. Orders in bulk have been liberally distributed during the past week throughout the district, and most of the pits are well occupied.

The local iron trade is a trifle weaker than was reported a week ago. An opinion is prevailing with buyers that prices will weaken shortly, and specifications have not consequently been so freely dealt out. These remarks apply to both the raw and finished departments. The pig trade is somewhat affected by reason of the fall in Scotch iron. Smelters generally are turning out the average quantity, but stocks in the hands of several makers are slightly increasing. The demand for best pigs is certainly not so good; but common brands are receiving plenty of attention, though reduced rates are asked for. Part-mine and cinder pigs appear to be most wanted. Most of the mills and forges are running full time; and there is still a good supply of orders in the district, though the most recently booked have been for class iron. In particular, however, may be stated sheets and plates, of which the demand on foreign account is well sustained. Best marked bars are a slow sale, though there is a better look-out for unmarked qualities. Galvanized sheets, girder plates, and tin and boiler plates are selling most freely, though there are plenty of inquiries for hoops, rods, strips, and girder varieties. In most cases easier rates are asked; but makers are firm, and refuse to book on other than recent terms. Middlesbrough g.m.b. sell slowly; hematites, however, are in better call.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The finished iron trade throughout Yorkshire has not of late materially changed. The mills and forges are fairly worked, and the material produced has somewhat increased in price, owing to the advance of coal. The various furnaces in both South and West Yorkshire are kept in full blast, and are producing a good tonnage of pig iron. The yield of ironstone at the local pits is diminishing, so that larger supplies have to be obtained from North Lincolnshire and other districts.

There is a good demand for the various kinds of house coal raised in the West Yorkshire district, where the men are working under a sliding scale. The position of the London market has been improved by the severe weather which prevailed at the end of last week; consequently most of the Silkstone and Barnsley thick-seam pits which are at work are

sending a large quantity daily over the Midland and Great Northern Railways.

Gas coal of good quality meets a ready sale at somewhat improved rates, owing to the output having been reduced by the closing of some of the largest of the district collieries. The requirements on account of contracts are numerous, and in some instances supplies have been rather difficult to obtain where such have been large. A very good tonnage is being sent to various parts of the Eastern Counties, as well as to the Midland districts. The steam coal trade for exportation is not large, but there is a good demand for "hards" for locomotive use. The contracts entered into with the various Railway Companies are absorbing a good deal of what is raised.

An excellent business is being done in coke, and collieries which are able to turn out a really good strong article find no difficulty in getting a market for all they can make. The stoppage of the pits has caused some makers to be put to great inconvenience for want of supplies of small coal and slack.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade got behind again last week through the bad state of the weather upon the sea and land. South-east gales prevailed at sea, which threw the regular gas steamers out of their course, and the same storms on land blocked the coal traffic on the waggon ways and upon the railways to a large extent. The shipments were in consequence below an average. At the same time the supply of coals to the London gas-works by steamers was pretty fully maintained, all things considered. Some more contracts for gas coals were concluded at Newcastle last week. Contracts were made by Gas Companies in Sweden and Holland, with Newcastle and Sunderland merchants, whereby they will be furnished with Durham gas coals over the season. There is a better demand for coke for shipment, and vessels have been chartered to load for Spain and the Mediterranean, but the iron market in this district has suffered a somewhat disagreeable collapse, and the local inquiries for coke are therefore less. There can be no shipments to the Baltic until the navigation is reopened, which is going to be extremely late this year. The business doing in other sorts of coal is limited except for household use. The freight market is quiet. Rates do not change materially.

Attention has been called by the local newspapers to the letter and leading article which recently appeared in the JOURNAL in relation to the London City dues levied on coals imported into the Metropolis. Durham gas is a cheap coal, and a levy of 1s. 1d. a ton tells upon it under the circumstances. Besides, attention has been drawn by the local press to the fact that the electric light is competing with gas in London; and, to the extent of the dues, the latter will be handicapped by it. When the subject comes up for parliamentary discussion, it is likely to be fully considered by the chambers of commerce, the steam shipping and coal trade associations of the North of England, as bearing directly on the coal trade of the locality.

All branches of manufacturing industry are very dull. The Cleveland pig iron trade has gone from bad to worse during the past three weeks, and the prospects are far from cheering. Ironfounders continue badly off for work, and they have had to reduce their prices. The pipefounders have more inquiries, but the prices that consumers will give are such, the Cleveland report says, as will do them very little good.

KENDAL GAS AND WATER COMPANY.—The half-yearly meeting of this Company was held on the 15th ult., when the usual dividend of 5 per cent. for the half year was declared. Mr. R. Thompson was appointed to succeed the retiring Manager (Mr. R. L. Robinson), who has held that office since the year 1850, during the whole of which time the Company have paid dividends of 10 per cent. per annum.

MAIDSTONE WATER-WORKS COMPANY.—The forty-second half-yearly general meeting of this Company was held on the 23rd ult.—J. B. Green, Esq., J.P., in the chair. The Directors' report stated that the water-rents for the year ending Dec. 31, 1880, were £5676. The estimated profit for the year was £2653, out of which the Directors recommended a dividend of 5 per cent. This would absorb £1579, and leave £1074 to be carried forward. The report was adopted, and the dividend of 5 per cent. declared. The retiring Directors and Auditor were re-elected, and the passing of the usual votes of thanks brought the proceedings to a close.

SALES OF GAS SHARES.—On Friday, the 25th ult., some shares in the Wakefield and Rothwell Gas Companies were offered for sale by auction at Wakefield. Twelve £25 shares in the former Company were sold for £60 each, which is stated to be the highest price ever realized for similar shares; while 45 £5 shares fetched £12 2s. 6d. each, and 48 "B" 5th shares (£5) were knocked down at £9 each. A single £25 share was also sold for £60. The shares in the Rothwell Gas Company, 50 in number, were sold for £7 12s. 6d. each, being a premium of £2 12s. 6d. on each share.—On Feb. 17th, nine fully paid original shares in the Folkestone Gas Company were sold for £20 each. On the same occasion the premiums on 50 £10 unpaid new ordinary shares in the same Company were offered for competition, and starting at £2 per share, 35 were sold for £2 15s.; ten for £2 17s. 6d.; and five for £3 per share.

NEWPORT (MON.) WATER COMPANY.—The half-yearly general meeting of this Company was held on Monday, the 28th ult.—Mr. J. Lawrence in the

chair. The report of the Directors recommended that the guaranteed interest for the half year ending the 31st of December be paid on the preference shares, and that a dividend of 4 per cent. be declared for the same period upon the ordinary share capital called up, leaving a balance of £38 17s. 10d. to the credit of the general revenue account. The statement of accounts showed receipts on capital account for the half year, £108,716 19s., leaving a balance of £188 18s., after allowing for the disbursements. The receipts on revenue account were £5229 14s. 6d., leaving a balance of £3314 16s. 6d. to be carried to the general account. The report was adopted, the retiring Directors and Auditor were re-elected, and the proceedings concluded with the customary vote of thanks to the Chairman.

THE OPPOSITION TO THE DUDLEY GAS COMPANY'S BILL.—A meeting of owners and ratepayers resident in the district of Dudley was held on Monday last week, under the presidency of the Mayor (Alderman Wainwright), for the purpose of considering the expediency of opposing the Bill promoted by the Dudley Gas Company in the present session. The Mayor, referring to the object of the Bill—viz., "to enable the Dudley Gaslight Company to raise a further sum of money," said he and others were of opinion that this did not represent the real object of the Bill, and in consequence it had been resolved by the Town Council that it should be opposed. Accordingly, a petition had been presented, but it was necessary, in addition to having the consent of the Corporation, that the sanction of the ratepayers generally should be obtained, hence this meeting. He then moved—"That the expediency of the Dudley Town Council opposing, in the present session of Parliament, a Bill to enable the Dudley Gaslight Company to raise a further sum of money, having been considered at the present meeting of owners and occupiers, they hereby approve and consent to the Town Council opposing such Bill, and for that purpose consent to the costs and expenses of such opposition being charged upon and paid out of the general district rate of the borough." Mr. Round seconded the motion, and it was carried unanimously.

SEVENOAKS WATER COMPANY.—The sixth half-yearly meeting of this Company was held on Saturday, Feb. 26.—Mr. W. J. Thompson in the chair. The Directors reported that the general revenue showed improvement, and the works were in good condition. The Company's capital so far raised—£16,000 of consolidated stock, £6000 of new 7 per cent. shares, and £2500 of debentures—has been expended, except a sum of little more than £1000. The water-rents for the past half year were £1109 10s. 6d.; the expenditure (including interest on debentures due Jan. 1) being £589 7s. 2d. The balance (£520 3s. 4d.) added to the amount in hand on profit and loss account and the net profit on fittings during the six months, left a sum available for dividend of £682. The Directors recommended, and it was agreed that from this a dividend of 5 per cent. per annum on the consolidated stock, and 3½ per cent. on the new share capital, should be paid (free of income-tax), which will absorb £487 10s. The Directors' report concluded as follows:—"The consideration of a high-service reservoir, to enable the Company to supply the higher districts in the neighbourhood, as also to give extra power in case of fire, has long been before the Board, and that it was only a question of time was admitted. A recent demand for a water supply has determined your Directors to begin the works. Three sites were kindly placed at the command of the Board, and after consideration by a Committee, that which Lord Amherst had been good enough to offer (on the highest portion of Sheep Leas) was fixed upon and arranged. The approaches are now in course of construction. The reservoir will be so built that it can be duplicated, at any future time, in case of need. The total cost of land and works is estimated at £4500 to £5000." The usual votes of thanks terminated the meeting.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 738.—AUBE, P., Paris, "A method of simultaneously manufacturing steel and lighting-gas." Feb. 21, 1881.
- 806.—NORTHCOTE, G. A., Montague Square, London, "Improvements in apparatus for purifying and increasing the illuminating power of coal gas." Feb. 25, 1881.
- 811.—HAIGH, W. B., and NUTTALL, J., Oldham, Lancs, "Improvements in the construction of gas-engines." Feb. 25, 1881.
- 821.—THORP, T., Whitefield, and TASKER, R., Prestwich, Lancs, "A new method of and apparatus for indicating the illuminating power of gas." Feb. 26, 1881.
- 853.—SHALLIS, J. F., and THOMAS, T. J. C., Minorities, London, "Improvements in lighting railway carriages, and apparatus therefor, partly applicable to other purposes." Feb. 28, 1881.
- 867.—WENHAM, F. H., New Bond Street, London, "Improvements in combined gas and heated air engines." March 1, 1881.
- 877.—LAKE, W. R., Southampton Buildings, London, "Improvements in and relating to gaslight apparatus, chiefly designed to serve as a beacon for buoys, lighthouses, or other structures or places, which in ventions partly applicable for other purposes." A communication. March 1, 1881.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending March 2, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	16.9	16.4	16.7	Station	closed	for repairs	0.0	0.0	0.0	None.	In excess,
	Camden Town	17.7	17.1	17.3	13.8	12.1	12.7	0.0	0.0	0.0	"	"
	Dalston	17.2	16.8	17.0	13.5	10.1	11.2	0.5	0.3	0.4	"	"
	Bow	17.3	16.5	17.0	19.4	16.0	17.3	0.2	0.0	0.2	"	"
	Chelsea	17.3	16.6	16.9	17.8	14.5	16.5	0.3	0.2	0.3	"	"
	Kingsland Road	21.6	20.9	21.2	12.8	6.5	9.5	0.8	0.2	0.6	"	"
South Metropolitan Gas Company . . .	Peckham	17.3	16.8	17.0	13.7	11.0	13.0	0.5	0.0	0.2	"	"
Commercial Gas Company	Old Ford	17.8	17.0	17.3	13.1	10.7	12.1	0.3	0.1	0.2	"	"
	St. George-in-the-East . . .	17.2	16.1	17.0	16.1	9.8	12.7	0.3	0.1	0.2	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for canal gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

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TO CORRESPONDENTS.

- J. D.—See reply to W. H. B.
D. C.—Shall next week make use of the matter you send.
T. F. H.—Thanks for your letter and enclosure. The former shall be considered, as marked, "private." We shall publish the latter, in all probability, next week.
W. H. B. (Glossop).—Thanks for report, &c., to hand. We have made use in to-day's number of all that is of general interest in regard to it. Personal and other matters of merely local interest would be quite out of place in our pages.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 15, 1881.

WORK FOR THE SUMMER.

THE coming season of comparative leisure in gas-works—when, among other summer duties, the reconstruction and extension of carbonizing plant occupy much of gas managers' attention—we hope will be generally marked by the introduction of much-needed reforms in this class of gas manufacturing apparatus. From the nature of the plant in question, and its continuous use, anything like thorough reconstruction must necessarily take time, even when such a course

has been definitely decided upon. Economical as well as functional reasons strongly incline the reformer of retort-settings to wait until the benches require to be renewed in the ordinary course. There is again less objection to this sectional process of carbonization reform, as a large proportion of the manufacturing plant has to be reconstructed in some way every year, and in most cases additional benches have also to be built annually. The ensuing summer will thus, in every gas-works throughout the kingdom, be occupied, in the usual course, in the demolition of worn-out settings and the erection of new ones. This annually recurrent work is in many cases looked upon as strictly a matter of routine; and too frequently the retorts and their fittings, and all the arrangements of carbonization, are simply stereotyped, the same old patterns and practices being followed year after year. It is now, however, quite time that this style of doing a most important class of work should be altered. For the last two or three years the subject of retort-setting and management, with especial reference to the advantages and objections to gas generators, as compared with the old-fashioned direct-acting furnaces, has been brought very prominently before English gas engineers in many ways—in our columns, and by the independent communications of several well-known advocates of the new system. We know what has been done in this matter on the Continent, and also what a few of the foremost gas engineers of our own country are doing; and with this knowledge it is not putting the case too strongly to state that any manager of gas-works who, with so much information on the subject at hand, still contemplates the reconstruction or extension of the manufacturing department of the works committed to his care, upon the old lines, and without so much as an attempt to adapt the new principle to his own particular wants, or to improve upon the modern examples that have been put forward, should be prepared to advance solid reasons for his inaction.

When Mr. F. Livesey, at the last meeting of the British Association of Gas Managers, described the experiments with generator furnaces which had then been carried on for many months at the South Metropolitan Gas-Works, it was too late in the season to expect that any practical result would immediately follow from the fresh interest in the subject which that communication was so eminently calculated to awaken in the minds of his hearers. Feeling this, and also desiring to acquaint our readers with the final product of the South Metropolitan experiments, we gave, in the first number of the current volume of the JOURNAL, such full information on the matter, that any gas engineer who might wish to move in this direction during the present year might experience as little difficulty as possible, by being put in possession of a starting-point for his own proceedings, which had cost its designers many weary months—we might almost say years—of patient labour to bring to perfection.

In these times no faithful gas manager can afford to wilfully neglect any innovation which promises to benefit the industry with which he is connected, and for the continued prosperity of which he is to some extent personally responsible. It is unnecessary here to enter into any fresh argument as to the advantage or otherwise of regenerative gas-retort firing. What we have to do is to put it to every gas engineer whether he has, in a manner consistent with his own responsibility, quite made up his mind either to try the system referred to, or to have nothing to do with it. Every one has an indisputable right to his own opinions on this as on any other debateable question. If a man says he disbelieves in the new departure, and can bring forward valid objections to it, based on his own observation or experience, he is to be respected; and if he is in error, it is possible to convince him of his mistake. There may be another class of men, with perfectly fossilized notions, who have no other objection to fall back upon than their own *vis inertiae*. We do not pretend to argue with these hinderers of progress, if any such there be. We wish more particularly to reach those managers who would perhaps say they have heard or read something about the new style of furnace, but have not seen any in action, or do not think them suitable for their own purposes. To these hesitating or half-interested gentlemen we would say—try them yourselves. Every gas manager who means during the coming season to pull out a setting of old retorts and replace them with new, has it in his power to try some simple generator like that in use at the Old Kent Road, or to improve upon this model. At least an attempt should be made to do something of the kind, and if the wishful experimenter is, by superior force, debarred from the fulfilment of his desire, the fault of inaction will not lie at his own door.

It may be said that what can be done by way of experiment in a large London works cannot be copied in small establishments. In reply to this it need only be remarked that experience of the relative professional activity of the managers of large and small works rather points to the superiority of the latter. The multifarious duties of the engineer of a great establishment really militate against his chances, even with his considerable material advantages, of carrying out to the full a laborious investigation in any one branch of his official duties. If all difficulties arising with themselves are first overcome, it is very unlikely that those who may wish to advance this or any other promising class of research will meet with insurmountable external obstacles. Now is the time to commence a general effort to follow, or perhaps to surpass, Messrs. Siemens, Oechelhäuser, Schilling, Liegel, Livezey, and the rest; or to prove them in error, and prevent their opinions from spreading. It has come to this: If generator firing is to be the universal practice, advantage cannot be taken too soon of the annual reconstruction and extension of retort-settings, in order to introduce it gradually, and with all due precaution; if, on the contrary, the rising school are wrong, let as many independent trials as possible be made to demonstrate the fact. But we believe they are not wrong, and that those who follow them in principle, if not in detail, will by so doing find benefits which we will not now stay to enumerate. Therefore it may be trusted that another year will not be lost in lethargy or vacillation, but that everywhere, and to the fullest possible extent, our professional readers in the United Kingdom will show that in at least one direction, where the path of progress is clear, they will not stand looking at the direction-posts until all the world shall have passed on before them.

GAS AFFAIRS IN PARLIAMENT—THE STALYBRIDGE, HYDE, AND DUDLEY BILLS.

DAY by day clearance is made of the Gas Bills remaining before Parliament in the list of opposed measures. The Corporation of Stalybridge, having consented to alter some of the clauses of their Improvement Bill which injuriously affected the Gas Company, will henceforth be relieved from the opposition of the latter, to the satisfaction, it may be presumed, of both sides. It will be remembered that the Corporation, in seeking to extend the borough, proposed to perpetuate, over the enlarged area, certain dormant powers of lighting their old district which had come down to them from 1828. They also desired rather extensive and vague powers of electric lighting. The Gas Company very naturally opposed both proposals, and with such effect that the Corporation have agreed to give up the idea of extending their old powers of lighting to include the desired additions to the borough, thus restricting them to the old boundaries; and the aspirations of the Corporation in regard to electric lighting are also to be confined to intelligible limits in respect of locality and time. There was, of course, no more reason in this than in other cases of compromise, why such an amicable understanding should not have been arrived at before so much expense had been incurred on both sides.

The Hyde Gas Company's Bill has met with better fortune this session than last. It was then abandoned by the promoters in consequence of the vehement and successful opposition of the local authority. This year the same Bill, or with some slight alterations not affecting the scope of the measure, has been re-introduced, and when the local authority came up again, thirsting for slaughter, they found the door of the committee-room shut in their faces—that is to say, their *locus standi* was disallowed, save only on the matter of the situation of the proposed testing-station. This alteration of circumstances is apparently due to the simple fact that the Company have not offered such good terms in this Bill as in that which was so roughly handled last session. Then the Company inserted conciliatory clauses respecting price, &c., which are not to be found in the present Bill, whereat the local opposition is so far discomfited. The Company will not be permitted to get their Act without as much tribulation as their enemies can manage to inflict upon them from the narrow loophole for offence that has been left open. The gas consumers and ratepayers of Hyde will therefore, in all probability, have received some instructions in the intricacies of Private Bill legislation by the time the protracted struggle is over and the spoils are counted up.

In the case of the Dudley Gas Bill, the opposing Corporation have also been disallowed *locus standi* except as regards the locality for the testing-station—a barren concession which will scarcely encourage in them a policy of determined opposition.

STREET LIGHTING IN LONDON AND WESTMINSTER.

A DECIDED show is being made in the streets of the City of London with the preparations for the great electric lighting experiments, which are to come off some time before next winter. It is true that, so far, most of the exhibition has been supplied by Messrs. Siemens Bros., who have the Mansion House district under their particular charge. No one will be able to say that this celebrated firm show any indication of a desire to conceal their lights under a bushel—or anywhere else, save perhaps up above the fog. Lattice iron posts, of the construction favoured for railway signals situated in deep cuttings, &c., have been erected in the various comparatively open spaces within the distance of thoroughfare extending from King William Street to the Guildhall. It will not be readily conceded, by those who object to see our narrow streets made gratuitously hideous, that these signal posts, now supplied at a point near the summit with a ring and rope connection which gives them the appearance of some kind of embryo shower bath—the suggestion of a kind of bathing fixture being further accentuated by the occurrence of a projecting platform a few feet above the ground—are a striking advance, in the matter of ornament, upon the Temple Bar griffin. The widest of the open spaces in the City is, after all, so insignificant in extent, that some of Messrs. Siemens's beacons will spend the greater portion of their radiance upon the unornamental leads and chimney-pots of the adjacent houses. Still, the powerful lamps that are to be fixed at that terribly congested centre of traffic which lies between the Mansion House and the Bank of England will doubtless be most useful on foggy days. They will, of course, be instantly available at all hours, and will frequently be more appreciated at noon than at midnight during the winter of 1881-2.

The preparations in one of the remaining districts have till now been confined to the interruption of traffic by the breaking up of the roads and footways for laying the main wires. As to the third and last district, it has been announced that in consequence of some difficulties, the nature of which is not particularly explained, the Electric and Magnetic Company, who were the original contractors, cannot carry out their engagement, and therefore the Jablochkoff candles are to be supplanted by Lontin lights. This unfortunate circumstance will naturally delay still further the installation of electric lights in the Southwark Bridge district. Eventually, we suppose, the great experiment will go on merrily enough; but we must evidently be in no hurry for the opening night. Meanwhile, The Gaslight and Coke Company are busily fixing their own experimental lights in Westminster, and Parliament Street and Whitehall will probably be illuminated throughout their entire length by the time this number of the JOURNAL is in our readers' hands. The work would have been done long since, but for a few alterations which have been made in certain respects, to adapt the plan as a whole to the wishes of the several Vestries concerned. As soon as finality has been achieved in this matter, we shall be enabled to publish full particulars of the new arrangements.

STRATFORD-ON-AVON GAS SUPPLY—GAS PROFITS AND DIFFERENTIAL RATES.

THE little borough of Stratford-upon-Avon is afflicted with the same difficulties in the matter of gas administration that trouble other and more populous places. Although the Corporation gas undertaking is not a large one, the Town Council manage to make it in two respects an example of unsound principles. In the first place, the Committee proposed and the Council have sanctioned the appropriation for general purposes of £1030 out of £2772, balance on the profit and loss account for the past year. It is true that a reduction in the selling price is to be made for the current year, as well it may be under the circumstances; but in connection with this another injustice must be noted. The Committee have a series of rates, proportioned to the quantity of gas consumed, ranging from 4s. to 3s. 6d. per thousand cubic feet. A system prevails here, as in some other towns where differential rates are charged, of allowing a tradesman or manufacturer to lump together the gas bills for all his various establishments—trading and private—in order for him to obtain the benefit of the lessened price rateably charged for the entire consumption. It is evident that the usual arguments in favour of differential rates, such as the diminished cost for leakage, meter inspection, &c., do not hold good as excuses for procedure of this kind, which is only to be rightly regarded in the light of an organized tax upon the smaller for the benefit of the larger consumers. We should like to know if the Town Council would object to an owner of house property of all classes in different parts of the town, agreeing

with his tenants to sell them gas as part of their holding, at slightly less than the price that would have to be paid to the Committee, while the owner himself would, by paying for all the scattered consumptions together, obtain a sufficient reduction to reward him for his enterprise. Such a case would probably not be allowed; but from the point of view of the advocates of differential rates, considered as merely representing the advantage to the manufacturer of having few accounts instead of many, the owner, in this hypothetical case, would be conferring a positive benefit on the concern. On the other hand, if the management of Corporation gas undertakings is to be based on the well-worn principle of "doing the greatest good to the greatest number," all systems of differential rates must be considered wrong.

THE QUALITY OF LEEDS GAS.

THERE has been some trouble at Leeds respecting the quality of the Corporation gas. It seems that on several occasions lately, owing, it is stated, to some imperfection in the manner of connecting the purifiers, a serious proportion of air has found its way into the gasholders, with the natural result that the illuminating power of the gas has been materially impaired. It appears that Leeds gas is commonly tested with a photometer which gives an abnormally low result—as much, in fact, as three candles below the average, as it would be reckoned elsewhere. Thus Leeds gas of nominally sixteen-candle power would generally be called nineteen-candle gas. This discrepancy in methods of measurement may help to explain some of the differences that have occasionally arisen with reference to the real value of the gas supplied by the Leeds Corporation at cost price. During the late irregularities, the quality of the gas is stated to have fallen on one occasion to 10·88 candles, and this unfortunate occurrence has consequently excited much comment. As, however, it appears that the default in question has arisen from structural defects of apparatus, and not from original inferiority in the gas itself, we may hope that the trouble will soon be over.

Water and Sanitary Affairs.

THE contemplated purchase of the rights of the Metropolitan Water Companies has taken effect on the East London Bill now before Parliament. Mr. G. B. Richardson, the Chairman of the Parliamentary Committee of the Metropolitan Board, has addressed a long letter on the subject to *The Times*, and the "leading journal" has followed this up with a leading article. Somewhat out of the ordinary course of things, as it appears to us, a report of the Local Government Board on the Company's Bill, addressed to the Select Committee of the Lords, to whom the Bill was referred, has been made public, its propositions being quoted by Mr. Richardson in his letter to *The Times*. These propositions, in the form of suggestions to the Select Committee, were framed for the purpose of preventing any enlargement of the rights of the Company, the object being to prevent any addition to the cost of purchase. Mr. Richardson is not quite satisfied with the manner in which the Local Government Board have thus proposed to compass the end in view; neither is he contented with the conclusion arrived at by the Select Committee, although this in its turn differs from the scheme of the Local Government Board. The idea on all sides is to keep the Water Companies as they are with respect to the rights which would have to be purchased, and this condition has to be harmonized with the necessity for an extension of the works in order to meet the increasing demand for water. A very ingenious scheme proposed by the Metropolitan Board was, that the further capital now required by the East London Company should be raised by the issue of Metropolitan Consolidated Stock, that the rate of interest should be three and a half per cent., and that the capital so raised for the Company should be inscribed in their books in the name of the Metropolitan Board *pro tem.*, as representing the future Water Trust, and be entitled to rank for dividend with the ordinary stock of the Company. The excess of the dividend over the interest of the capital thus raised would go towards the formation of a redemption fund. But the Select Committee have decided on a different plan. The East London Company, in virtue of their existing Acts, have power to issue £95,000 more of ordinary capital, and the Select Committee consider that this is sufficient for the present. Leaving the Company, therefore, in the possession of this power, the Select Committee proceed in the next place to extricate the Company from a difficulty in which they have been placed through their inadvertence in issuing £95,000 of debenture stock in excess of their statutory powers. This

issue the Committee propose to legalize, and to this extent only would the Company be benefited by their present application to Parliament, supposing the Bill to pass in the form given to it by the House of Lords. But the Bill has now to go down to the Commons, and it is difficult to say what may befall it there. To interfere with the power to issue capital under the existing Acts would be palpably unjust. But the amount thus furnished bears a very small proportion to the £560,000 which the Company asked power to raise. The validation of the last issue of debenture stock is a relief; but if the House of Commons refused this kind of aid, the loss in that direction would counterbalance the remaining power to issue ordinary stock. The £95,000 may serve to meet the present wants of the Company, but this is a hand-to-mouth mode of proceeding, and is not conducive to economy in the laying out of works. With respect to the scheme for taking the Metropolitan Board into partnership, *The Times* observes that such a plan would have one effect, "which Mr. Richardson has probably not overlooked, but which he has omitted to notice"—namely, that "its adoption would clearly make the Metropolitan Board the heir-presumptive of the Water Companies." This is a position which the Board would probably like to occupy, although we very much question their ability to manage such an inheritance should the property of the Companies ever be placed in their hands. Concerning the East London Bill, we observe that the Parliamentary Committee of the Metropolitan Board propose as a question for consideration, whether the Select Committee of the House of Commons should be asked to limit the amount of share capital which the Company have power to issue. In other words, it is suggested that Parliament having given certain powers should afterwards curtail them. Where a *quid pro quo* is offered, a Company might consent; but we should think that Parliament would never stultify itself in the manner which Mr. Richardson and his friends seem to contemplate. Water Companies have "no rights" in the estimation of some people.

A case illustrating the legal position of Water Companies in reference to the effects of frost, has been decided by the Magistrates in Petty Sessions at Staines. The Grand Junction Water-Works Company were summoned by a clergyman for having failed to supply water to sundry cottages, being his property, situated at New Hampton. During the recent frost the communication-pipe leading from the Company's main to the aforesaid premises had been frozen, and when the thaw came it was found to be burst, so that altogether there was no supply through the pipe for a period of more than a fortnight. It was admitted that the Company's main, at the point of junction with the communication-pipe, was only 17 inches below the surface of the road, and the defendant contended that it ought to have been laid at the depth of at least 2 ft. 6 in., in which case the pipe would not have been frozen. On the side of the Company it was shown that they were not under any obligation to lay their mains at any particular depth, and as the communication-pipe belonged to the complainant, he was bound to repair it, so that it might be in a fit state to receive the supply of water which the Company were prepared to deliver. The Bench decided that this was the law of the case, and so dismissed the summons. With reference to this matter, we may observe that the complainant was his own lawyer, and evidently made a mistake. Concerning the inconvenience to which the cottages were subjected, it would appear that a stand-pipe was erected for their use after the frost set in. We should also like to know whether, if this communication-pipe had not been frozen, there would have been a supply to the cottages? or whether the pipes inside the houses were not also frozen? There is no evidence that the main itself suffered any damage. It was certainly nearer the surface than was desirable, but possibly there was some local reason for this which could not be obviated, and this seems to be implied by the fact that a bridge over the Longford River was close to the point of junction.

The Lower Thames Valley Main Sewerage Board are in a painful predicament. Their Bill of the present session, for legalizing the costs and expenses incurred by them in connection with the rejected Bill of 1879, has been thrown out by the House of Lords, on the report of Earl Redesdale. According to a statement made by the Clerk at a recent meeting of the Sewerage Board, it would appear that when Lord Redesdale referred to the Local Government Board for their opinion, the latter reported in favour of the Bill. The Clerk to the East Molesey Local Board has stated in a meeting of that body, that Lord Redesdale was much struck by the fact of the Joint Board having been served with notice from different Boards, warning them against going to

Parliament with their Bill of 1879. Sir Thomas Nelson and Mr. Wyatt argued before Lord Redesdale in support of the Indemnity Bill, and Mr. Wyatt is said to have intimated that the Board would be broken up if the Bill did not pass, as gentlemen could not be expected to represent authorities on the Board if they were to be made liable to pay costs of this character. Lord Redesdale replied that the liability "need not" have been incurred. This obviously is the weak point in the case. The Board plead, in the preamble to their Indemnity Bill, that they promoted their former measure in the belief that by so doing they "were only seeking the requisite powers to enable them to carry out the duties of an important public trust." The fact that they were warned of their mistake tells against them, and it is obvious that their application to Parliament in 1879 was not a necessity, but a distinct departure from the path which had been marked out for them. It is a hard lesson to learn, but local authorities, not absolutely municipal in their constitution, have limits to their powers, and when they break bounds it is at the peril of the individual members.

Mr. Hillé, of Chiswick, has issued a statement, from which it appears that his system of sewage treatment has been in daily use at Edmonton since 1875, at a cost of fivepence half-

penny per head of the population. At Tottenham the process was adopted in 1876, and the cost is fourpence per head. At Aldershot the date of commencement was 1877, and Windsor and Birkdale adopted the process last year, the cost in these three last instances being sixpence per head. The sewage outfall works at Aldershot are large enough to deal satisfactorily with the sewage of from 15,000 to 20,000 people, and were erected at a cost of £3000, inclusive of about three acres of land. The results at Aldershot are said to give the authorities complete satisfaction. At Windsor seven acres of land have been recently laid out and prepared as filter-beds, and are now used in rotation. The degree of purity in the effluent is thus increased, and satisfaction is given both to the Urban Sanitary Authority of Windsor and the Conservators of the Thames. Here, as elsewhere, Mr. Hillé states that he has not met with any difficulty in disposing of the sludge, this being used on the land, with excellent results both for green and for root crops. When the process was tried at Leicester some time back, under circumstances by no means favourable to success, the occupiers of land in the vicinity stated that they had not known the river to be so clear and inoffensive for the last twenty years. The absence of noxious effluvia from the works is one recommendation to Mr. Hillé's method. The process is one that seems to hold its ground amid all the discouragements and difficulties which have beset the treatment of sewage.

A NEW CONTINUOUS AMMONIA PROCESS.

A CLEAN and reliable kind of continuous process for the extraction of ammonia from gas liquor is still felt as a want by gas managers who, with the best desire to do well with their residuals, have little time to devote to superintending a chemical works. The process we are now about to describe claims to fulfil every possible requirement of simplicity, cheapness, and efficiency; and although occupying very little space, and demanding the minimum of attention, it is said to extract all the ammonia from ordinary gas liquor down to 1 part in 2000, or 0.05 per cent. It is therefore almost needless to add that it is a lime process; and it is moreover in connection with this principle that some of the most striking peculiarities of the apparatus present themselves. It is well known to sulphate manufacturers who use lime in their liquor boilers, that considerable inconvenience attends its use in the ordinary way—especially with fire-heated boilers—from the settlement and incrustation of the lime salts on the plates of the boiler, causing great loss of evaporative power and deterioration of the plates of the boiler, and frequently involving a suspension of operations to allow of the removal of the deposit by hand labour. On the other hand, there are considerable drawbacks to the use of steam, separately generated, for distilling the contents of the lime boiler. The accompanying illustrations of apparatus recently patented by Dr. Hermann Grüneberg show how this gentleman

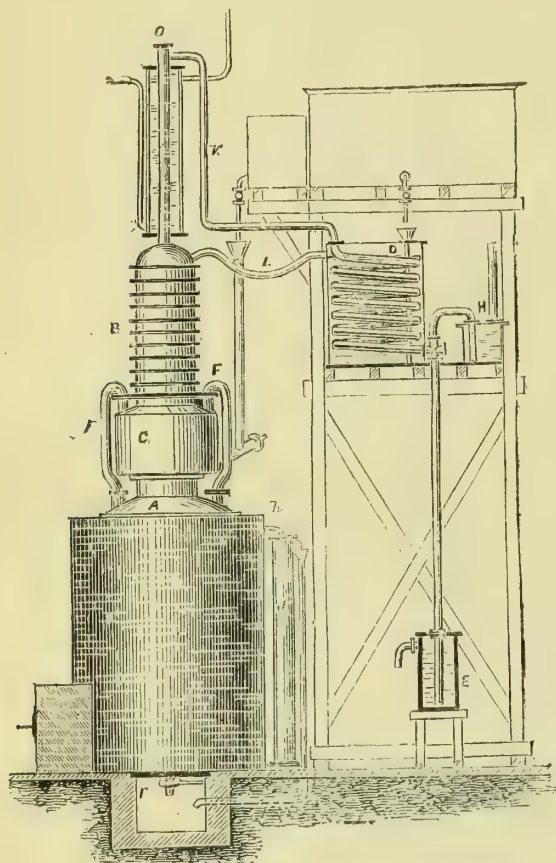


FIG. 1.

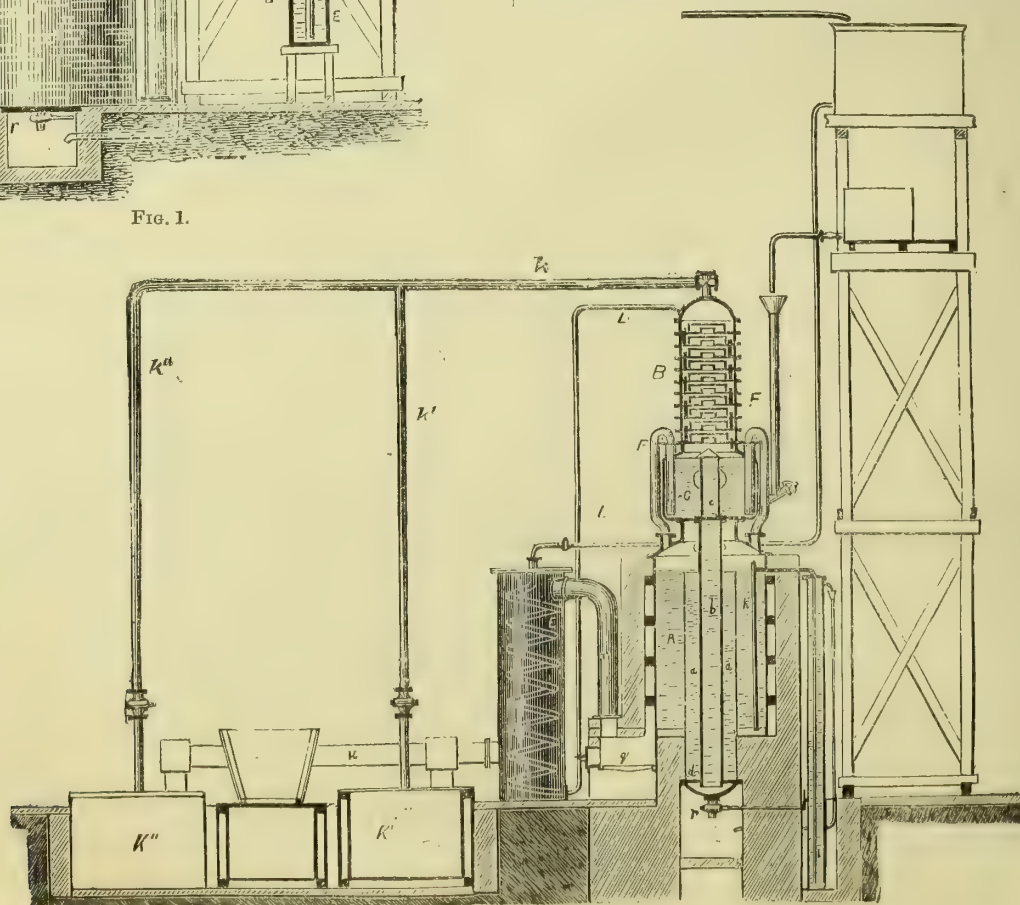


FIG. 2.

proposes to solve the difficulties of the problem of distillation by fire heat, but without risk of interruption by deposits of lime scale. The external elevation of the still is shown in fig. 1 as fitted for the extraction of ammonia and its concentration in the liquid form; fig. 2 shows the same still in vertical section, with adjuncts for the manufacture of ammonium sulphate.

The liquor boiler, A, of cylindrical shape, set vertically, is heated from the furnace, *g*, terminating in the usual circulating flues. The boiler is provided with an inner concentric tube, *a*, which is carried down to some depth below the bottom of the boiler, and beyond the action of the fire, and is there finished off inside with a flat perforated screen or sieve, *d*, and underneath with the blow-off cock, *r*. The top of this tube, as will be observed, ends at about the top water-line of the boiler, and is open to the steam space. Over the boiler is set the independent vessel, C, intended to contain milk of lime. The connection between this vessel and the liquor boiler is thus arranged:—The two bent pipes, F, F, conduct the ammoniacal steam from the boiling liquor to the bottom of the lime solution, being provided at their lower (sealed) ends with small holes, from which the vapours generated within the boiler are made to issue and agitate the milk of lime. The vapours then rise through the columnar vessel, B, which is a kind of Coffey still, with numerous shallow trays filled with the raw liquor, which is continuously run in by the pipe L, and in its descent meets the hot vapour and gas on their upward course. In this way the liquor becomes heated as it nears the boiler, and some of its gas is thereby liberated, while the ascending vapours become partly condensed, and mix with the descending liquid, the uncondensed gases passing away by the pipe *k*. Following now the course of the liquor, by the time it reaches the bottom of the Coffey still, B, much of its volatile ammonia has been driven off; but the remaining liquid, containing those ammoniacal salts which are not volatile, flows by a suitable opening into the before-mentioned lime vessel, C, and mixes with its contents, which are kept in continual agitation by the vapours from the pipes F, F, as already described. By the action of the lime, the ammoniacal salts become decomposed, the ammonia is liberated, and a portion of it at once ascends through the still, B, and thence finds its exit by the discharge-pipe, *k*. The contents of the lime-vessel, consisting of liquid yet containing ammonia, find their overflow by means of the connected pipes, *c*, *b*, which are placed concentrically within the boiler-tube, *a*, and terminate at its lower end, just below the screen or perforated plate. It will be observed that the liquid, which, heavily charged with lime, finds its way to the bottom of the tube *a*, is enabled to deposit the lime and other solid substances beneath the sieve (which prevents them from subsequently rising), where they are quite removed from the action of the fire, and, therefore, cannot become hardened or burnt, and whence they may be blown out at any time by the cock, *r*. Having thus got rid of its solid accompaniments, the liquor finally rises to the top of the pipe *a*, and overflows into the boiler, contributing its final quota of gas and vapour to the already described circuit, which begins with the pipes F, F. Thus the operation goes on, the spent liquor being continuously run off from the bottom of the boiler by the pipe *h*, sealed outside in a deep vessel, J, the depth of which determines the ultimate pressure on the boiler. From this seal-cup the waste liquor is led away in any convenient manner.

This completes the operation as regards the extraction of ammonia from gas liquor. Next comes the consideration of the means for turning it to account. Fig. 2 shows the Grüneberg apparatus as fitted up for the production of sulphate of ammonia. The evolved gas and vapours taken off from the still by the pipe *k*, pass to the duplicate saturators, K', K". The vapours and gases from these saturators—which may, of course, be of any approved construction—pass away hot by the large pipe, *u*, and are caused to traverse a cylinder, E, containing a coil of the crude liquor pipe, leading to the still, the liquid circulating through which is therefore warmed by the waste heat of these gases. The uncondensed gases are then finally led to the fireplace to be consumed.

In fig. 1 is shown a very ingenious arrangement for producing the concentrated aqueous solution of ammonia, which deserves notice. The gas and vapour from the still pass through the cooling-pipe, O, which serves as a regulator of the degree of condensation. It is in reality a Liebig's condenser, and the more cold water there is supplied to the casing, the greater will be the condensation of aqueous vapour in the pipe, and, as the condensed water is continually returned to the still, the more concentrated will be the residual fluid which is formed in the second or final condensing coil, D, and thence runs into the vessel, E. The vessel containing this coil is closed, and the condensing liquid is the raw gas liquor passing onward to the still. The uncondensed gas passes from the coil to the seal-box, H, which is provided with an escape-pipe. In both figures elevated tanks are shown, which are intended to contain a store of liquor and milk of lime, the supply of both being adjusted as required.

With this apparatus 1 cwt. of coal for fuel is said to be capable of distilling 1 ton of gas liquor; and two men can attend to an apparatus capable of passing 10 tons of liquor per diem. The apparatus, which is of Continental origin, has been for some time in operation in several large gas-works in different parts of Europe, but has been only lately introduced into this country. It is said to give great satisfaction. The process should be decidedly economical, as the care taken by the inventor to utilize waste heat to the fullest extent is not the least remarkable feature of the design. The illustrations given with this article are taken from actual examples; and the process is simple, although, from its endless character, it requires many words and some repetition of terms to describe in a sufficient manner.

Notes.

MR. LANE FOX'S SYSTEM OF ELECTRIC LIGHTING.

The system of electric lighting lately introduced by Mr. St. George Lane Fox is in many respects similar to those of Mr. Swan and Mr. Maxim. The general shape of the lamp is very like the Swan or Edison bulb, and contains like them a thread of carbon bent into a loop, which, when rendered incandescent by the passage of a powerful current, forms the lighting medium. The carbon loop is in a vacuum, but before being fixed for use it is heated in an atmosphere of coal gas and benzol vapour, whereby a hard deposit of gas carbon is formed over its whole surface. It will be remembered that the Maxim loops are strengthened in this way, but in their case the gasoline vapour is contained in the lamp itself. The most important part of Mr. Lane Fox's system is, however, said to be the arrangements for distributing electricity from a central station. He proposes to lay large conductors, the method of construction and probable cost of which are not indicated, except that they are to be buried in ozokerit, and are to ramify underground wherever a light is required. These large conductors, or, as they may perhaps be called with equal fairness, condensers, are to be kept charged at a constant electro-motive force by the generators at the central station. The lamps are to be connected to wires, which are laid on to the electric mains, precisely as gas or water services are tapped into the street mains. There is no return current, the other end of the wire, after the lamp, being simply connected to earth by affixing it to the gas or water pipes. A switch is, of course, introduced into the circuit of the service wire, by which the lamp may be put on and off. A governor arrangement is also devised for the central station, whereby the steam admitted to the motor engine of the generators, and consequently the work done, is to be made dependent on the draught on the mains. Heating as well as lighting is to be effected by electricity thus distributed. We are told that "energy" can be retailed in this way at a cost of less than one farthing per horse power per hour—at a less cost than "energy" resulting from the combustion of gas for heating; while for lighting by incandescence, "energy" can be used more economically than gas, in the proportion of about 15 to 1. It is much to be regretted, from the point of view of the enterprising electrician, that "energy" is not a marketable commodity. It is only the three common forms of energy that are bought and sold—a consideration which somewhat complicates the question of cost.

THE EFFECT OF LIME ON LEAD.

According to the *Scientific American*, leaden gas or water pipes should never be placed in contact with mortar or cement. Dr. Rossel has found that lead loses very perceptibly in weight from contact with ordinary lime mortar, and that cement is nearly as deleterious. Moist earth containing chlorides (common salt), saltpetre, and sal-ammoniac also attacks lead, but not so powerfully as lime. Sulphates, such as plaster of Paris and Glauber salts, have no action upon lead; neither have the carbonates, such as chalk, soda, or potash; nor the silicates, sand or clay. It is calculated that if buried in active material, like some of the foregoing, leaden pipes may be eaten through at the rate of about 1-25th of an inch in 15 or 16 months. The sum of Dr. Rossel's observations is as follows:—Lead pipes should never be brought in contact with any sort of mortar or cement. Clay does not affect lead pipe if it is free from sal-ammoniac and saltpetre, which result from decaying organic matter. Plaster of Paris affords the best protection for lead pipes, and wherever such pipes pass through a wall they should be laid in gypsum, over which mortar and cement may then be safely placed.

THE BESSEMER SYSTEM OF CONVERSION APPLIED TO COPPER.

From a communication appearing in the last number of the *Revue Industrielle*, it would appear that the price of copper, and consequently of brass and gun metal, is likely to be affected by a discovery recently made in Lyons. Attempts have been made at various times to adapt the Bessemer process, as applied in the manufacture of steel, to the refining of copper ores. These attempts have generally been confined to simply burning off the sulphur, combined with the metal in the form of pyrites, by means of a powerful blast. The difficulty has been that towards the end of the process the charge has been always cooled down too much by the operation. This hitherto insurmountable obstacle has, it is said, been at length overcome by the Lyonnais. One day, when melting down some old copper in a Lyons works, a piece of phosphor bronze having found its way into the mass, the superintending engineer was surprised by seeing the phosphorized metal, when exposed to the heat, increase in temperature far beyond that of the surrounding copper, and at length arrive at a dazzling white heat. The phosphorus, thus burning, disengaged an enormous amount of heat, which liquefied the copper. In studying the order of combustion in air of the substances capable of being mixed with pyrites, or matts, it was found that sulphur burns first, then certain metals, and last of all phosphorus. Hence the inference was drawn that all that is necessary, in order to prolong to any length the Bessemer operation in copper refining, is simply to add a small quantity of phosphorus to the charge, and thus obtain, after the combustion is all over, a cake of pure copper. A company has been formed in Lyons for the purpose of working the new process, and for this purpose works have been already laid down, respecting which further particulars are promised.

A GIGANTIC FIRE-ENGINE.

Mr. H. S. Maxim, of New York, has designed a floating fire-engine for that city, which is to surpass anything of the kind ever

seen before. The hull of the float is to be 250 feet long and 40 feet beam, and is intended to carry boilers of 3000-horse power nominal. These boilers are to be connected in such a manner as to be available either for propelling the boat or for pumping water. The pumps are of the compound duplex direct-acting pattern. The float is to be fitted with only two discharge nozzles, which are intended to work immediately from the deck, without hose piping. One of these is on the deck level, and is designed to flood ships in harbour or low water-side warehouses. It has a nozzle 20 inches in diameter, the discharge from which would probably sink any ship in a few minutes. The other discharge branch-pipe is 60 feet above deck, and is 60 feet long, mounted on a trunnion. It may be moved up or down, and turned in any direction, and when at its highest elevation the nozzle is 100 feet above the deck. This nozzle is to have a changeable discharge, to be operated from the deck without interruption of the flow of water, ranging from a 10-inch round orifice to a sprinkler of 100 $\frac{3}{4}$ -inch holes. It is evident that such a volume of water as either of these nozzles could supply, should be sufficient not merely to extinguish a fire in any building within their reach, but also, on occasion, to wash away the structure itself.

THE PREVENTION OF BOILER INCRUSTATION.

In a recent number of *La Nature* coal tar is recommended as a preventive of the incrustation of steam-boilers. The tar, which is described as previously distilled, is introduced into boilers in the proportion of about one pint to 220 gallons of fresh water; or of double the quantity of tar when sea water is used. In the former case the quantity mentioned is sufficient for about a month, when it must be repeated; but where salt water is employed the tar must be introduced at intervals of about 15 days. If a boiler has already been allowed to become incrustated with scale, a larger quantity may in the case of either class of feed-water be usefully tried as a beginning, in order to loosen the deposit, which it will in a short time either detach or dissolve. It is said that with some examples of foul feed-water, the use of tar in this way will effect a saving of from 10 to 15 per cent. in the consumption of fuel.

The death has been announced of M. Eugène Philippe Pelouze, son of the eminent chemist and Member of the Institute of France. The event took place at Cannes on the 4th inst., and was the result of a long-standing chest complaint. The deceased gentleman, who was only 47 years of age, was one of the Directors of the Paris Gas Company, an Officer of the Legion of Honour, and a Commander of the Order of Charles III. of Spain. The funeral took place at the Montmartre Cemetery, in Paris, on Friday last.

REDUCTIONS IN THE PRICE OF GAS.—The Altrincham Gas Company announce that from the end of the present month the price of gas to private consumers will be reduced from 4s. to 3s. 9d. per 1000 feet, subject to a discount of 3d. per 1000 feet on all accounts paid within one month from the end of the quarter; and the price to the Local Boards of Altrincham and Bowdon, for gas supplied to the public lamps, is to be 3s. 4d. per 1000 feet. At present the discount is 5d. per 1000 feet, and the charge to the Boards 8s. 7d. per 1000 feet. At the annual meeting of the Watton Gas Company, Limited, held on the 1st inst., the price of gas was ordered to be reduced from 6s. 8d. to 5s. 10d. per 1000 feet from January last.

SALE OF SHARES IN THE NEW RIVER COMPANY.—At the Auction Mart, Tokenhouse Yard, E.C., on Wednesday last, Messrs. Fox and Bousfield submitted for public competition some fractional portions of King's shares in the New River Company, and a few new shares in the same undertaking. In offering the shares, the Auctioneer (Mr. E. H. Bousfield) referred to their high character as investments, and drew special attention to the Company's operations in the past 18 years, during which period their income had, he said, increased from £219,000 to £440,000; and as there could, he thought, be little doubt that the increase of business in the future would be equally great with that of the past, the property for which he was about to ask biddings not only offered every present security, but also the very best prospects for the time to come. He then invited offers for lot 1—the 100th part of a King's share, the proportion of dividend in respect of which at Christmas last was £24 3s. 9d. per annum—which was sold for £940, being at the rate of £94,000 for the entire share. Lots 2 to 6 (similar lots) fetched £930 each, and lot 6a, £920. Lot 7—the 120th part of a King's share, the proportion of dividend in respect of which at Christmas last was £20 6s. 11d. per annum—sold for £790, and lots 8 to 10 (similar lots) for £775 each. The new shares, 25 in number, were then put up, and realized the following prices:—1, £390; 3, £385; 11, £380; 10, £375. The total amount produced by the sale was £19,100.

EXHIBITION OF GAS APPARATUS AT DOVER.—As incidentally remarked in another column, an exhibition of gas cooking and heating appliances, burners, &c., was opened in the Wellington Hall, Dover, under the auspices of the Gas Company, on Tuesday, the 1st inst., and continued open till the following Friday. The exhibition was the first of the kind ever held at Dover, or, it is believed, in the county of Kent, and the manner in which it was inaugurated and carried out ensured for it a present success, while its ultimate beneficial effect on the visitors, in enlightening them as to the advantages to be derived from the use of gas in culinary operations, cannot but be made manifest in the not very remote future. The proceedings were inaugurated by a luncheon at which the Directors and a number of Shareholders of the Company took part; the whole of the eatables having been cooked by the stoves exhibited, which were sent by most of the well-known makers. On the Thursday evening Mr. W. Sugg gave an interesting lecture on the various uses of coal gas, in the course of which he dwelt on the superiority of gas-cooking stoves for the preparation of food for the table, alike on the score of cleanliness as of economy; the advantage of its employment as a heating agent; its applicability as a supplier of motive power; and its incalculable convenience as a lighting medium. The lecturer was introduced by Mr. R. H. Jones, the Company's General Manager, at whose invitation he attended, and his remarks earned for him a cordial vote of thanks from his auditory. It is stated that a considerable sale of stoves took place during the period of the exhibition, and it is to be hoped that as the summer advances their merits will be fully tested, to the satisfaction of the purchasers and the pecuniary advantage of the Gas Company. In addition to the numerous stoves shown, there was a display of globes and gas-burners by Mr. Sugg, in a room adjoining the hall; and in the same room was an exhibit of Messrs. W. and B. Cowan's wet and dry gas-meters. The same firm also showed a 40-foot standard gasholder for testing meters, and a case of pressure-gauges.

Communicated Article.

THE TRANSPORT OF MATERIALS FOR GAS-WORKS. ILLUSTRATED BY THE PLANS OF THE YORK, NEWCASTLE-ON-TYNE, AND BECKTON GAS-WORKS.

By V. WYATT,
Constructing Engineer to The Gaslight and Coke Company.

FOURTH ARTICLE (concluded)—BECKTON GAS-WORKS.*

The port of Beckton was primarily and necessarily laid out on a large scale, and the details of the works had to be arranged for a large reserve of accommodation for future wants. The tonnage growth from year to year has not hitherto been less than about 25 per cent. on account of the increased manufacture of gas at this station through the closing of the gas-works in London, the natural increase of gas wanted by the Metropolis, and also for the added import and export of materials and products connected with the building operations and the manufacture of products at Beckton. The import and export trade at Beckton rivals that of a tolerably busy shipping port giving trade to a large district of country like the Hartlepoons, its total annual imports reaching nearly a million tons, and its exports upwards of 300,000 tons; although the actual cost of the works of the port proper, up to the present time, is not one-tenth of what has been expended at other ports doing a less trade. The import of coals alone annually reaches to between 500,000 and 600,000 tons; and in five years' time this will grow to a million tons. The original idea, under the Company's Act of 1868, which authorized the creation of Beckton, was to construct a large dock in the interior, on the site of the present retort-houses Nos. 1 and 2, with a river wall fronting the Thames, and an entrance lock. With this arrangement there would have been long lines of quays, dispersed and isolated cranes, tedious lines of railway, obstructive turn-tables, and all the belongings of a large dock establishment, with its great waste of site; and besides these obstructions the factory part of the establishment would have been thrown about half a mile farther into land, and away from the river front. Fortunately this notion was abandoned at an early date, and it was resolved, with the consent of the Thames Conservancy Board, and by payment of an annual subsidy to the latter, to erect a good, sound, workable pier, with high and low levels, taken out into the river to low-water line. As accompaniments to this central pier, two low-level jetties or piers, each 160 feet long, were constructed with platform levels of 5 feet above Trinity high water mark (ordinary high water) to the east and west of the Company's river frontage, and running out at right angles to the face of the river wall. With these port arrangements the river foreshore in front of the Beckton site now exhibits two dock areas, east and west of the large high-level pier, for the accommodation of the large fleet of barges—sometimes a hundred in number—lying there engaged in the transport of coke, residual products, and building materials, to feed the low-level traffic of the establishment.

There are two transport systems or lines of communication at Beckton—the high-level and the low-level routes running through the works. The former, or the high-level route, coming away from the river pier on a short incline of 1 foot in each 100 with a double railway, leads the coal direct into the several retort-houses. After leaving the pier abutment at the river wall front, the double line of railway goes straight and level through the entire system of the works, between the double row of retort-houses, to the western end of the establishment. Diverging from this double line there are four single lines of railway, right and left, one line to each side of, and through each retort-house; with facilities for dropping the coals in front of the line of retorts, at a level of from 12 to 14 feet above the coal stages. This high level is 23 ft. 8 in. above Trinity high-water mark, which latter is the low level of the several coke-holes, and the formation of the ground or low-level lines throughout the Beckton works. Between Nos. 7 and 8, and 9 and 10 retort-houses there occur crossover, connecting, or scissors lines, to form second communications from the double trunk railway along the centre to the branch lines through the houses, so that in case of a block to any one or more of the lines, the several retort-houses can be fed from the rear, as well as the front entrances. By these contrivances there are two strings to the bow, and alternatives for working the traffic. The trains of coal waggons can thus return to the pier either by the central railway, or by means of one of the four single lines of railway through the retort-houses, to avoid any obstruction which may at any time ensue, by breakdowns, on the lines.

The high-level railway system is being carried on farther and farther westward, from time to time, as the works grow and extend. The railway lines will ultimately pass through an end pair of curved retort-houses at the western end of the system, and descend by an incline of 1 in 25 to the low-level railway system, and thence form a permanent connection with the Great Eastern Railway and with the world outside. At present the high-level railways stop with dead ends at Nos. 11 and 12 retort-houses; but at this point a side or parallel single line on an inclined viaduct of 1 in 25 connects the high and low levels together. There is at present at the river end of the viaducts also a temporary inclined viaduct of 1 in 16, which for some years has done a similar duty to the above. The traffic between the high and low level routes has thus always been interchangeable; and the locomotives and rolling stock have been housed and repaired on the low or ground level. The high-level system is principally devoted to the delivery into the retort-houses of the enormous

* This article completes the description of the plan accompanying the last number of the JOURNAL, and finishes Mr. Wyatt's present valuable series of communications.—ED. J. G. L.

bulk of coal, common and cannel, consumed upon the works, which now reaches upwards of half a million tons yearly; and collaterally it accommodates also the imports and exports of the products works, at the west end of the site, amounting to upwards of 100,000 tons annually. The high-level viaducts at Beekton are constructed upon cast-iron columns, 12 to 15 inches in diameter, supporting a wrought-iron girder superstructure. The double viaduct has three columns to each bay, spaced longitudinally at 25-foot centres, and transversely at 12-foot centres, carrying three longitudinal wrought-iron girders. On these girders are placed the wrought-iron rolled joists, laid transversely at 5-foot centres, upon which are laid the longitudinal timbers and rails, weighing 56 lbs. per yard, of steel and iron. The single-line viaducts have only two of the above cast-iron columns to each bay of 25 feet, with similar wrought-iron superstructure, timber, and rails for a single, instead of a double line; but there are two main wrought-iron girders for the single line, instead of three for the double line.

The high-level or viaduct lines are directed and regulated by a complete system of railway signals, on the improved railway block plan, actuated from a high-level signal-bridge cabin, placed over the pier abutment and river wall; and the switches and points are governed from this central position under one control, like the best devised methods in use at the large railway centres throughout the country, as directed by the Board of Trade. The locomotives work trains of about 16 waggons each, the latter weighing when full about 7 tons each, carrying between 4 and 5 tons of coal net. The wheel-base of these waggons being only 3 ft. 6 in. in length, they run with facility round the sharp curves of 150 feet and 115 feet radii occurring at certain points on the viaducts and pier. The train of 16 waggons is led into the retort-houses in front of the retort-benches, and shot through a horizontal trap-door in the floor of the wagon (operated by a side lever from the railway floor) on to the coal stages, between the lines of rail. The trains are worked by locomotives with cylinders 10 in. in diameter and 18 in. stroke, with two pairs of driving-wheels 33 in. in diameter, and a wheel-base of only 5 ft., the latter sufficiently narrow to enable the engine to slip easily round sharp curves. The weight of each locomotive when light is 12½ tons, and with fuel and water 14 tons. The traction power of these locomotives, with their small wheels, is considerable; and they usually take three 10-ton railway waggons up the temporary incline of 1 in 16, with a sharp run to start on the low level. This is equal to a net load of 50 tons exclusive of the locomotive, or 64 tons in all, including everything. It may be mentioned here, to illustrate the subject the more fully, that one of these locomotives has a tractive power—on the level of 247 tons; on an incline of 1 in 300, of 142 tons; on an incline of 1 in 200, of 115 tons; and on an incline of 1 in 100, of about 65 tons—exclusive of the locomotive load itself, and with a full steaming effect in the boiler of about 120 lbs. on the square inch. But where the locomotive can command a level run of 200 or 300 yards previous to rising the incline with its load, and provided the incline be a short one, then these loads can be much increased, as is shown by the daily working of the 1 in 16 temporary incline at Beekton.

The low-level railway system at Beekton, which is mostly used for the coke and miscellaneous traffic of the works, starts from the river quay and low-level jetties previously described, and by a number of single-line railways, as shown upon the plan, compasses the whole of the ground-level business of the establishment. All low-level lines are at Trinity high-water mark, or high-water level of the Thames, except where they approach the river front, where the level mounts 5 feet higher; and they are shown by dotted lines on the general plan in juxtaposition to the high-level railways, which are denoted by strong lines. These low-level lines enter all the coke-holes of the retort-houses, go into the purifying-houses, lime and oxide stores, round the external purifiers, into the workshops and locomotive house, westward to and surround the products works, make good a junction with the high-level viaducts at two points, with the general railway system of the Great Eastern Railway at the Beekton passenger and general railway station, and thence with the traffic of the entire country. The branch line of railway from Beekton to the Victoria Docks Custom House Station, about two miles in length, was made by The Gaslight and Coke Company under an Act of Parliament obtained in 1871 specially for the Beekton traffic; and which Act turned the Gas Company into a Railway Company.

The railway gauge at Beekton is the usual narrow gauge of the country, 4 ft. 8½ in., and the rails used are both steel and wrought iron, weighing 56 and 60 lbs. per yard of rail. The curves on the low-level lines are even sharper than those used on the viaducts, from sheer necessity and economy, turning occasionally round the end of a building at right angles with a radius of 60, 70, and 100 feet; and they take the ordinary 10-ton railway waggons into the coke-holes and several buildings about the works. The secret of working these sharp curves with the usual railway rolling stock is that the outer rail to each curve is super-elevated at least 4 inches wherever practicable, and the gauge of the railway is laid full—say to 4 ft. 8½ in. instead of 4 ft. 8½ in. net, as is usual on railways. The sharp curves on the viaducts are guarded by a check rail next the inner rail, but with the low-level lines the rails are left unchecked, the free gauge and super-elevation of outer rail before mentioned being sufficient to keep the waggons safely on the roads at low speeds. The coke waggons which work on the low level carry about a chaldron of coke, and have a very short wheel-base; begin constructed as side-tip waggons, to facilitate the side loading into the barges at the quay wall, and without being removed from the straight line of rail.

All the loading and unloading of the quay wall traffic, excepting

coke, is performed by the ordinary portable cranes which run on the lines of rail parallel to the river. It comprises large imports of chalk for burning into lime, at the kilns upon the works, ballast, building materials of all kinds for the extensions of the works, and articles for the general use of the undertaking, as well as exports of the different products made upon the works.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

GAS COMPANIES AND THE EXTENDED USE OF GAS.

SIR,—No one, I think, who has read the very able address recently delivered by the President of the Midland Gas Managers' Association (Mr. R. O. Paterson, of Cheltenham) can fail to most fully endorse his remarks concerning the evils arising from men who are totally ignorant of the business they profess to understand, undertaking to advise upon matters connected with gas and gas-fitting; and I think all connected with gas undertakings will re-echo his wish that Parliament will soon grant them powers to regulate the internal part of the gas-fitting of every house. I go most heartily with Mr. Paterson in his condemnation of the "timmen, blacksmiths, plumbers, and others," who undertake "gas-fitting;" and in support of this I will quote two cases (out of, I may say, hundreds) which have come under my own observation.

A lady bought a £7 7s. gas cooker, capable of cooking a dinner for 30 people; and she placed it in the hands of one of these "timmen, blacksmiths, plumbers, and others," to fix. So skilled was he in the art of gas-fitting, and so perfect was his knowledge of the distribution of gas, that he inserted into a ½-inch compo. pipe a small ¼-inch brass tube connector; and from this to the stove he conveyed a piece of ¾-inch flexible tube, to supply a cooker with four boilers on the top, and an oven large enough to roast 25 lbs. of meat and bake three large tarts. Of course, the oven failed to cook; and, instead of blaming the so-called gas-fitter, the lady condemned the stove, and sent it back, declaring that gas cooking was a complete failure.

The second case was that of a man who, having to fix a reflector cooking stove, and not knowing that the cause of the stove not cooking lay with himself, through not having conveyed a pipe sufficiently large, took out the gas-bar at the top of the oven, and replaced it by an air-bar, with the holes drilled downwards. Of course this failed; and the result was the same as before.

Now here are two samples, out of hundreds of cases, where good and useful articles are brought into disrepute through men undertaking what they know nothing at all about. How are we to remedy this? Mr. Paterson's plan, as far as it goes, is exceedingly good. He says: "I am convinced that it would prove much more advantageous, and be more useful to the public, if a sufficiently commodious room were fitted up with examples of the best of every kind of gas appliances, whether for the purpose of lighting, heating, cooking, or motive power, as a theatre for practical demonstration, and permanently maintained." This plan, I think, would attract and amuse only one class of those among whom gas-stoves ought to be largely used. The sole way to meet the difficulty with any chance of success, both to the public and gas companies, is for the latter to fit up their own show-rooms, and hire out gas apparatus of all kinds, *faring them themselves*. The public would then have the benefit of the experience of gas officials, and the assurance that the gas companies' men would thoroughly well fix each article sent out from their establishments.

The result would be a general advance in the use of gas-stoves; an increased revenue to gas companies; and a complete dying out of "gas-fitting timmen, blacksmiths, plumbers, and others." J. WYNN.
Birmingham, March 9, 1881.

THE PROPOSED AMENDMENTS OF THE SALE OF GAS ACT.

SIR,—On first reading the "Notes" of your Edinburgh correspondent in the JOURNAL of the 8th inst., I was disposed to reply to him "according to his humour;" but remembering a scriptural injunction, I resolved to take a little time, so that I might at leisure carefully re-read the "Notes." This I did last night, with much amusement, accompanied by a little of the "dew off Ben Nevis," part of which was devoted to the purpose of wishing your correspondent health and prosperity, and "more power to his elbow" when next he tries to "floor an opponent." In truth, your correspondent's explanation explains nothing, but only makes clear that he had written his previous "Notes," if not hastily, at all events without, as it appears to me—for I must be careful as to what I now say in respect to the Solon of gas measurement—full consideration of all the conditions which are attendant on the testing, the use of, and the obligations of makers in relation to gas-meters.

I shall not occupy time in a discussion which can settle nothing. The whole of the matters affecting gas-meters will have to be thrashed out before a Parliamentary Committee, and until then we can wait for a solution of the problem, "What is needful to be done?"

55, Millbank Street, S.W., March 12, 1881.

F. W. HARTLEY.

ACCIDENTS IN GAS-WORKS.

SIR,—A fatal accident has recently occurred at our gas-works; and the Government Inspector under the Factory and Workshops Act, 1878, requires that notice of accidents should be sent to him.

I shall be glad to know from your correspondents whether or not it is generally conceded that Inspectors under the Factory and Workshops Act, 1878, have power to require any such notice.

March 12, 1881.

A. B.

MESSRS. S. OWENS AND COMPANY, of Whitefriars Street, E.C., are now issuing a new catalogue of their gas apparatus and machinery suitable for use in gas-works, a copy of which can be had on application.

SLAITHWAITE GAS COMPANY.—The annual general meeting of this Company was held on the 2nd inst., under the presidency of Mr. C. Thornton. A dividend of 10 per cent. per annum was declared, and the usual routine business transacted.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION, 1881.

PROGRESS MADE TO SATURDAY, MARCH 12.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Jan. 27	Jan. 28	Feb. 2	March 8	..	..
Alnwick "Gas Bill"	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Barrow-in-Furness Corporation Bill.	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Beverley "Water Bill"	Commons	Feb. 4	Feb. 7	Feb. 15	..	..	..
Bingley "Water and Improvement)	Lords	Jan. 27	Jan. 28	Feb. 2	March 11	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Birkenhead Corporation (Gas and	Lords	Jan. 31	Feb. 2	Feb. 7	..	..	..
Water) Bill	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Bradford Water and Improvement)	Lords	Feb. 18	Feb. 18	Feb. 25	..	..	..
Bill	Commons . . . .	..	..	..	..	..	..
Bray Township Bill	Lords	Jan. 27	Jan. 28	Feb. 14	March 3	..	..
Brighton and Hove Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
Cambridge "University and Town)	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Cheltenham Corporation Water Bill.	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Cleator Moor Local Board Bill . . .	Lords	Jan. 27	Feb. 7	Feb. 14	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 28	Jan. 28	Feb. 3	..	..	..
Colne and Marsden Local Board Bill.	Lords	Feb. 2	Feb. 3	Feb. 15	..	..	..
Dudley Gas Bill	Commons	Jan. 28	Jan. 31	..	..	..	..
Dundalk Water Bill	Lords	Jan. 27	Jan. 28	Feb. 15	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 8	March 7	March 11	..
Eastbourne Water Bill	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
East London Water "Bill"	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Egremont Local Board Bill	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Fylde Water Bill	Lords	Jan. 27	Jan. 28	Feb. 9	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 9	..	..	..
Goole and District Gas and Water)	Lords	Jan. 27	Jan. 28	Feb. 8	..	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 8	..	..	..
Hexham Gas Bill	Lords	Jan. 28	Jan. 31	March 2	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 28	Jan. 31	March 2	..	..	..
Holland " (Parts of) and Sutton)	Lords	Jan. 31	Feb. 2	Feb. 7	..	..	..
Bridge Water Bill	Commons	Jan. 28	Jan. 31	Feb. 14	..	..	..
Hyde Gas Bill	Lords	Jan. 31	Feb. 2	Feb. 7	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 31	Feb. 2	Feb. 7	..	..	..
Irvine Burgh Bill	Lords	Jan. 28	Jan. 31	Feb. 7	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 28	Jan. 31	Feb. 7	..	..	..
Kirkcaldy and Dysart Water Bill .	Lords	Jan. 28	Jan. 31	Feb. 7	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 28	Jan. 31	Feb. 7	..	..	..
London "Sea Water Supply Bill . .	Lords	Jan. 28	Jan. 31	Feb. 1	Preamble	not proved.	..
Lower "Thames Valley Main Sewer-)	Lords	Jan. 28	Jan. 28	Feb. 1	..	..	..
age Board Bill	Commons	Jan. 27	Jan. 28	March 2	..	..	..
Matlock Water Bill	Lords	Jan. 28	Jan. 28	Feb. 1	March 11	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 1	..	..	..
Oban Burgh Bill	Lords	Jan. 27	Jan. 28	Feb. 4	March 4	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Paisley Burgh Bill	Lords	Jan. 27	Jan. 28	Feb. 4	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Reading Corporation Bill	Lords	Jan. 27	Jan. 28	Feb. 4	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Richmond Gas Bill	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Ryton Local Board (Water) Bill . .	Lords	Jan. 31	Feb. 2	Feb. 7	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 31	Feb. 2	Feb. 7	..	..	..
Sevenoaks Gas Bill	Lords	Jan. 31	Feb. 2	Feb. 21	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 31	Feb. 2	Feb. 21	..	..	..
Sheffield Water Bill	Lords	Commons Bill	March 11	Feb. 7	March 1	March 10	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
South Metropolitan Gas Bill . . .	Lords	Jan. 27	Jan. 28	March 4	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	March 4	..	..	..
Stalybridge Extension and Improve-)	Lords	Jan. 28	Jan. 31	Feb. 7	..	..	..
ment Bill	Commons	Jan. 31	Feb. 2	Feb. 7	..	..	..
Stirling Water Bill	Lords	Jan. 27	Jan. 28	Feb. 4	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Westbury-upon-Trym Gas (No. 1))	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Westbury-upon-Trym Gas (No. 2))	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Westgate and Birchington Gas Bill.	Lords	Jan. 27	Jan. 31	Feb. 7	March 11	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 27	Jan. 31	Feb. 7	..	..	..
Woking "Water and Gas Bill . . .	Lords	Jan. 28	Jan. 31	Feb. 7	..	..	..
" " " " " " " " " " " " " " " "	Commons	Jan. 28	Jan. 31	Feb. 7	..	..	..

HOUSE OF COMMONS.

MONDAY, MARCH 7.

Requisitions to withdraw their petitions against the following Bills were presented:—Alnwick Gas, from North-Eastern Railway Company; Bradford Water and Improvement, from Midland Railway Company; Cleator Moor Local Board, from London and North-Western and Furness Railway Companies; Hexham Gas, from North-Eastern Railway Company; London Sea Water Supply, from The Gaslight and Coke Company.

The *locus standi* of petitioners was disallowed in the following cases:—Dudley Corporation, against the Dudley Gas Bill, except as to clause 22, which is as follows:—"Within six months from the passing of this Act a testing-place shall be provided at the works of the Company." Hyde Local Board, against the Hyde Gas Bill, except as to clause 27, as follows:—"Within six months after the passing of this Act a testing-place shall be provided at some part of the existing works, and that or some other testing-place provided for the purpose, within the gas-works for the time being of the Company, shall be the prescribed testing-place."

TUESDAY, MARCH 8.

The Beverley Water, Dudley Gas, Hyde Gas, Matlock Water, Reading

Corporation, and Ryton Local Board (Water) Bills were referred to a Select Committee, consisting of Mr. A. Smith (Chairman), Sir Hervey Bruce, Lord Lymington, and Mr. A. Arnold; to meet on Tuesday, March 15.

WEDNESDAY, MARCH 9.

A petition against alterations in the Stalybridge Extension and Improvement Bill was presented from the Staley Local Board.

Requisitions to withdraw their petitions against the following Bills were presented:—Goole and District Gas and Water, from (1) Corporation of the Level of Hatfield Chase, (2) North-Eastern Railway Company; London Sea Water Supply, from London and North-Western Railway Company; Stalybridge Extension and Improvement, from London and North-Western Railway Company.

THURSDAY, MARCH 10.

Requisitions to withdraw their petitions against the following Bills were presented:—Barrow-in-Furness Corporation, from the Furness Railway Company; Beverley Water, from North-Eastern Railway Company; Fylde Water, from (1) James Ormrod and others, (2) John Gordon

M'Minnies, (3) Charles Edmund Thornton and John Addie; London Sea Water Supply, from London, Brighton, and South Coast Railway Company; Stalybridge Extension and Improvement, from Manchester, Sheffield, and Lincolnshire Railway Company.

FRIDAY, MARCH 11.

A petition in favour of the Westgate and Birchington Gas Bill was presented from Owners, &c., of property in Westgate-on-Sea, Birchington, &c.

A requisition to withdraw his petition against the Holland (Parts of) and Sutton Bridge Water Bill was presented from the Earl of Lindsey.

HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, MARCH 2.

(Before Mr. W. J. LEIGH, Chairman; Mr. SEVERNE, Mr. COLMAN, and Captain O'SHEA; Sir J. DUCKWORTH, Referee.)

BRIGHTON AND HOVE GAS BILL.

Mr. RICHARDS, Q.C., Mr. MICHAEL, Q.C., and Mr. MERRIFIELD appeared for the promoters; Mr. LITTLE, Q.C., and Mr. LUMLEY SMITH, Q.C., for the Corporation of Brighton, petitioners against the Bill. Petitions were also presented by the Brighton Gaslight and Coke Company, the Commissioners of Hove, and Vallance's Trustees, but no Counsel appeared in support of them at the commencement of the proceedings.

Mr. RICHARDS, in opening the case for the promoters, said that Brighton had been supplied with gas for many years by two Companies—the Brighton and Hove Gas Company, which lighted the west portion and all Hove, and the old Brighton Gas Company, whose works were at the extreme east, and which supplied the eastern portion, including Kemp Town. The Brighton and Hove Company were originally established as an Association prior to Her present Majesty's reign, and in the second year of her reign they obtained their first Act of Incorporation. For some time their works were in the parish of Hove, but for many years past they had been removed from that site to an extremely well-chosen and convenient position upon the borders of the sea near Shoreham Harbour. There they had been situated for a great length of time, and the Company had expended a very large sum of money in plant necessary for the manufacture of gas; and also, in consequence of the inroads the sea had at times made upon this particular spot of land, they had been obliged to build a sea-wall and erect some groynes, which had occasioned a considerable expenditure of capital. The old site at Hove was still used for storage purposes, but this was not liable to offend the senses of the inhabitants to the same extent as gas manufacturing works. The old Brighton Company were likewise established many years ago as an Association, and they obtained their last Act of Parliament so long back as 1848, and therefore were not liable to any of those restrictions which the Legislature for some years past had thought proper to impose upon gas companies. It must not be supposed, however, that the old Brighton Company had been free to do as they liked. The fact that their neighbours were limited as to price, and were under several other restrictions, had, in point of fact, operated just as satisfactorily as if those restrictions had been imposed by clauses contained in an Act of Parliament. Although the two Companies had the power of lighting a good many portions of the district in common, they had not been mutually uttering their throats for the benefit of the public. If there had been any competition, it had been what of late years had been called a competition of accommodation. A line had been agreed upon between them, and the effect of the conduct of the two Companies had for many years past been extremely satisfactory to the people of Brighton. One of the Acts of the Brighton and Hove Company—that of 1866, he thought—reduced their price to 3s. 6d. per 1000 feet; and considering that Brighton was some distance from the coal-fields, this price was extremely low. At that time the promoters left the committee-room with a sad feeling that it would be many years before they would be able to hold up their heads with such an extreme restriction of price; but as time had gone on the Company had been more flourishing, and the manufacture of gas had improved, so that at present the price was not the hardship that it was some years ago. The price operated not only upon one Company, but upon the other also, and the same was the case with regard to the illuminating power, which was fixed at 14 candles. In 1866 a third Company was started, apparently as a speculation; but at the time it proved extremely troublesome to the Brighton and Hove Company. This third Company was known as the Aldrington, Hove, and Brighton Gas Company, and obtained certain powers, but up to the present time these powers had never been exercised, and he believed that the very land they took had been sold to the Brighton and Hove Company. It was now proposed to give them the *coup de grace* by purchase, if there was anybody to sell or anything to buy, and so put them out of existence altogether. The two Companies in Brighton had, on the whole, conducted matters to the satisfaction of all parties, if one might judge from the tone of the petitions presented by the Corporation of Brighton and the Commissioners of Hove. [The learned Counsel then entered at some length into the subject of the amalgamations which had taken place between the London Gas Companies, and the operation of the sliding scale, and concluded his remarks on this point by suggesting that it would also be a good and desirable thing for the amalgamation between the Brighton Companies to take place.] It might be asked why the agreement between the two Companies had not been produced; but at the present moment no such agreement existed, and was not likely to exist unless it was perfectly well known that there was a possibility of turning it into a binding form by Act of Parliament. What was contemplated by the promoters was such a financial arrangement between the two Companies as should not offer any objection to an outsider, and also one which the Board of Trade would approve, and which would be more correctly described as an amalgamation than as a purchase. The 7th clause of the present Bill stated that "The Board of Trade shall give notice, by advertisement in two daily or weekly papers published in Brighton, of the submission of such scheme, and shall receive any representation made to them by any person affected thereby respecting the scheme, and shall consider the scheme and modifications (if any), and may suggest any modification of the scheme." The Board of Trade had experienced persons to take the duty which would be thus imposed upon them, and it need hardly be said that a more competent body for such a purpose it would be very difficult to find. The admirable way in which the work was done by the Board of Trade for the large area of London spoke volumes for the satisfactory manner in which they dealt with things of this sort. This was the proposal laid before the Committee, although there were some other points in the Bill which need not then be referred to. For instance, there was the purchase of certain lands and easements; but the opposition was withdrawn with regard to them, the owners of the land having been satisfied. Petitions had been presented by the Corporation of Brighton, the Hove Commissioners, and the Brighton Gaslight and Coke Company; but when the latter Company protested against the purchase, he apprehended that this meant they had not been offered acceptable terms. In their petition they submitted "that no Bill should be passed in any way dealing with the transfer or amalgamation of their undertaking, unless such provisions are contained therein as are, in the opinion of your petitioners, satisfactory." So far as this went, all the Committee would give power to do was to submit to the

Board of Trade a scheme of amalgamation by agreement; but before this was done something like an agreement must be arrived at with the old Brighton Company, and then the Corporation of Brighton and the Commissioners of Hove would have a right to appear before the Board of Trade to take objection to the scheme. There was nothing in the Bill that gave power of coercing the Brighton Company in any way. The petition of the Corporation of Brighton stated that "the existence of the power of competition between the Company and the old Company in every part of the borough is a most valuable protection to the gas consumers and to your petitioners against any undue increase in the price of gas, and in tending to secure the supply of gas in all parts of the borough of good quality and illuminating power under proper pressure. The effect of the Bill would be to place the monopoly of the supply within the borough in the hands of a single Company, and thus to deprive the gas consumers and your petitioners of the benefits above referred to;" but there was a little inaccuracy in this statement. At present the Brighton and Hove Company were under very severe restrictions; they had to supply 14-candle gas at a price which was never to exceed 3s. 6d. per 1000 feet, they were also under the usual restrictions as to percentages, and so on; and of course they were limited as to capital, &c. Those restrictions unquestionably operated in a like manner upon the old Company; and therefore Brighton had the benefit of these restrictions and obligations over the whole town. The petitioners also stated that they believed "that one main object of the Company in promoting the present Bill is, by the removal of the risk of competition, to which they are at present exposed, to enhance the value of their undertaking and the price which they would be enabled to demand in the event of its transfer to your petitioners." This seemed to be very far-fetched. They did not allege that they had the slightest intention of buying up the undertakings, and if they had it would be much easier to deal with one Company restricted to a price of 3s. 6d. per 1000 feet than to deal with the old Company, which was not restricted at all in price, and which might claim large arrears of back dividend. The petitioners next stated that it was contrary to the practice of Parliament to grant general and undefined powers, and that in all cases it was required that the terms and conditions of purchase or amalgamation should be submitted in the first instance to the consideration and judgment of Parliament; but this was directly contradicted by a clause in the City of London Gas Act of 1863, and Parliament had over and over again given powers to gas companies to submit their schemes to the Board of Trade. The petitioners next complained that "no opportunity would, under the provisions of the Bill, be afforded to your petitioners, or to any gas consumers or other interested parties, of objecting to the terms and conditions of any agreement which the two Companies may think fit to make." This was not a fair construction of the matter, because the Board of Trade might introduce any modification they pleased; and if there was any part of the agreement they thought objectionable, or unfair to the Corporation of Brighton, or any consumer, or to the Commissioners of Hove, they had ample power, under the terms of the Act, of rejecting the objectionable part, or modifying the agreement. The next allegation in the petition was with reference to the capital sought to be raised in 1879: "Your petitioners opposed that Bill especially upon the grounds that the money powers sought were excessive, having regard to the legitimate requirements of the Company, and in the result those powers were largely reduced by the Committee to whom the Bill was referred, and were limited to the raising of the sum of £150,000 by shares or stock, and of £37,500 by borrowing; the Company by their witnesses representing that they *bona fide* required those sums for their then authorized purposes. The Company therefore can have no funds which would be applicable for the purposes of the proposed purchase or amalgamation under the Bill." He (Mr. Richards) did not know what expenditure the amalgamation was to need—it included financial arrangements—it did not include any capital expenditure on the part of the Brighton and Hove Company. The petition went on to state that "if the Bill should pass in its present form the Company would be entitled, after the purchase or amalgamation, to exercise within the whole of the borough the powers of supply of the old Company, both for public and private purposes, upon the terms contained in the Act of 1848, without regard to the provisions contained in the Acts relating specially to the Company." It need hardly be said, however, that if the Brighton and Hove Company were to absorb the old Brighton Company, unquestionably the restrictions under which the former Company were at present would apply to the amalgamated Companies.

Sir J. DUCKWORTH: Amalgamation would seem not to absorb the Companies. When amalgamated, they both stand, as it were, upon the same ground, and one Act operates upon both?

Mr. RICHARDS said the practical meaning was that any restrictions imposed upon the one operated upon the other. Taking the illuminating power of the gas, one Company was not under any limitation, while the other were bound to supply 14-candle gas. After they were joined together it would not be known where the gas came from, and therefore the restriction would apply to the whole. The next paragraph was to the effect that, after the purchase or amalgamation, the Company might manufacture gas for the whole of the borough, and also convert the residuals at the works of the old Company, thus causing a nuisance to the eastern part of the borough, and militating against building operations being carried on in the neighbourhood; but this was a little too strong, because it was notorious that the whole of Kemp Town was one of the most miserable building speculations ever known, although of late years it had a little recouped itself. There was, however, nothing in the amalgamation which would increase the nuisance, if there was any; and all he (Mr. Richards) could say was that when the two Companies were amalgamated, although they could not possibly afford to shut up the old station, or anything of this sort, there would be an opportunity of making any extension of manufacturing plant at the new works at Shoreham. The position of the old Company's works was a very bad one; and no one would think now of erecting gas-works high up on the top of a cliff. The Brighton and Hove Company's works were situated close to the sea, and any gas engineer would say he would prefer extending the works at the seashore to extending those at the top of a cliff. The petition next alleged that "as regards both the old Company and the Aldrington Company, the effect of the proposed purchase or amalgamation would be to empower the Company to supply gas in outlying districts of large extent, but with comparatively sparse populations, which are now beyond the Company's limits of supply, and your petitioners object to such power being conferred upon the Company as tending to postpone the period when a reduction would take place." This was the old story; but why should a gas company, unlike the conductors of any other reasonable business, go into an unremunerative district, and extend their mains and pipes into places which did not pay? There was no new power contained in the Bill now before the Committee; any powers that existed were contained either in the old Company's Act of 1848, or in one of the several Acts obtained by the Brighton and Hove Company. This concluded the petition of the Brighton Corporation, and he did not propose to read that of the Hove Commissioners, because it was substantially the same. There was one other subject to which attention ought to be called—viz., the present position as to capital of the two Companies supplying gas to Brighton. The Brighton

and Hove Company, under their Act of 1839, had power to raise £100,000, which had long been entirely called up. Under their Act of 1866 they had power to raise £75,000, and under a Provisional Order granted in 1875 they had power to raise £50,000, and both these sums had been likewise called up. Under their Act of 1879 they had power to raise £150,000, which had not yet been called up; and, therefore, their total capital was £375,000, of which the amount actually called up was £225,000. The state of the old Brighton Company was very simple. Their Act was passed in 1848. In it they had power to raise £90,000, and this sum had all been called up. Then there were certain borrowing powers. Under their Act of 1839 the Brighton and Hove Company were authorized to borrow £10,000, which was so borrowed. They obtained an Act in 1854 authorizing them to borrow £10,000, but not any share capital, which power had been exercised. In 1866 they had power to borrow £25,000, which had been called up. Under the Provisional Order of 1875 they had the power of borrowing £12,500, and of this amount £6200 had been called up, leaving a balance of £6300. Then in 1879 they had power to borrow £37,500, but no portion of this had been called up. Consequently the Company's authorized borrowing powers amounted to £95,000, of which they had actually borrowed £51,200, leaving an unexhausted borrowing power of £43,800, and, therefore, they were not likely to apply to Parliament again for capital for some time to come. The old Company had, by their Act of 1848, power to borrow £30,000, and this had been raised, so that their powers were exhausted. In conclusion, the learned Counsel asked the Committee to pass the preamble of the Bill if they thought that, on the whole, it would be likely to prove a good and desirable thing, both for the people of Brighton and also for the Company, which latter point he did not deny for a moment, as he did not pretend to such extraordinary philanthropy as to be indifferent to this. The promoters thought that amalgamation would lead to economy in the supply of gas, and they, therefore, asked for the powers which Parliament had already conceded to The Gaslight and Coke and South Metropolitan Companies, and which they believed would redound to the benefit of everybody concerned.

Mr. LITTLE said he should like to take the opinion of the Committee as to whether the Bill should be proceeded with. His learned friend had quoted the precedent of the London Companies, but with that exception he had not cited any precedent whatever. He (Mr. Little) ventured to say it was entirely contrary to the whole principle of Parliament. The Brighton and Hove Company was the creation of Parliament itself, and lived subject to parliamentary conditions; but what the Committee were asked to do was to let some one else decide for them on what terms this creature should alter the condition of its very being; and instead of four honourable members having the responsibility of considering the matter, it was to be decided afterwards—without the slightest disrespect to the Board of Trade—by some mere machinery of correspondence, or something of that kind, in their offices at Whitehall. If the promoters had chosen to embody their propositions, as they ought to have done, in an Act of Parliament, the Committee would have been in a position to say whether they ought to have an amalgamation or not. If the Companies were to be amalgamated on the terms of being allowed to increase the price of gas, or on the terms of being allowed to spend half their capital in buying these old works, it would be a serious injury to Brighton, and yet it would be a thing which could not be discussed in that House, where, upon any grave question of principle, they had the advantage of being enabled to make a special report to the House. In the cases of the London, Chatham, and Dover Railway, the Albert Assurance Company, and the European Insurance Company, certain specific questions were referred to arbitrators, whose awards were to have the effect of Acts of Parliament; but here there was no specific question; it was simply that the Companies might hereafter amalgamate. His learned friend had relied upon the precedent of the City of London Gas Act, 1868; but it was now 13 years since this Act was passed, and with the exception of London, nobody had ever dreamed or suggested that such an arrangement should be carried out anywhere else. If such a precedent were applied, would it not equally apply to any two railway companies or water companies seeking to amalgamate? The Committee were asked to refer this matter to an absolutely irresponsible tribunal, from which there was no appeal. There was no machinery to ensure the parties being heard before the Board of Trade. It was simply to write and advertise to all people that there was a suggested amalgamation; and it would be quite competent for the Board of Trade to refuse to hear anybody before them, but simply say, "You must send in your communication in writing." He (Mr. Little) submitted it would be an evil precedent indeed if such a Bill as the present were ever to be listened to by a Committee of Parliament. His learned friend had quoted the precedent of the City of London; but it must be remembered that the present Bill was not merely for authorizing the Companies to refer an agreement. It was a Bill pure and simple for referring to somebody else the authority to say on what terms these Companies should agree. Why could not the two Companies say on what terms they asked for powers to amalgamate? Were the Committee going to allow an amalgamation utterly in the dark, without knowing what the conditions were to be in a Bill which provided for nothing else? In the case of the London Gas Companies, the agitation was of a special character, and contained special provisions as to dividends, Gas Referees, a Chief Gas Examiner, forfeitures, and a number of other things, to meet special wants under very special circumstances. There was no instance in which there had been so many conflicting and difficult interests that it was impossible for a Parliamentary Committee to deal with it. Railway companies submitted agreements with 40, 50, and 100 clauses to be approved by Parliament, and to be scheduled to Acts; but these gentlemen had not agreed, and with regard to the Aldington Company there could be no reason why they should agree at all, because this Company had not done anything. They might agree with the other Company by paying them twice as much for their shares as they ought to do; and they might do other things that would be settled by agreement, and would not come before Parliament, and he (Mr. Little) put it to the Committee whether that should be allowed when there were no special circumstances stated. It was taking away from his clients the right to be heard before the tribunal appointed by Parliament for the purpose of deciding such matters. They objected to legislation in Whitehall; they desired to have legislation at St. Stephen's.

Mr. RICHARDS said it was true that in the case of the City of London Gas Act of 1868 there were a large number of other matters besides the scheme for arbitration, but did this make any difference? The fact was that two very extensive amalgamations had taken place which had been found to work perfectly well. His learned friend contended that the Board of Trade were not to consider the agreements, but only the modifications; but as he (Mr. Richards) understood the matter, the Board of Trade could on the one hand say, "We object to it altogether," or they might insist upon any modifications they liked, and to such an extent that the thing could not take place. If the instances he had mentioned were good for London, why would they not be equally good for Brighton? Parliament did not treat the suggestions in the Act of 1868 and in the South Metropolitan Company's Act as the Committee were asked to do in the present instance, but they actually passed them, and thought them exceedingly good schemes; but to save themselves the trouble of discussing

minute details, they referred this work to the much more convenient machinery which existed at the Board of Trade, and this was what was asked in the present case.

The committee-room was then cleared. After some time the Counsel and parties were called in, and

The CHAIRMAN said the Committee had decided to go on with the Bill.

The following evidence was then called:—

Mr. John Birch Paddon, examined by Mr. RICHARDS.

I have been Engineer and General Manager to the Brighton and Hove Gas Company for over 20 years, and have had about 30 years' experience in the construction and management of gas-works. Brighton is lighted by two Companies—the Brighton and Hove Company, who light the western part of Brighton and Hove, and the old Brighton Company, who light the eastern part of Brighton, including Kemp Town. Our mains pass each other, and we run into what may be called the eastern district, and the old Brighton Company's mains come westward into the Hove district. There is a division made by the contract for public lighting with the Brighton Corporation, and the divisions represent portions of the district upon which we do not care to make extensions. There is no active competition between the two Companies, a personal understanding existing between myself and the Manager of the Brighton Company. The Brighton and Hove Gas Company was incorporated in 1839, but it was established in 1825, and at that time the manufacturing station was in the parish of Hove, adjoining the parish church. In 1870 we obtained a site by Shoreham Harbour, where we now carry on our works.

Examination continued by Mr. MICHAEL: We discontinued making gas at Hove in 1878, because we thought the manufacture could be conducted better at the present site in the parish of Portslade. Some pressure was put upon us by the local authorities, and we felt it would be a very desirable thing if we could get out of their way; and although we incurred a good deal of expense, yet the advantage to the locality was very great indeed. I should think its rateable value has quadrupled since that time. From time to time we have extended our works at Portslade, and we have also a good deal of land unoccupied which was obtained under our Act of 1879. The quality, pressure, and purity of the gas are tested by an official analyst, and his reports have always been extremely favourable to the Company. The illuminating power prescribed in our Act is 14 candles, but we have supplied from 14½ to 14¾ candles. Our Act of 1866 contains a provision that the Corporation can require at any time an additional candle of illuminating power by payment of an additional 3d. per 1000 feet, but nothing has ever come of it. The price charged in Brighton and Hove at present is 3s. 6d., and in the outlying districts 4s. 6d. and 5s. 6d. per 1000 cubic feet, on account of the extra cost of supplying the latter places. I consider these prices fairly meet the case, so that Brighton is in no degree prejudiced by the supply of the outlying districts. The total quantity of gas sold last year was 337,718,000 cubic feet, and the quantity made was 364,500,000 cubic feet. We have not altogether paid our maximum dividends since 1861. Going back as far as 1866, I find that the Proprietors have gone short to the extent of £27,786. Previous to 1866 we had no limitation as to dividends. We have £100,000 of capital, upon which 10 per cent. can be paid if it is earned. This was authorized by our Act of 1839. By the Act of 1866 we were authorized to raise £75,000 more, which was limited to 7 per cent. if issued as ordinary, or 6 per cent. if issued as preference capital. As a matter of fact, £50,000 was issued as preference, and upon this 6 per cent. is paid. In 1875 we obtained power to raise £50,000, which was also limited to 7 per cent., and the whole of this has been called up. In 1875 we obtained further capital powers for £150,000, but none of this has been called up. The total amount required to pay our maximum dividends is £8119. We were authorized by our Act of 1839 to borrow £10,000; by the Act of 1854, £10,000; by the Act of 1866, £25,000; and by the Provisional Order of 1875, £12,500. All this has been issued in perpetual debenture bonds at 5 per cent. By our Act of 1879 we obtained power to borrow one-fourth of £150,000, and this still remains to be borrowed. Under the Act of 1871 any person within the Company's limits can claim from us a supply of gas; and we have never looked very closely into matters of distance, or anything of this kind. I believe we have lighted everything we have been requested to light. We have also, up to the present time, supplied all the public lamps within our district which have been required of us by the Corporation. By our present Bill we propose to amalgamate our Company and the old Brighton Gas Company, who carry on their undertaking just outside the eastern boundary of Brighton, in the parish of Rottingdean. The supply of that Company ranges pretty well all over Brighton, going very slightly, if at all, into Hove, and they also light a small portion of Rottingdean. Both Companies have their pipes in the same streets, so far as Brighton is concerned; but there is practically no competition, and the charge is the same by both Companies—viz., 3s. 6d. per 1000 feet. Under their Act of 1848 the old Company were authorized to raise the sum of £90,000 as share capital, and £30,000 as loan capital; the former has all been raised, and the latter has been converted into ordinary share capital, under the Companies' Clauses Act. The old Company have a large amount of back dividends unpaid, but I cannot say how much. The quantity of gas supplied by the old Company last year was 271 million cubic feet. They paid their maximum dividend of 10 per cent., and had some overplus. The Brighton and Hove Company require £18,000 to pay their maximum dividends, and the old Company £12,000, or a total of £30,000 on the two capitals. The works at Black Rock are not well placed for the purposes of manufacture and distribution, on account of their elevation. I think that it would be a very desirable thing for an amalgamation to take place between the two Companies, and also that it would be greatly to the advantage of the consumers—more so, indeed, than to the Companies, who cannot profit very largely by the amalgamation, because their profit is limited by the amount of dividend they are receiving at the present time. I think there would be an economy in administration if the amalgamation of the two Companies took place, because a better organization could be made with one authority than with two. We also look forward to the time when the whole of the gas will be made upon one site, which I believe will eventually be the case. The works of the Brighton Company are placed at an elevation of some 70 feet, I think, above the level of the sea, while our works at Portslade are situated close to the sea, and all the coal is brought up by screw steamers, and deposited just where it is required, while in the other case it has first to be carried by railway, and then drawn up by carts. When our sea defences at Portslade are carried out, and our ground is in proper condition, there will be ample space upon which the requisite works can be constructed for doubling the consumption. The direct effect of amalgamation must be to reduce the price of gas, and I can foresee that a reduction will take place at no very distant period. In 1866 there was another parliamentary contest, and a company was established called the Aldington, Hove, and Brighton Gas Company, but nothing whatever has since been done by them, and we take powers to merge in the amalgamated undertaking any powers existing in this Company. It has been thought undesirable that a matter of this kind should be left in any uncertainty, and so, if it can be settled inexpensively, an opportunity is now afforded for so doing. Some of our works

are situated on leasehold ground, and by the present Bill we take power to acquire this land in fee simple.

Cross-examined by Mr. LUMLEY SMITH: We are at present in possession of land which is quite sufficient for the whole of our requirements, and are engaged in preparing additional works and making provision for the future. The amount of capital we have will be ample to cover all the works necessary for the supply of gas to the whole of Brighton; but my impression is that, large as this capital is, it is only a sufficient provision for about eight or ten years, and then we shall have to apply to Parliament again. When we were before Parliament in 1879, I said the capital then applied for would last for considerably over ten years; but we were then asking for a large amount, which was afterwards reduced to £150,000. It would be impossible for the old Company to deal with any great increase of business without applying for further powers. They have gone on without since 1848, but their rate of increase has not been so large as ours. There is an indirect advantage to be obtained from the passing of this Bill, and that is we should have a stronger position as one concern; and I also think that the property of the Proprietors would be in some degree improved so far as security is concerned. I likewise imagine that, indirectly, at some future time, it might lead to a reduction in the price of gas. The introduction of the sliding scale has not been contemplated by the Company, but I do not know that there would be any very strong objection to something of the kind. At present no reduction in the price of gas is contemplated.

Sir J. DUCKWORTH: That is to say, a reduction in the maximum price?

Mr. SMITH: Yes.

Mr. MICHAEL: It will not be a reduction in the maximum, if there is a sliding scale, but the standing price.

Cross-examination resumed: We have been charging our maximum price since 1873, but the old Company are practically unlimited as to the price they charge. There is no compulsion on the part of the old Company to supply any one, those provisions having been introduced much later than the date of their Act. I do not think it is competition that keeps the old Company in check. Assuming we were not there at all, and that they had the thing entirely in their own hands, I still think that, under the operation of the Act of 1847, the state of things would be very much what it is at the present time.

Mr. SMITH: At any rate, under modern legislation Parliament has always imposed terms upon gas companies, and has not trusted to them entirely as to the price they charge, or the quality of gas they will supply?

Witness: Price is a thing very frequently in the discretion of a company. There are a great many companies at the present time who have maximum prices very much in excess of the amount they charge.

Mr. SMITH: When competition is withdrawn, will not the old Company be entitled to charge what they like, and supply what quality of gas they like?

Mr. MICHAEL: But it never will be withdrawn.

Witness: They are not under restrictions, but when it is considered that our mains run over the whole of the district, and that we are really under compulsory provisions of supply, it cannot be imagined that any difficulty will arise.

Cross-examination continued: Our districts are the same, and we are under compulsory provisions of supply. Therefore if the old Company were to refuse to serve a customer, and our pipes were outside, that customer would come to us, and insist upon being supplied.

Mr. SMITH: Your compulsory powers merely make it necessary for you to supply gas within a certain distance of your mains; but if there was a street at the east end of Brighton in which the old Company have pipes and you have not, there is no compulsory power that makes it necessary for you to supply gas to anybody there?

Witness: There are powers which would compel us to take gas there.

Mr. MICHAEL: We may be called upon to supply light to any lamp, and so go on from yard to yard until we supply all the district.

Cross-examination resumed: There is a provision in one of our Acts that each lamp shall consume 15,000 cubic feet of gas in a year, but at this moment I cannot say whether it has not been overruled by another Act. We make no proposal to do away with this clause in the event of amalgamation, but it is a clause which is never pressed upon the Corporation with any inconvenience.

Mr. SMITH: The only way of escaping from the pressure of the clause would be by the Corporation dealing with the old Company?

Witness: If we were to insist upon the clause, and they were to object to it, they would certainly have the means of going to the other Company, and asking them whether they would consent to supply them.

And that would cease if the Companies were amalgamated?—Yes; the other Company are not under the same obligation.

Mr. SMITH: Your Bill makes no provision for bringing the undertaking of the old Company at all under the recent requirements of your own Acts of 1873, 1879, and the general Act of 1871?

Mr. MICHAEL: That already applies, because, so far as the decision of the Court of Queen's Bench goes, the Act of 1871 applies to the old Company as well as to the other.

Mr. SMITH: There I must differ from you.

Witness: Even if it be not so, it is certain we could not supply gas anywhere except under our present restrictions; and if we took possession of the district of the other Company, of necessity all our restrictions would apply there, just the same as they do to the present district.

Mr. SMITH: It would be a most important matter for the Board of Trade to consider?

Witness: Yes; but I think it would be taken for granted by any one looking at it.

Mr. RICHARDS said it was unquestionably intended that all the restrictions should apply, and if there were any doubt, words should be introduced to make them apply.

Cross-examination resumed: I think it is possible the time may come when all the gas will be supplied from Portslade; but it is manifest that a considerable period must elapse before this can be done. If the works were to be immediately removed from Rottingdean to Portslade, all the capital expended upon the former works would be sacrificed, and a large quantity of additional capital would be required, and we should be unable to consider a reduction of price at all.

Sir J. DUCKWORTH: If the manufacture of gas were done away with at any future time at Black Rock, would the mains of the old Company, as they now lie, be effectual to convey gas from your end?

Witness: They would be useful to some extent, but not very largely.

Are the gas-mains always laid on the level?—No; they follow the contour of the ground line.

If the manufacture of gas were given up at Kemp Town, would it involve increased works at Portslade?—Yes, undoubtedly.

There would be nothing else but the expense of putting up the works at Portslade?—Yes; the alteration would extend to the mains, which would have to be largely altered as well as the works.

Would not the distance involve a waste of gas?—Not to any considerable extent.

Cross-examination resumed: It may be taken that the old Company

are now making 300 million cubic feet of gas at Black Rock, and if the manufacture were removed to Portslade, additional plant and apparatus would be required there sufficient for the production of this quantity of gas. Storage would also be needed, and then we should have to distribute the gas. Our mains, as they now lie, are wholly incapable of performing an additional duty of this kind, and therefore new ones would have to be laid; in fact, with the exception of the land, we should be simply constructing our works *de novo*. If the storage apparatus remained at Kemp Town, the sacrifice would not be so great, but the disadvantage and danger would be considerable, and it would have to be taken into account whether there was any real advantage in retaining the storage power there. I should think about 20 years would be a very fair time to devote to the gradual removal of these works.

Mr. SMITH: I presume if the old Company had to apply to Parliament, they would be placed under terms to put their works farther east?

Witness: No; there would be no precedent for that. They are there on their own rights, and on their own land under the authority of an Act of Parliament.

By the COMMITTEE: The cost of coal at Portslade, taken for the whole of the year 1880, was 14s. 11-8ld. per ton; and I should think, speaking approximately, the cost to the old Company was 4s. a ton more.

Cross-examined by Mr. BROWN (Parliamentary Agent for the Hove Commissioners): I should think the Company would object very strongly to a restriction being placed upon them from manufacturing any gas at all in the parish of Hove, because such restriction would be very gratuitous, although they do not contemplate taking such a step. It is an unpleasant thing to be placed under an obligation which does no one any good. By removing our works to Portslade we conferred a considerable benefit on the locality, and we also profited by obtaining our coal in a better way. We did not in the slightest degree contemplate being indicted for a nuisance, and are able to take care of ourselves.

Re-examined by Mr. MICHAEL: In the case of the old Company the proportion the capital bears to the gas sold is £408 per million cubic feet, which is a singularly low figure. I cannot give you the proportion between the distributing apparatus and the manufacturing apparatus with regard to the Black Rock Company, but in our own case it is about 7½ per cent. It is difficult to set up any exact formula, but it may be said that one-third of the capital goes in mains.

Mr. MICHAEL: You would therefore require £40,000 for mains, which would make £120,000 for the works to be constructed at Portslade to supply the gas which would be required in order to have the same quantity as is now made at Black Rock.

Witness: That is on the assumption that we could replace those works at Portslade for £400 per million cubic feet.

The whole of the capital would be more than wasted which now belongs to the old Company, and would defer to the Greek Kalends any hope of a reduction in the price of gas?—It would very seriously interfere with it.

Do you think it would be desirable to take gas from your works and store it at the Black Rock works at an altitude, and then force it down to Brighton?—It would not be a proper or desirable thing, but I do not say it might not be done under any circumstances.

I presume when you said that if the amalgamation took place you would gradually localize the whole of the works, this would be on the supposition that no new works of extension would be made at Black Rock?—That is so, and the provision for the increased business should be made at once at Portslade. Again, by extending it over a long time another element would come into operation—viz., the natural decay and wearing out of the works. In this way I think the financial difficulty would be got over, but I do not know any other way in which it could be dealt with.

Re-examination continued: I have considered the matter, and it seems to me to be impossible that we could in any way, if we desired to do so, evade the regulations and restrictions incident to the whole of our Acts; but we are perfectly willing to make the matter clear. To supply gas from two works would entail an amount of difficulty almost impossible to deal with. The only way is to make one undertaking, conducted by one Board, with one staff of servants, and practically with one set of pipes; and this principle will be carried out throughout the whole of the matter. We should have the advantage of supplementing the supply of one place from the other to meet any contingency or difficulty that might arise, and this has been found of great value in previous amalgamations.

Mr. Somers Clark, examined by Mr. RICHARDS.

I have been Vestry Clerk at Brighton for some 50 years, and Solicitor to the Brighton and Hove Gas Company for over 40 years. I know the old Company's works at Black Rock, but I am not connected with them at all. I have never heard the works complained of by residents at Kemp Town, which is in their immediate neighbourhood, and I have several friends residing there. Almost the whole of the houses which now form Kemp Town have been built since the gas-works were established, notwithstanding the allegation that the works are a nuisance. If the gas-works at Black Rock were abolished and the site sold, I am afraid it would not be very valuable as building ground. There have been some new buildings erected recently on the east side of the gas-works, in the parish of Rottingdean. The Brighton and Hove Company propose to purchase certain lands in fee over which they have at present a long lease, and these lands are situated in the parish of Hove, not far from the church. The lease has about 78 years to run, but we propose to convert it into freehold. The Company have not arranged any price, but they have agreed to place themselves under the same obligations they are under now in the lease, and the opposition has therefore been withdrawn.

Cross-examined by Mr. SMITH: Until I read the petition, I certainly never heard of any complaint from the inhabitants in the neighbourhood of the works.

Mr. G. W. Stevenson, examined by Mr. RICHARDS.

I have been largely concerned both for and against the Metropolitan Gas Companies; formerly more against them than for them, but latterly more for them than against them, because they have been placed under restrictions which have rendered it unnecessary for the public to appear against them. I have read the Bill now before the Committee, and know the neighbourhood of Brighton pretty well. I think if the objects of the Bill were carried out in the way proposed, it would be advantageous to the public of Brighton as well as to the Company. The first amalgamation in the Metropolis took place in 1868, under the City of London Gas Act. [Witness was examined at some length as to the various amalgamations which have subsequently taken place, but as our readers are familiar with the details we refrain from reproducing this portion of the evidence.] All the Metropolitan schemes of amalgamation were submitted to the Board of Trade, contested before and confirmed by the Board, and signed by Her Majesty in Council. The present Bill is drawn precisely on the same lines, and if it had simply incorporated the clauses of the Act of 1868, instead of setting forth the process of amalgamation as it has done, it would have been on all fours with the procedure that was adopted in the Metropolis. I think the proposed amalgamation is beneficial to both parties, because when amalgamation is possible competition is impossible. This has passed into a proverb, owing to the companies finding it eventually to their interest to amalgamate; and it is likewise to the interest of the consumers. There is nothing that tells the effect so surely as citing

the selling price of gas. In the Metropolis the price has been reduced on the north side of the Thames from 8s. 9d. to 8s. 2d., and on the south side from 8s. 6d. to 2s. 10d. per 1000 feet. Assuming the amalgamation of the two Companies in Brighton, I conceive the restrictions imposed on the Brighton and Hove Company ought to extend to the whole district, and this should be provided for in the Bill, and the promoters have already said they are quite willing that this should be the case.

Cross-examined by Mr. SMITH: The amalgamation cannot take place except under a scheme which is to be approved by the Board of Trade and confirmed by an Order in Council. If there is any doubt on the matter, the Board of Trade will take good care to make the price rule over the whole of Brighton and Hove.

Mr. SMITH: I believe at the time of the coal famine in 1873 the Brighton and Hove Company obtained power to charge an extra 6d. per 1000 feet for one year, did they not?

Witness: I think so.

And also make a reduction in illuminating power from 16 to 14 candles, and it has so remained ever since?—I do not remember it.

Sir J. DUCKWORTH: Do you mean 16-candle power was in the Act, and they went back to 14 candles?

Mr. SMITH: The way in which it was done was this: A mode of testing was enacted which had the effect of reducing the 16 candles to 14, and in the next Act of Parliament this was actually put into words.

Witness: The prescribed burner was altered. Instead of destroying the illuminating power, as the prescribed burner did, that used by the Referees in the Metropolis allows the illuminating power to be developed, and this makes a difference of 2 candles.

Sir J. DUCKWORTH: The 14-candle power now is as good as the 16-candle then?

Witness: Yes; there is no difference at all in the gas.

Mr. SMITH: In the present state of things, whereas London has gas of 16-candle illuminating power, Brighton has gas of 14-candle power with the same test?

Witness: That is so.

This is not satisfactory?—It depends upon whether Brighton is prepared to pay for 2 candles more. The Metropolis is a larger place than Brighton, and can afford to have gas of a higher illuminating power at a higher price; but 14 candles is the usual illuminating power.

By the COMMITTEE: Outside the Metropolis, in Bristol, two Companies were amalgamated; in Liverpool, two Companies; in Sheffield, two Companies, and in Leeds, which is a large place, two Companies' works were bought up by the Corporation. I believe agreements were arrived at in all cases before Bills were introduced.

By Mr. SMITH: I think in the interests of the public it is far better not to let the Companies agree, but to go to the Board of Trade, and let the Board say what shall be the conditions on behalf of the public.

Mr. SMITH: Do you know of any instance before this Brighton case, except that of London, in which an open power to amalgamate has been sanctioned by Parliament without an agreement being made by the companies?

Witness: There is no precedent besides that of the Metropolis.

Mr. RICHARDS: Do you see any difference in anything preventing an application of the principle that has been successfully applied to London being applied also to Brighton?

Witness: I do not. The two parties go before the Board of Trade, and if they are not agreed they will be brought to an agreement in some way or other, and we are quite sure the Board of Trade will see that the public do not suffer.

Mr. SMITH inquired if the Board of Trade had been communicated with, and whether they would undertake such a duty.

Mr. RICHARDS said he had been informed that the Board of Trade were perfectly ready to do so, but he would have a definite reply by the following morning.

Mr. J. Orwell Phillips, examined by Mr. RICHARDS.

I am Secretary to The Gaslight and Coke Company, and have been concerned in several amalgamations which have taken place in the Metropolis. I agree with Mr. Stevenson that these amalgamations have redounded to the benefit of the public as well as to the Gas Companies. The amalgamations in London were effected entirely under schemes submitted to the Board of Trade, inquired into by them, and receiving the force of Acts of Parliament upon obtaining the Sign Manual. Since the amalgamation of the Chartered with the Imperial and Independent Companies in 1876, the price of gas has been reduced from 8s. 9d. to 3s. 2d. per 1000 feet, and 1d. represents £50,000 a year. Under the operation of the sliding scale we are entitled to divide one-quarter per cent. for every penny we take off in price; but apart from this the amalgamation has tended distinctly towards the cheapening of the gas that has taken place in London. I do not see any reason why what has worked so well in London should not work well, in its degree, in Brighton; on the contrary, I think it ought to work precisely in the same beneficial manner. In the case of our amalgamations, a most searching investigation was made, and I think there is a larger amount of machinery to enable the Board of Trade to deal with the matter than there is before a Committee.

Cross-examined by Mr. SMITH: The questions as to alterations of price and quality of the gas are points to which the Board of Trade have always turned their attention. I do not remember any particular case in which any alteration has been made at the instance of the Board of Trade, because these questions have always been determined by Parliament.

Mr. SMITH: With regard to the beneficial effect there has been in reducing expenditure, I may take it that the cost of supply has been reduced rather than the cost of production, in consequence of districts being more conveniently supplied from one set of existing works than another?

Witness: Yes; this was one of the peculiarities which had to be arranged.

Cross-examination continued: Another item which led to a saving was the reduction in the cost of coal by reason of the much larger purchases that were made. The same remark applies to stores generally—iron, and things of that kind. In our case, there was an economy of work induced, because we weigh the working of one engineer against another, although this would not apply to the same extent at Brighton, because we have ten separate stations. There is also a considerable saving in the general management. For instance, there was a separate Board of Directors for each of the separate Companies which were absorbed by The Gaslight and Coke Company, and also a separate Secretary; and the economy realized by the fusion of the whole has been annually something considerable. The trade of the Company has also been very largely increased, and this has been induced by the low price the Company have been able to charge since the amalgamation. We removed several of our stations in consequence of the compulsion exercised by the Corporation of London, but we selected a site far away from the City because we were able very largely to economize on our coal traffic at Beckton. In Brighton I think there might be an improvement in the system of mains which would produce very advantageous results. The larger the mains the less pressure at which a company are obliged to work. In the case of The Gaslight and Coke Company, several reductions in price have been made under

the influence of the sliding scale, but they have not been made to the fullest extent. We have not divided the full amount we might have done. Our last dividend was 11 per cent.

Mr. Alfred Penny, examined by Mr. MERRIFIELD.

I am acquainted with the Bill promoted by the Brighton and Hove Gas Company, and have read the petitions against it. I was retained by the Company in connection with their Bill of 1879, and at that time I examined the works carefully, and made myself familiar with the whole details of the gas supply, and also of the accounts. I am also acquainted with the site of the old Brighton Company at Black Rock. The relative advantages of the two sites are simply that the Brighton and Hove Company's works are situated by the sea, having facilities for the delivery of coal, while on the other hand the old Company have not any advantages of sea frontage, and have to cart their coals to the works. This makes a considerable difference in the cost of coal, which is the principal expenditure in gas making.

By the COMMITTEE: The difference in the cost of coal amounts to about 5d. per 1000 cubic feet in the manufacture of the gas.

Examination resumed: If the proposed amalgamation is carried out, it appears to me that the whole advantage must be to the public, because the two Companies at present are earning and paying their full statutory dividends, and they appear likely to be able to do so. I therefore do not see, except by the strengthening of the Company, and making it one whole concern, that the Companies themselves can derive any benefit. The public will receive the benefit, because they will save the pay of one of the two Boards of Directors, and something in the diminished number of the officers. There is no doubt that gas can be made most economically on such a site as the Brighton and Hove Gas Company have, and eventually the whole manufacture of gas will take place there, and this will be an immense benefit to the public.

Mr. RICHARDS said his clients would undertake to remove the Black Rock works in ten years if the amalgamation took place, but it was impossible to suppose they could be removed all at once; and if they were not got rid of in this way it was impossible to see how they could be abolished. There was also no objection to the introduction of the sliding scale, and they would not object to the standard price being fixed at 3s. 3d. When the standard price was arranged for The Gaslight and Coke and the South Metropolitan Companies it was fixed at the price they were then charging. At Brighton the price was 8s. 6d., so that the offer of 3s. 3d. as a standard was coming down considerably; but this offer was only made conditionally on the passing of the scheme of amalgamation. He believed this reduction of the standard price would be equivalent to £7500 a year in the pockets of the people of Brighton.

Mr. SMITH said the offer of his learned friend should receive careful consideration. It was evident that the works at Black Rock could not be removed immediately, but ten years seemed a long time, after the evidence that had been given.

Mr. RICHARDS said it could not be done in a shorter time.

Mr. MERRIFIELD (to witness): I believe you have had some experience of the special advantage of the Board of Trade arranging the terms of amalgamation?

Witness: I had not finished my remarks on the subject of removing the works. It is a financial question. If the works, which are making nearly 300 million cubic feet of gas per annum, were put out of use immediately, it would involve an enormous sacrifice to the interests of the town. It will enhance the price of gas, and it will be long before there is a reduction in the price. It is to the interest of all concerned that the Company shall not be asked to pledge themselves that the works shall be discontinued in less than ten years, unless they themselves see the means of so doing without wasting a good deal of money, and this is the point I wish to urge on the Committee.

By the COMMITTEE: The saving of 5d. per 1000 cubic feet means really £5000 a year with regard to the gas sold by the Brighton Company. There is no doubt that the advantage to the public by this amalgamation would be enormous. It is only because the old Company have so much less capital than the other that they are able to carry on their operations so successfully, they having less to pay in dividends.

A MEMBER of the COMMITTEE: That is an argument in favour of a change to Portslade?

Witness: It is; but recollect what a large sum is embarked in this manufacturing apparatus. The Brighton and Hove Company would have to build up new manufacturing works to supersede the existing ones; and though ten years' time is mentioned, it is quite possible a greater period might intervene. As regards the Board of Trade, the great advantage is that you can go backwards and forwards to them for twelve months until they are satisfied; but when the parties make their bow to a Committee, they cannot go to them again; and therefore I think it is a great advantage that we should be relegated to the Board of Trade.

Mr. SMITH said he did not propose to ask any questions, as the evidence of the witness was chiefly matter of opinion, and this could be otherwise dealt with.

THURSDAY, MARCH 8.

Mr. MICHAEL said he was happy to inform the Committee that certain heads of agreement had been arrived at with the Corporation, which were as follows:—Clauses to be inserted in the Bill providing for the standard price to be 3s. 3d. per 1000 cubic feet, to come into operation within three calendar months after the amalgamation was confirmed by Order in Council. Also a sliding scale according to the terms in recent legislation. On the completion of the amalgamation, the Brighton and Hove Company to cease to manufacture gas and residual products at the works of the Brighton Gas Company within a period of ten years from such completion. In case of amalgamation, the Acts relating to the Brighton and Hove Company are to apply to the United Company. These terms being agreed to and embodied in the Bill, the opposition of the Corporation of Brighton to the Bill to be withdrawn. This agreement was signed by the Town Clerk of Brighton and the Solicitor to the Gas Company, and an adjournment was asked for to allow the necessary clauses to be introduced.

Mr. BROWN said that, on behalf of the Hove Commissioners, he would reserve their opposition for the House of Lords.

Sir J. DUCKWORTH said he did not see why the matter should be encumbered at all with having the sanction of the Privy Council. It seemed to him perfectly satisfactory for the Board of Trade to settle it.

Mr. MICHAEL said it gave to any person who had cause of complaint against the Board of Trade a court of appeal before whom they might lay objections to the scheme.

Sir J. DUCKWORTH inquired if there were any precedents for this course.

Mr. MICHAEL said the last one was that of the amalgamation of the South Metropolitan with the Surrey Consumers' and Phoenix Gas Companies.

After some further discussion, the proceedings were adjourned for a time. On re-assembling,

Mr. MICHAEL read the clause which had been prepared, embodying the heads of agreement with regard to the provisions to take effect in the event of amalgamation.

Mr. WOOLLEY said that the Hove Act did not prevent the manufacture of gas.

Mr. MICHAEL said the matter was left precisely as it was before. If the old Company could make gas in Hove and the other Company could not, then they would not be able to do so by virtue of the powers of the Brighton and Hove Company's Act, because where there was any distinction it was stated that the latter Act should apply; but they did not restrict their own powers.

Mr. J. COATES (on behalf of the old Company) said his clients were in no way parties to the agreement, and would reserve full powers to take such course as they might think fit in the other House.

Mr. REES (on behalf of the Corporation of Brighton) said the concluding paragraph of the clause had only just been inserted. [The words were, "The Brighton and Hove Gas Acts, 1839 to 1879, shall apply to the amalgamated Company, and where inconsistent with the Brighton Gaslight Act, 1848, these Acts shall prevail."] He, however, intended to pass them, subject to the observation that if any question arose hereafter he should be at liberty to raise it.

Mr. MICHAEL said he would assent to this.

The CHAIRMAN inquired what check there would be against an increase in the price of gas.

Mr. MICHAEL said that as the Company increased the price of gas they would receive a lower dividend, and therefore it was directly to their interest, by the operation of the sliding scale, to sell gas as cheap as possible.

Sir J. DUCKWORTH: Will you explain to the satisfaction of the Committee as to the outlying places?

Mr. MICHAEL said it was unfair to the consumers of gas in the centre of a district where the profit was earned that the outlying districts should be supplied at the same rate, because it entailed an additional cost, and so made it impossible that a reduction of price could eventuate. Parliament had therefore said that a difference of 1s. or 2s. should be added in cases where a difficulty arose between the inhabitants and the outlying districts.

The committee-room was then cleared. On the Counsel and parties being called in,

The CHAIRMAN said the Committee were of opinion that the preamble of the Bill was proved.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

LINCOLN'S INN, TUESDAY, MARCH 1.

(Before the MASTER of the ROLLS, and Lords Justices JAMES and LUSH.)
ATTORNEY-GENERAL V. HILL AND OTHERS.

This was an appeal made from the decision of Vice-Chancellor Bacon, whereby he had ordered the defendants, the Directors of the Tamworth Gas Company, to pay the costs of a suit in Chancery brought against them by the Tamworth Corporation. The decision referred to was given in the JOURNAL last year (see Vol. XXXV., page 484), and the main facts of the case were as follows:—About the year 1835 a sum of money was subscribed by several gentlemen living in and about Tamworth—the late Sir Robert Peel being the principal subscriber—for the purchase of shares in the then projected Gas Company, in aid of the rates for lighting the town with gas. From the year 1837 to 1874 the dividends on these shares were always applied to the reduction of the Company's account against the Corporation for lighting the public lamps, but in the last-named year the Company applied the dividends to the payment of penalties to themselves which they alleged were due, but which the Town Council disputed. Inquiries were then made into the way in which the shares were entered in the Company's books, and it was ascertained that in the year 1872 a deed had been executed by Mr. Bramall, the only surviving subscriber to the fund, which vested the shares in the Directors of the Company, and gave them power to apply the dividends either in aid of the rates or in any other manner they, in their uncontrolled discretion, might think fit, so long as it was for some public object for the benefit of the town. The Company refused to allow the Corporation to examine this deed, and eventually a suit in Chancery was commenced in order to obtain an inspection of the deed, and also to set it aside. The action was tried in April last, with the result that the deed was declared null and void; the shares were held to belong to the town, the dividends to be applied in aid of the rates for lighting the public lamps; and the defendants were ordered to pay all the costs of the suit. The value of the shares is about £600; and, in addition, the dividends have accumulated since the year 1874, and now amount to about £270. The defendants appealed on the question of costs only, but as the suit has been before the Courts for nearly seven years, the fund would be insufficient to pay them.

Mr. MEDD appeared for the Directors of the Company; and Mr. LANGWORTHY for the Town Council.

After a long technical argument on the bearing of certain previously decided cases upon the question of permitting appeals merely in reference to costs,

The MASTER of the ROLLS allowed the objection of the respondents to have been rightly made.

The other learned Judges concurring, the appeal was dismissed with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

THURSDAY, MARCH 3.

(Before Justice HAWKINS and a Special Jury.)

HAWKLEY V. BRADSHAW.

When this case, which has several times been referred to in our columns, was called on,

Justice HAWKINS asked whether it was necessary it should be tried.

Mr. MELLOR, Q.C., who, with Mr. W. GRAHAM, appeared for the defendants, after consultation with Counsel on the other side, said he was happy to say the jury would not be troubled with the case. The plaintiff, Mr. Hawksley, C.E., brought the action against the defendants for a libel published in the *Nottingham Journal*, imputing to him that for the sake of his commission he had induced the Nottingham Water Company to execute works which were not necessary. No one could for a moment believe that his clients meant to make such an imputation upon him, and they positively and unreservedly through him (Mr. Mellor) denied any intention on their part to do so. Mr. Hawksley occupied a deservedly high and honourable position, and was quite incapable of such conduct, and therefore it would be satisfactory to his lordship and the jury to know that with this explanation, and an expression of regret by his clients at what had occurred, it had been agreed, upon terms, to withdraw the record.

Mr. MURPHY, Q.C., who, with Mr. E. J. DUNN, represented the plaintiff, said that Mr. Hawksley only brought the action to vindicate his honour against charges which he and his friends felt should not be disregarded. It could not be expected that a gentleman who had passed so long and distinguished a career as Mr. Hawksley would allow aspersions of this

kind to be passed upon him publicly; but his sole object was to protect himself from them, and he accepted the explanation and apology which had been offered.

Justice HAWKINS said that, although he could well understand that the defendants never had the smallest intention to impute anything dishonourable to Mr. Hawksley, yet he could also well believe that Mr. Hawksley was very jealous of even a breath of suspicion being cast upon him. He added that he thought the parties had come to a very proper arrangement; Mr. Hawksley's character had been amply vindicated, and the defendants had done that which was right in the circumstances.

The record was then withdrawn upon terms which were not stated in court.

COURT OF GENERAL ASSESSMENT SESSIONS.

WESTMINSTER, MONDAY, FEB. 28.

(Before Mr. P. H. EDLIN, Q.C., Assistant-Judge, and a Bench of Justices.)
The sittings of this Court for the hearing of appeals under the Valuation (Metropolis) Act, 1869, were resumed to-day.

SOUTHWARK AND VAUXHALL WATERWORKS COMPANY.

The first two days of the sittings were devoted to Railway Companies' cases, but in the course of the sitting on Monday,

Mr. POLAND mentioned two of the Southwark and Vauxhall Water Company's appeals which had been settled—viz., those against the parishes of St. Mary, Battersea, and Lambeth respectively. In the former case, the gross value of the pumping-station at Nine Elms was, he said, agreed to be reduced from £21,800 to £16,800; and the rateable value from £16,000 to £14,000. The gross value of the mains to be reduced from £5681 to £4698, and the rateable value from £4983 to £4000. With regard to the property in Lambeth parish, the gross value was reduced from £8166 to £7320; the rateable value from £7000 to £6100. In both cases the parties to pay their own costs.

NEW RIVER COMPANY.

Mr. WEBSTER, next day, informed the Court that the cases in which the New River Company were the appellants and the respondents were respectively—(1) St. Andrew, Holborn-above-Bars, and St. George-the-Martyr; (2) St. Luke, Middlesex; and (3) St. Giles-in-the-Fields and St. George, Bloomsbury, had been settled. In the first case the gross value was fixed at £4260, and the rateable value at £3866. The former was reduced to £3975, and the latter to £3313. In the second case the gross value was reduced from £8286 to £5218, and the rateable value from £7520 to £4949. In the third case the gross value was reduced from £7150 to £7122, and the rateable value from £6500 to £5935.

SOUTH METROPOLITAN GAS COMPANY.

In reply to Counsel last Tuesday, it was stated that the Court would take the Gas Companies' cases on the following day, and it was explained that the decision in the appeal of the "South Metropolitan Gas Company v. The Parish of Bermondsey" would settle all the cases in which this Company were the appellants—a dozen in all. This being so, the case in question was put down for hearing first, and the Court adjourned.

WEDNESDAY, MARCH 9.

SOUTH METROPOLITAN GAS COMPANY V. ASSESSMENT COMMITTEE OF BERMONDSEY.

Mr. WEBSTER, Q.C. (with him Mr. H. D. GREEN), who appeared for the appellants, said the decision in this case would govern a great many of the appeals by gas companies. As his lordship was aware, the first thing to be ascertained was the rating of the whole undertaking; the division of the subject-matter into various parishes being a very simple matter when once the rateable value of the whole undertaking was decided. What they had determined to do in the case of Bermondsey was to find out the rateable value of the whole undertaking, and when once they had a decision upon this point there would be no necessity to discuss the other cases in the list. This being so, he would give the particular figures so far as they concerned the parish, for the purpose of making his observations clear. The present rateable value was—gross, £8200; rateable, £7400. The Company consisted of an amalgamation of three Companies—the old South Metropolitan, the Phoenix, and the Surrey Consumers'—and the rateable occupiers for this and the coming five years were the South Metropolitan Company, representing the three amalgamated Companies. He did not apprehend that any difference of opinion would ultimately arise between the parties as to the receipts and expenditure, and in estimating the rateable value for the coming five years they had to take the thing as it would exist for that period. He mentioned this, because he thought it would simplify the labours of the Court in one respect—viz., as to the price of gas. At the time of the amalgamation the charge made was not uniform over the whole district, and for the purpose of calculating the receipts the price was taken at 3s. per 1000 feet. It was higher with regard to the Phoenix and the Surrey Consumers' Companies, being 9d. in one case and 4d. in the other; but the actual prices were not material, because the Company had now made a uniform charge of 3s. per 1000 feet over the whole district. He would remind the Bench that gas-works could not be rated by a comparison with other cases; one had to work backwards from the complicated undertaking belonging to landlord and tenant. It could not be said that because gas-works were worth £20,000 as a whole, therefore the South Metropolitan works were worth so much; one must work backwards for the gross receipts. The first set of figures were the total gross receipts, amounting to £517,685, made up of private consumers, public lamps, &c., £509,000, leaving out the odd figures; meter-rents, £11,500; making a total of £520,698, less bad debts, £3000. The actual consumption of gas must be taken from the three accounts—the South Metropolitan, Surrey Consumers', and Phoenix—and this quantity of gas had been taken for the amounts it would produce to the three separate Companies.

The ASSISTANT-JUDGE inquired whether the statement was upon an average of half years.

Mr. WEBSTER said it was for the whole of the year 1879. From this the deductions to which he had already referred had to be made. The Surrey Consumers' Company were charging 3s. 9d., and the Phoenix Company 3s. 4d. per 1000 feet, but the result of the amalgamation was that all the gas was charged at 3s. per 1000 feet. Estimating the gas at the price charged, which was the proper way to make an estimate, it produced £517,685. Before reading the gross receipts, he might mention that the valuation was supposed to be made for the coming five years, and in the case of the New River Company it had been decided by his lordship that the natural accretion of existing mains could not be made the subject of a re-valuation at the end of each year. Upon the cause being argued in the Court of Queen's Bench, it was decided that the amount was open to be ripped up every year if the parish valuers thought there was an increased return from an existing main, although the main was the subject of valuation at the quinquennial period. He referred to this for the purpose of pointing out that they were obliged to estimate the receipts upon the basis that they were not to take increase into consideration, as this must be dealt with each year. The first set of deductions were the ordinary working expenses, to reduce the gross receipts to net receipts by

showing how much the tenant must pay out of pocket to produce his gas before he could get any return; and these amounted to a total of £251,028, which subtracted from the £517,685 left net receipts of £266,657. Then arose the question—What is a tenant entitled to have out of the receipts of £266,657? As he carried on a trade, of course he expected to receive a trade profit upon his capital, and therefore the first and most important item to be considered was what was the amount of tenant's capital upon which interest should be charged, and this he (Mr. Webster) put at £375,000. Coals, purifying materials, wages, &c., amounted to £409,000, and eminent gas engineers, who had personal acquaintance with the manufacture of gas, would be called as witnesses, and would give it as their opinion that, looking at the fact that the greater part of the work had to be done in two months out of the twelve, 5-12ths of the total cost of the year was the money that the tenant required for the purpose of carrying on the undertaking. This produced a sum of £170,432; then there were cash at banker's, £8059; stock of coals, £32,000; sundry stores, tools, and implements, £30,000; and an important item for meters. He did not know whether his friends would contend that meters were not the tenant's property. It might be said that they should form part of the rateable value of each house; but in the case of *Regina v. Parish of Lee* it was decided that they were chattels. The meter-rent amounted to £134,509; making a total of £375,000. Upon this they claimed 17½ per cent.—5 per cent. for interest, 10 per cent. as trade profit, and 2½ per cent. for risk, amounting together to £65,255, leaving to the landlord £201,032, less the statutable deductions. The statutable deductions were—repairs and renewals, £105,424; insurance, ½ per cent., the whole rateable value being £91,680. He would now state how he proposed to deal with the case as regarded the productive and non-productive parts. The total cost of the works was, roughly speaking, a million and a half sterling, and by the use of the word "cost" he meant the present structural value. The structural cost of the unproductive portion of the undertaking amounted in round figures to £1,000,000, the mains costing £500,000; so that for every £3 in the undertaking, £2 might be taken as unproductive, and £1 as productive. The proper way of dividing the receipts between the productive and the non-productive parts was to divide it in accordance with their present structural value; but the practice having obtained of putting upon the unproductive part an arbitrary proportion, he could not expect to break through this custom, and therefore he should not seek to do so. This being the case, he had assumed a division which attributed to the unproductive part of the works 5 per cent. of the present structural value. He had mentioned the sums of £1,000,000 and £500,000 for the purpose of making his statement clear, but the actual amount of the unproductive part was £976,320, and of the productive part £511,103. Now 5 per cent. upon £976,320 amounted to £48,816, which, deducted from the £91,680, left £42,792, being roughly 8½ per cent. upon the gross receipts, and this, he submitted, represented the fair rateable value of the whole undertaking so far as the productive part was concerned. He was now dealing with that part of the case which affected mains and pipes, which directly produced revenue. In Bermondsey the gross receipts were £32,284; and it was a very significant fact, with regard to the valuation, that this was £2734 less than the receipts of the three Companies in 1874. The valuation then was £2985, which had been increased to £7400, although there had been no corresponding increase in the receipts from the gas in the parish to justify this increase. Applying the 8½ per cent. to the £32,284, the figures worked out at £2663.

The following evidence was then given:—

Mr. Edward Ryde, examined by Mr. WEBSTER.

In connection with my experience with rating I have had on many occasions to deal with the rating value of gas-works. In order to ascertain the rateable value of productive mains, it is essential to find out first the rateable value of the whole undertaking. In 1875, when the three Companies were separate, the rating value was £2985; but this has been increased to £7400. The gross value was £8200. According to my view, the fair rateable value of the productive mains in the parish of Bermondsey is £2663. This corresponds to the £2985 which was the rateable value in 1875. In Bermondsey the gas-rental is £32,284, which includes meter-rent, and it is a part of the £520,698. Meters are charged for, but this estimate assumes that the meter-rents are in proportion to the receipts everywhere, and the £32,284 would have its fair share of the bad debts. The rateable value applicable to the undertaking is 8½ per cent. of the rental. The rent from private consumers and otherwise is £509,102 for the whole undertaking.

Mr. POLAND, who appeared for the respondents, said he must object to this valuation on the ground that from the time the Company, as now constituted, came into existence they had shown the result of an actual year's working. This was seen in the balance-sheet for 1880, and these were the true figures to go upon for determining the present valuation. His friend Mr. Webster had taken the working of the three Companies when they were separate undertakings, added them together, and now asked the Court, from the experience of working the three Companies in 1879, to arrive at the expense of working them as one concern. The point to consider was what rent a tenant would give for the property one year with another. In the schedule as prepared for the second half year of the Surrey Consumers' Company there was a blank, and this had to be tacked on to one of the other Companies. To illustrate his point, he might take the figure for law charges. In the second half of the year the Phoenix paid £1052, but nothing the next half; but a tenant would take the average for the year.

The ASSISTANT-JUDGE inquired when the list was deposited.

Mr. POLAND said it had to be deposited before the 1st of June, and the Assessment Committee had to finally settle the list by Nov. 1.

The ASSISTANT-JUDGE did not suppose Mr. Webster would deny that the Overseers were to take six months.

Mr. POLAND said his objection went to the substance of the thing. They took the working expenses of the three Companies, but a tenant would not have three separate establishments to keep up.

Mr. WEBSTER denied that this had been done.

Mr. POLAND said a tenant would only have one set of Directors and one set of Solicitors; and the first thing he would do would be to get rid of unprofitable works. The Committee who settled the list in November had the advantage of having before them the result of six months' working of the amalgamated Companies. He could not help thinking that the published accounts of the Company for the year 1880 were much better figures to go upon than those of 1879, when they were dealing with the future and not with the past.

The ASSISTANT-JUDGE asked whether the Company had been applied to for a statement of their accounts for the year 1880 for the purpose of the new valuation.

Mr. POLAND said the Committee had asked for information to be given to them, but had been unable to obtain it.

The ASSISTANT-JUDGE inquired what accounts were used before.

Mr. POLAND said he could not answer the question off-hand. The facts were all within the knowledge of the appellants, but they did not give a single figure in their case; they merely said that the rateable value of their property ought to be reduced from £7400 to £3228, and the gross

value in proportion. The object of a case was to get the figures, but in the present instance the case was a sham.

The ASSISTANT-JUDGE said he understood Mr. Poland to represent that the published accounts for 1880 showed that the figures that were being given in evidence were fallacious.

Mr. POLAND said he thought if the Company were dealing in a straightforward way, the figures which had been presented that morning should have been given to the respondents before, so that they might have come into court upon an equal footing.

The ASSISTANT-JUDGE thought the accounts for the first six months of 1879 were entirely fallacious. They had to determine the value which a tenant would give, and yet they were told they ought not to look at the accounts for the past year.

Mr. WEBSTER said he had not the least objection to the accounts for the year 1880 being looked at. Every one had assumed that he was bound in the first instance to base his calculations upon the facts within his knowledge, and at the time the calculation was made the accounts for 1880 were not published. It was said that the Company had charged three sets of Directors' fees; but he begged most emphatically to say that they had done nothing of the kind.

The ASSISTANT-JUDGE said that reference had been made to the law charges.

Mr. WEBSTER thought that when the matter was more fully explained it would be found that the average of law charges put down was very small. He was quite willing that Mr. Poland should use the 1880 accounts for the purpose of correcting the estimates, though the Parish had acted upon the same figures as the Company had done. If his friend had only waited, he would have found that the Company had corrected the items where they were supposed to be a fair average.

The ASSISTANT-JUDGE: Then we will go on.

Examination continued: The figures £85,167 and £127,609 are taken from the published half-yearly accounts; and these figures are accessible to the parish authorities or to any one else. No question was raised by the Assessment Committee as to what year should be taken. The £50,379 put down as the gas-rental of the Surrey Consumers' Company for the first half of 1879 was an actual figure, and the sum put down as the working expenses of the three Companies—£558,652—was also an actual figure.

Mr. POLAND said all this must be taken *de bene esse*.

Mr. WEBSTER said he would put in the half-yearly accounts. The amount received by the united Companies for gas and meter-rent in the first half of the year was £285,263, and for the second half £278,298, making together £563,561 as compared with £558,652.

Examination continued: The South Metropolitan Company's charge for gas was 3s., the Surrey Consumers 3s. 9d., and the Phoenix 3s. 4d. per 1000 feet, but after the Companies amalgamated the charge of 3s. was made uniform, and this is the figure I have dealt with. The price of gas has since been reduced to 2s. 10d. per 1000 feet throughout the entire district. The meter-rents and bad debts are also taken from the published accounts. The total working expenses are £251,028, after giving credit for the sale of the residual products. The amount paid for coals is £256,327.

The ASSISTANT-JUDGE: How does this contrast with 1880?

Mr. WEBSTER: It is £259,128 in 1880 as compared with £256,327 in 1879.

Examination continued: I have given credit for £161,119 for residual products. These are actual figures. The wages are £55,582, as compared with £56,047 in 1880. In my opinion the tenant of a property like this would have to pay more than £1600 a year for law costs—especially if he had many rating appeals. I put down £5000 for Directors' fees, the actual figure being £4180; repairing, renewing, and testing meters, £8189, is an actual figure. I have prepared an estimate of the tenant's capital, and I put 5-12ths of the whole amount together as tenant's capital, and I do so for this reason, that a tenant must be able to meet his expenses for five months. He cannot make any charge until the end of three months, and then he would have to read all the indices of the meters, make out the accounts, and collect the money. I leave out the quarter's rent which he would have to pay. In the whole year there is £256,000 worth of coal carbonized, and I assume a tenant must have capital to have one-eighth of this stock of coal in hand, as in the event of a strike or frost there is a difficulty in getting coal. I believe in the two winter months the Company will use very nearly one-third of the whole consumption during the year. I have put down £375,000 as the tenant's capital, and I think no tenant of these works could do with less. Upon this I claim 17½ per cent.—5 per cent. for interest, 10 per cent. for trade profits, and 2½ per cent. for risk. I have not included anything for repair and renewal of the hereditament. I found that one of the Company's works had had a good deal of money spent upon them, and another very little, so that there was no exact criterion to be taken from the accounts of last year, and I assumed that the amalgamated Companies could be maintained at the same cost as that at which gas-works in London are maintained. This makes the rateable value of the productive and unproductive parts £91,680. The whole of the undertaking is productive. You cannot separate it and leave it worth the rent; it must all be worked together. The fair structural value of the unproductive part is £1,000,000, and of the productive part £500,000; the Engineers make the figure for the unproductive part £976,320. Upon this sum I allow 5 per cent.—£48,816—which deducted from the £91,680 leaves £42,864 as the estimate of the rateable value of the productive part of the undertaking, which has to be distributed among the different parishes according to their proportion of the gas-rental or gross receipts, and this comes out at 8½ per cent. The £7400 which is put down as the rateable value in Bermondsey would be about 23 per cent. on the gross receipts. There is no justification for such a valuation. The Company have ten stations, and as far as the actual expense of working is concerned the wages and materials would be about the same now as formerly; but there will be a saving by-and-by, when the business is re-arranged. I have no information as to how the respondents have arrived at their valuation.

Cross-examined by Mr. POLAND: I have not examined the accounts of the Company for 1880. When I made my valuation these accounts did not exist. The aggregate of the receipts of the three Companies is £558,652, and judging of what the receipts would be for the next year, I have made a deduction of £49,550 on account of the price of gas having been reduced. Gas-rents are paid quarterly, and the residual products are sold whenever a customer can be obtained. When the concern was once in full swing, the tenant would get in money every month. The money obtained from the sale of residual products would go to decrease the amount required for coal. I have not made any allowance for this, because a tenant must have the requisite sum to carry on the business with; he cannot rely upon this source of income. [The witness was then taken through the different items in the 1880 accounts with a view to altering his valuation.] To get the meter-rental of £11,596, a tenant would have to pay £134,509 upon taking possession of the concern. The value of a meter is ten or eleven years' purchase of the rental. A company is assessed sometimes for productive mains and stations, but unless I thought the total amount was unfair, I should not advise them to take any step in the matter, even if the assessment on the stations were too high, and the assessment on the mains too low. Assuming you have two landlords, one of the unproductive part and one of the productive, there

is no reason why one should have 8 per cent. rental and the other 5 per cent. I do not know that the Company have paid a dividend of 11½ per cent., amounting to £210,677.

[Mr. Poland then read the last two reports issued by the Directors of the Company.]

Mr. POLAND: Will you explain how they can pay these dividends, looking at the annual value you have brought out?

Witness: Before I could explain anything in connection with the accounts, I should like to have them. I should then perhaps find there was not the sum for renewals which we are entitled to have, or that there was no addition of the landlord's rent.

Re-examined by Mr. WEBSTER: If the Company paid £210,000 in dividend, the sum would include percentage upon tenant's capital, and it is the practice of the Courts to allow 17 per cent. upon it. Our total net receipts are £266,657, and out of this the dividend would be paid. I have not examined the 1880 accounts, but it would not be possible to arrive at a valuation by picking out isolated figures from them; you must take the figures as a whole. As a practical man, I know that the hereditament keeps extending as new houses are built. You cannot compare the accounts of 1880 with those of 1879 without taking into account all the facts. Last winter was an exceptionally severe one, and consequently there would be a greater demand for coke.

Mr. WEBSTER thought the simplest way of dealing with the case would be to have a report made by some gentleman appointed by the Court, showing the comparison between the two years. If this were done, the rest of the case might be disposed of in a couple of hours.

Mr. POLAND asked that the Company should deliver their statement of the figures before the Court again met.

Mr. WEBSTER said he was quite willing, on behalf of the Company, to hand in a statement based upon the 1880 accounts with the corresponding figures of 1879; but in fairness the parish authorities should give the Company their statement; otherwise there would be no mutuality.

Mr. POLAND said his case was based upon that of the Company.

Mr. WEBSTER said this was not so; it was based upon the accounts of 1880.

Mr. POLAND said when he received the accounts he would show how he dealt with them.

Mr. WEBSTER thought this was not quite fair. The valuers ought to assess the rateable value upon their figures, not merely take the statement of the other side.

Mr. POLAND said he would do this with pleasure if the accounts contained the necessary information.

After some further conversation, the case was adjourned till to-day, upon the understanding that each party would furnish the other with a statement of figures as suggested.

SOUTH METROPOLITAN GAS COMPANY v. ASSESSMENT COMMITTEE OF LAMBETH.

Mr. GREEN, who appeared for the respondents, stated that in this case the parties had come to an understanding upon the figures, and therefore the appeal would not be proceeded with. There were three ratings, and he would state the figures which had been agreed upon. In the first rating the gross value was £8907, and this was to be reduced to £8880. The present rateable value, which was £7500, was to be reduced to £7400. In the second rating the gross value was £5970, which was to be reduced to £5760, and the rateable value of £4910 was to be reduced to £4800. In the third rating the present gross value of £13,828 was to be reduced to £13,560, and the rateable value of £11,524 was to be reduced to £11,300. No costs were asked for, and he held in his hand a letter from the Surveyor of Taxes, assenting to these terms.

The ASSISTANT-JUDGE made the order as asked, subject to the letter from the Surveyor being verified.

SOUTH METROPOLITAN GAS COMPANY v. ASSESSMENT COMMITTEE OF ST. JOHN'S, HORSELYDOWN.

Mr. WILLIAMS, who appeared for the respondents in this case, said it had been agreed that the gross rateable value should be confirmed as it stood, and the appeal dismissed with costs.

The ASSISTANT-JUDGE made an order accordingly.

STAINES PETTY SESSIONS.—MONDAY, FEB. 28.

(Before Sir J. GIBBONS, Bart., Chairman; Lieut.-Gen. BROWNIGG, C.B., Mr. W. A. MITCHISON, and Mr. H. D. PHILLIPS.)

THE LIABILITY OF WATER COMPANIES FOR STOPPAGE OF SUPPLY DURING TIME OF FROST.

The Grand Junction Water-Works Company were summoned by the Rev. F. J. Fitz-Wygram, for that they on the 17th of January, and thenceforward, unlawfully neglected or refused to supply water to certain cottages, known as The Clump, situate in Mill Lane, New Hampton, the said cottages being his property, and being entitled to receive a supply of water from the Company.

Mr. CLARK appeared for the defendants.

Complainant, who conducted his own case, said he was the owner of about 120 houses and cottages at New Hampton, and to about 70 he had laid on a water supply from the Company's mains. From the 17th of January to the 3rd of February his cottages in The Clump were without any supply of water; the deficiency of supply, he believed, being caused by the Company's pipes not being laid at the depth required by the Act of Parliament.

Mr. CLARK: Will you mention the Act and the section to which you refer?

Complainant said he referred to Appendix A of the regulations made under the Metropolis Water Act of 1871, section 10 of which provided that "every pipe hereafter laid for the conveyance of, or in connection with water supplied by the Company, shall, when laid in open ground, be laid at least 2 ft. 6 in. below the surface, and shall, in every exposed situation, be properly protected against the effects of frost." On the previous Friday he measured the main near the bridge over the Longford River, from which The Clump was supplied, and found that the top was only 17 inches under the surface. The communication-pipe was burst about 4 feet from the main. The Company's regulations, of which he put in a copy, required communication-pipes to be laid 2 ft. 6 in. deep. The communication-pipe to his cottages was laid by one of the Company's servants about four years ago, and he paid the Company 10s. for doing it. Of course, owing to the main being only 17 inches down, it was impossible for him to lay it at the proper depth.

Mr. MITCHISON asked witness if he knew the diameter of the main.

Complainant replied that it was about 6 inches.

Mr. MITCHISON said he thought it was about 3 feet or 4 feet.

Complainant explained that this was only a district main. The Company, he went on to say, called upon him to repair the broken communication-pipe a few days previously, but he declined, considering that the bursting was occasioned by their mains not being laid at the proper depth, and that they ought to do the repairs themselves. The reason why he had brought this action was, not to save a few shillings, but because 300 poor people had been without water for some time.

The CHAIRMAN: Are you liable to the rates for the water supply which you have not received?

Complainant said he was. He paid about £36 a year to the Company.

Cross-examined by Mr. CLARK, complainant said the communication-pipe was laid by a man named Lee, in the employ of the Company, and not by a plumber. He did not remember that, at the time it was laid, Lee suggested to the plumber that it should be laid at another spot from that which the plumber himself proposed, at a place where the main was deeper. He was not aware that a stand-pipe was put up within a few yards of Longford Bridge subsequent to the 17th of January.

Mr. MITCHISON said he did not think the Company were compelled to lay their pipes 2 ft. 6 in. below the surface of the ground, but persons making communications with the main were obliged to go to this depth.

Mr. CLARK said that this was what he contended. The regulations upon which the complainant relied had only regard to pipes which were required to be kept in repair by the owners.

Complainant called attention to section 80 of the Company's regulations, in which it was stated that the term "communication-pipe" shall mean the pipe which extends from the district pipe or other supply-pipe of the Company up to the stop-valve. This was just the pipe they had laid for him. Section 10 said "every pipe," and this, he thought, included the main.

Mr. MITCHISON said the New River Company had called upon hundreds of persons in London to lay down new supply-pipes, and this they had done. The pipes belonged to these persons. So here, this communication-pipe was complainant's, and if it burst it was his duty to take care to see that it was put right again.

Mr. CLARK, before replying to complainant's statement, said he would admit that the main was laid only 17 inches deep, so that no further evidence need be called upon this point. As to the case before the Bench he maintained that the complainant must prove that he was a person entitled to the receipt of a supply of water, and in order to do this he must come within the Act of Parliament regulating the supply—viz., the Company's Act of 1861, called the Grand Junction Water-Works Act, which incorporated certain sections of the 5 & 6 Wm. IV., c. 95, and also the Water-Works Clauses Act of 1847. Now the sections of the Water-Works Clauses Act on which the complainant relied were the 48th and 53rd. Section 48 provided that any owner or occupier of any dwelling-house, being desirous of having water brought from the mains to his house, might, with the consent of the owner of the ground under which he proposed to place the pipes, bring the pipes from such mains to the house, upon giving 14 days' notice of his intention to lay such pipes to the undertakers—who were, in this case, the Grand Junction Company. So that upon the owner or occupier of the house was cast the duty of laying the pipe, and not upon the Company. The next section said that before any pipe was made to communicate with the pipe of the undertakers, the person intending to lay such pipe—the complainant in this case—should give two days' notice of his intention. This supposed that the pipe had already been laid, and the communication not effected. The communication was to be made under the direction of the Company's surveyor or superintendent.

Complainant asked what he was charged 10s. for.

Mr. CLARK said the 10s. was for boring a hole in the main so as to join the communication-pipe with it. Then the Act provided that in the event of any dispute as to the manner of the communication, such dispute should be settled by two justices. Therefore, if complainant thought the mode of communication in this case was an improper one, he should have declined to take his water from the main, and gone before two justices to require the Company to provide some better mode. Then section 53 provided that the owner or occupier of a dwelling-house, after paying or tendering the water-rate, should be entitled to demand and receive from the undertakers a sufficient supply of water for his domestic purposes. This section contemplated that between the main and the house there should be provided, by the owner or occupier, a fit and proper conduit-pipe for conveying the water from the main. If they had a fit pipe in proper condition to receive the water, the Company were bound, upon tender of the rate for the current quarter, to supply water into this conduit-pipe; but if there were no fit and proper pipe for them to discharge the water into, then the person complaining did not come within the Act as a person entitled to the receipt of a supply. Section 55 provided that every person supplied with water by the undertakers who should suffer any cistern-pipe—that was the pipe leading from the main, and the property of the owner or occupier of the house—to be out of repair, should for every such offence forfeit to the undertakers a sum not exceeding £5. This communication-pipe which had burst was the complainant's, and he was bound to repair it. The pipe was not in a fit state to receive a supply, and it would be monstrous for the Company to discharge water that would not go into it at all, but would percolate through the soil. Complainant had said that the pipe had burst owing to the main not having been laid a reasonable depth by the Company, in breach of a duty imposed upon them by statute. He was afraid complainant had made a mistake as to the nature of the regulations under which he had proceeded. He was under the impression that they imposed upon the Company the duty of laying their main at a depth of 2 ft. 6 in.; but this was entirely wrong, as would be seen by reference to the heading of the regulations. They were not like an Act of Parliament; they were regulations made by the Company themselves as to pipes and other fittings to be provided and kept in repair by the owners and occupiers of premises upon whom notices should have been served by the Company. Regulation 10 meant that the pipes of the owner or occupier should be laid 2 ft. 6 in. below the surface; but it did not apply in the least to any obligation upon the Company to have their mains 2 ft. 6 in. below the surface, and there was no Act of Parliament whatever obliging any water-works company to lay them at this depth. The regulations were made by the Company for settling the manner in which their customers should have their pipes laid. There being no duty cast upon the Company to have their pipes 2 ft. 6 in. below the ground, the fact that the main here was only 17 inches below was no breach of any duty. Complainant could not say that it was in consequence of any improper act or default of the Company that he had not received a supply, for the Company were not under any obligation to discharge water into a defective pipe.

The CHAIRMAN said the Bench considered that the connecting-pipe was the property of the complainant, and that it was his duty to repair it. They therefore dismissed the case, and advised Mr. Fitz-Wygram to put it in repair; then, if he did not get a supply, to consult his legal advisers.

Mr. CLARK asked for costs; but the Bench declined to grant them.

LAMBETH POLICE COURT.—FRIDAY, MARCH 11.

(Before Mr. ELLISON.)

OPPONENTS OF A CONSTANT SUPPLY OF WATER.

James Fudge, owner of Nos. 55 and 57, Mina Road, Old Kent Road, was summoned by the Lambeth Water-Works Company for neglecting to have proper fittings for the water supply, whereby there was waste; and also with failing to comply with the regulations made by the Company for the constant supply to the houses.

Mr. BESLEY appeared on behalf of the Company.

Defendant did not appear.

Mr. BESLEY stated that from the very commencement of proceedings defendant had acted in the same way, never appearing to one summons. Last week the case was adjourned, in order to give him a further opportunity of attending. The present case resembled one in which his Worship fined the owner of houses £5 and costs, and in this instance the defendant aggravated the offence by cutting off the supply of water to the closets. The defendant in this case also acted in a similar way, but, owing to the steps taken by the Vestry, had been compelled to restore the supply. The dwellings in question were laid out for the constant supply, and out of 7500 houses only about 200 remained without the regulation having been complied with. The defendant had been served with notices to carry out the rule, long before any summons was taken out.

Mr. Henry Catmur, Head Waste Inspector of the Company, stated that when he visited the houses in December he found a great waste of water, and the fittings not in a condition for the constant supply. Nothing was done for some time, and on the 3rd of March the supply to the closets was cut off, and the tenants complained very much. By the action of the Vestry the defendant had been compelled to restore this supply.

Mr. ELLISON fined defendant £5 and £1 11s. costs on one summons, and 1s. and £1 1s. costs on the second.

Miscellaneous News.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

(Continued from page 396.)

At the recent Annual Meeting of this Institution, after the proceedings already reported,

Mr. T. B. BALL (New Wortley, Leeds) read the following paper, entitled

IS THE ELIMINATION OF THE LIGHT OILS FROM THE TAR, AND THEIR RETENTION IN THE GAS, DESIRABLE?

The interrogative form of title to this paper was designedly chosen, in order to elicit from the members of the Institution an expression of opinion on a subject which seems to be assuming more importance every day; and in order to assist you in arriving at a conclusion, I will lay before you such data as I have found available on, first, the practicability, and secondly the desirability, of retaining the light oils in the gas.

First, as to the practicability. Some four years ago a lively interest was aroused in the West of Scotland Association of Gas Managers by a report of a Sub-Committee of this body on a process patented about that time by Messrs. Aitken and Young, having for its object the retention of the naphthas in the gas, by keeping it at a high temperature until the heavier oils had had time to deposit; it being well known what an absorbing influence these latter exercise upon the light oils at ordinary temperatures. Very considerable advantages were claimed for the process, and the Committee reported that at Hamilton, where the experiments were conducted, an increased illuminating power equivalent to 189½ lbs. of sperm per ton of coal had been obtained—viz., 821·64 lbs. as against 631·92 lbs., parrot coal and shale being used in both cases in the same relative proportions. I have not thought it necessary to trouble you with the details of the experiments which gave these remarkable results, but you will find them reported at length in the JOURNAL for May 15, 1877. It is sufficient for my present purpose to point out that with a decrease of 2 per cent. in the percentage of naphthas when the tar was distilled to 320° Fahr., we have an increased illuminating power of, in one case, 6·8 candles, and in the other of 4·24 candles. As to how much of this is due to naphthas it is somewhat difficult to determine. The explanation of the high result from apparently so small a percentage of naphtha will probably be found in the way the tar was tested, as, though there might be only a difference of 2 per cent. found at 320°, if the distillation had been carried further in both cases, the difference in the percentage of naphthas might be more considerable. Some increase may also be due to the presence of naphthaline carried forward in the light oils; indeed, this seems the only other source of increased illuminating power possible.

Passing on to more recent experience, we find a similar, if less striking result obtained by M. Cadel, of the St. Etienne Gas-Works in France. In a paper read before the French Association of Gas Engineers at their last meeting, and a translation of which appeared in the JOURNAL for Sept. 21, 1880, he explained the system he adopts to secure the carrying forward of the light oils, and gave the results of his working with the old method and with the new. It would add unnecessarily to the length of this paper to explain the various systems in detail; I merely give the references, in order that if you have not already carefully considered them, you may do so at your leisure.

Again, we have the plan adopted at the South Metropolitan Gas-Works, the particulars of which were lucidly explained to the members of the British Association of Gas Managers at their last meeting, by Mr. J. Somerville and the able Engineer who presides over the destinies of the Company. In connection with this arrangement, I should like to read to you a paragraph which appeared in the JOURNAL for Jan. 25, 1881. Referring to this arrangement, it says: "From experiments with heavy tar and gas, it appeared plain to the Engineer of the Company that a very short contact of ordinary 16·5-candle gas, such as the Company are in the habit of supplying, with tar weighing 12·75 lbs. per gallon, was sufficient to reduce the illuminating power of the gas to 12·5 candles, thus diminishing its value by about 25 per cent. . . . A sufficiently clear idea of the benefit derivable from the new system may be gathered from the fact that no cannel has for some time been used in this house. The same coals as are carbonized in the other houses are used here, but in them with a regular mixture of cannel, to make 16½-candle gas, which has not been proportionately increased in consequence of its discontinuance in this house. Hence the whole of the cannel, representing about 2 candles in the gas, that would otherwise have been consumed here, has been saved, without diminution of the illuminating power of the total gas production. . . . A slightly diminished yield of tar may be expected from coal carbonized in this manner, due to the fact that the thick tar will not be diluted and swollen by the addition of hydrocarbon oils from the gas; but a gallon of tar* may well be spared if it is only obtained at such a cost—at least, while gas is the chief product of gas-works."

I have not mentioned Mr. St. John's apparatus, because I do not know anything of its merits; but one, at least, of our members has had practical experience with it, and I am told that the Birmingham Corporation are about to give it a trial. That it must possess some substantial merits is tolerably clear from the fact of these gentlemen being induced to adopt it.

I think I have adduced sufficient evidence on the question of practicability; I will, therefore, now turn to the second point—that of desirability. Here I am afraid we shall have to draw largely on conjecture, and infer what results may be anticipated, given certain causes. To be desirable, this retention of the light oils in the gas should first of all be profitable, because if we can arrive at an equally satisfactory result in a

more economical way, it behoves us to choose the cheaper. Hence it is necessary to ascertain, as accurately as may be, what is the value of the light oils absorbed by the tar, assuming we could keep them all in the gas. On this point I cannot do better than refer you to two papers by Mr. H. Leicester Greville, the Chemist to the Commercial Gas Company, published in the JOURNALS for Aug. 31 and Sept. 14, 1880. Here you will find the results of some experiments upon various qualities of tar taken at different points of the apparatus used on the works, the specific gravity varying from 1·103 at the scrubber to 1·220 at the hydraulic main, and the percentage, by volume, of light naphthas varying from a mere trace at the hydraulic main to 11·2 per cent. at the washers; one sample giving as much as 13·5 per cent., but how small a proportion of the bulk this forms is clearly shown by the fact that the stock tar, or a mixture of the tar from all parts of the works, contains only 2·6 per cent. It is calculated that on a yield of 10,000 cubic feet of gas and 10 gallons of tar per ton of coal this would give 1·65 grains by weight per cubic foot, or 1·82 grains by measure. Pursuing the subject a step further, Mr. Greville gives us the following as the results of some experiments on the amount of increased light to be obtained from the addition of naphtha in the quantity stated:—

Number of Experiment.	1	2	3	4
Initial lighting power of the gas.	16·33	16·60	15·8	15·8
Naphtha added, grains per cubic foot.	2·66	2·56	2·7	2·64
Lighting power of the gas after addition of naphtha.	17·96	18·00	17·1	17·2
Increased lighting power in candles due to addition of naphtha.	1·53	1·40	1·3	1·4

Mean quantity of light naphtha in grains weight required to raise the illuminating power of the gas by 1 candle. 9·4
Mean quantity of grains to each cubic foot, 9·4 ÷ 5 1·88

Now, it has been already stated that London tar (I say London tar, because I am assured on very high authority that there is a material difference in the constituents of London tar as compared with that produced in our part of the country, and indeed in the inland provinces generally) contains a quantity of light naphtha sufficient to add 1·65 grains weight to each cubic foot of gas, assuming the yield of gas and tar per ton of coal to be as stated previously—viz., 10,000 cubic feet and 10 gallons. Consequently, if it were possible to retain the whole of it in the gas, we should have an increased illuminating power of something less than a candle. Mr. Greville himself admits that the benefit to be derived will certainly not be more than he gives, and a glance at the way in which his experiments were conducted will show that he adopted a plan whereby the best results would most probably be obtained, for the gas, in passing over the light naphtha to which it was exposed, would naturally carry off the richest and most volatile, and leave a certain percentage of the total quantity found in the tar, such as naphthaline and phenol, almost untouched. Indeed, I am quite disposed to think that practically we may confine ourselves to benzol and toluol, and leave out those hydrocarbons with the higher boiling points.

This leads me to notice a paper in the JOURNAL for Aug. 24, 1880, by Mr. G. E. Stevenson, of Peterborough, "On the Relative Illuminating Value of the Hydrocarbon Vapours and Gaseous Hydrocarbons present in Coal Gas, and their Quantitative Determination." From this we get 14·15 candles as the value of 120 grains of benzol, and 12·80 candles as the value of a like quantity of toluol; and applying these figures to the yield of benzol and toluol from ordinary tar, as found from actual working, we shall be able to arrive at the cost of their addition to the gas. If I assume that 1 ton of coal will produce 10,000 cubic feet of gas and 11 gallons of tar, I shall certainly not be under-estimating the quantity. Now, these 11 gallons of tar will produce about 8460 grains by weight of benzol and toluol together, resulting in the addition of 0·527 of a candle of increased illuminating power to the gas, at a cost of about 1½d. per 1000 cubic feet, as I hope to show you a little farther on. Under existing circumstances, I do not think there would be any difficulty in accomplishing this result, by the addition of cannel, at a cost of 1d. per 1000 cubic feet, at all events for the first candle added. But you will doubtless say this is nothing like the result obtained by Messrs. Aitken and Young's process, and falls short of the advantages claimed for the arrangement at the South Metropolitan Gas-Works. This cannot be denied. But I said at the time I would refer again to the question of how much of the increased illuminating power of which I spoke was due to the hydrocarbon vapours, and how much to naphthaline, and I think I may conveniently do so here. It is no secret that the results I gave you of the Aitken and Young process exceeded the most sanguine anticipations of the inventors themselves, and though unfortunately I have no later information as to its working, I think there can be no doubt that the improvement in the illuminating power exceeded anything that could possibly be due to the quantity of light oils given in the experiments, and unless the explanation I have already given clears up the difficulty, the only other available source of light is the naphthaline—a rich illuminant, as is clearly proved by the albo-carbon light—and to this, as I have already said, we may attribute some part of the increase in illuminating power already referred to.

Having now formed an approximate idea of the quantity of light naphthas contained in the tar, and the value they are likely to represent in increased illuminating power, the question of the permanence of this increase at once suggests itself. In other words, having utilized all the light oils as illuminants, can you rely upon their remaining in the gas under all the varying conditions of supply? Theoretically, no doubt, the gas ought to carry a much larger percentage of hydrocarbon vapours at its normal temperature than is ordinarily found therein before reaching its point of saturation; but experience has proved over and over again that, even under the ordinary conditions of manufacture, where no attempt at carburetting is made, some of the light oils are deposited in the gasholders and syphons, and at various points in the apparatus; and surely it is a reasonable inference to suppose that there would be a still greater tendency to condense, especially under great variations of temperature, if the gas were charged with a still larger percentage of these vapours. Ordinary coal gas does not contain more than 1·3 per cent. of benzol vapours at a normal temperature, or about 45 grammes per cubic metre, and its point of saturation, even at 45° Fahr., would be represented by about 160 grammes; and if condensation cannot be avoided even with this large margin, how much more must we expect if we increased the volume of benzol vapours to about 1·8 per cent., as a writer in the French Gas Journal (the Journal des Usines à Gaz) claims that we may do.

There remains yet another question to be answered, and that is—"What influence will the absence of benzol and toluol have upon the price to be obtained for our tar?" I am assured, on excellent authority, that the production of benzol at present is only just equal to the demand, the price to-day being nearly double what it was two years ago. Now, 1 ton of tar will produce about 2½ gallons of benzol and toluol together, and at the present price of these products we may calculate this as worth about 11s. 3d.; therefore, if these products are abstracted, the value of the tar will be diminished to this extent. Adopting Mr. Stevenson's figures as to the value of benzol, this would give at least 1½d. as the cost of each candle of increased illuminating power. But the scarcity of benzol would inevit-

* It would be well to remark that any diminution in the yield of tar is really a diminution in its most valuable constituent, and must be valued accordingly.

ably lead to an immediate increase in its price, and it is one of those commodities which, when in demand, must be obtained, let the price be what it will. Any abnormal increase in the price of this product would stimulate the production of tar by means of coke ovens, and so invite competition in more ways than one. It is quite possible, too, that the absence of benzol might lead to some difficulty in working the tar, in consequence of the high heat required to start ebullition, and the tendency of the tar to burn on the bottom of the stills, thus adding to the working expenses; and on whose shoulders this would ultimately fall there can be no necessity to point out.

Whether this advantages or the disadvantages will in the end prevail, time alone can show. I have endeavoured to point out both impartially, and it only remains for you individually to form your own judgment upon them.

Discussion.

The VICE-PRESIDENT (Mr. Chadwick) remarked that he had not had much experience in trying to eliminate the light oils from the tar, but he had long thought it was hardly desirable. He believed it would barely pay for the cost of it, because it would be to the detriment of the tar, which would fetch a far lower price than at present. He therefore held the opinion that they could not advantageously retain the whole of the light oils in the gas. At the same time there could be no doubt that tar, even when produced from the same class of coal, differed very much in character, and it thus appeared to him to be first of all a question of distillation. In one instance they might get, say, 2 gallons of naphtha from a ton of coal, and in another instance 3 gallons; and it would then be a question which of these two distillations was the better. He believed it would not pay to try to get the naphtha and other light oils from the tar; but, at the same time, he thought they might advantageously prevent a great deal of the light oils falling into the tar.

Mr. W. FOSTER (Nelson) said he had had a little practical experience in trying to take the light oils from the tar. About three years ago he had a steam-pipe inserted into the hydraulic main, and found that the result was to increase the illuminating power of the gas by about a candle. In a short time, however, the tar became very stiff, and he had a letter from the distiller telling him that the quality was poor. He accordingly discontinued the use of the steam-pipe for a time, and the illuminating power went down about a candle. The temperature which he obtained by means of the steam-pipe was about 220° Fahr., and benzol was evaporated at about 180°. He was still keeping the pipe at work; but the tar distiller complained, and said they had better keep the tar and make pitch of it.

Mr. NEWBIGGER said he had listened with great pleasure to Mr. Ball's paper. The subject was one which had not been frequently treated at meetings of gas managers. It had always seemed to him (Mr. Newbigger) not so much a question of the desirability of retaining the light oils in a state of suspension in the gas, but rather as to the best way of achieving this end. About the desirability he had not the least doubt in his own mind. What he should like to know was, "What is best to be done to prevent the light oils being deposited, and if they are deposited how shall we best proceed to reinstate them in their place in the gas?" He believed that the legitimate business of the gas manager was to make the largest possible quantity of gas of the highest commercial quality out of a ton of coal. This should be his principal aim, and all other objects should occupy a secondary place in his mind. He would go farther than this, and say that if the gas could be enriched at the expense of the tar it was a proper thing to do, and it would be, or ought to be, a source of satisfaction to the gas manager who achieved this end. If the effect of retaining the light oils in the gas were to depreciate the value of the tar to such an extent that it interfered with the income of the company, then of course the price of the gas would have to be raised; but in his opinion this would not be the ultimate result. On the contrary, he thought that the benefit arising from the retention of the light oils would more than compensate for any loss the company would be put to in the disposal of their tar. He had made a calculation of the difference which it would make, and without going through the calculation he might say that he found the advantage of retaining the light oils in gas to be something like $\frac{1}{4}$ d. per candle per ton of coal carbonized; that was to say, allowing for a reduction in the value of the tar, there would still be an advantage to the company of $\frac{1}{4}$ d. per candle per ton. The articles by Mr. Leicester Greville, to which Mr. Ball referred, were very important indeed, and should be carefully perused by every gas manager. As Mr. Ball had explained, Mr. Greville's experiments led him to the conclusion that by retaining the whole of the light oils he would only be gaining something like a candle in illuminating power; but there was this point which must never be forgotten, that the richer they could make the quality of the gas the more likely was it that the rich gas would retain in suspension the heavier hydrocarbons, and so make it even richer than before. This was no doubt the effect of the Aitken and Young analyzer and the St. John's scrubber. At first sight, it did not seem any great advantage; but, when they came to consider that the heavier oils were taken up, the advantage gained was much greater. All this had been ably pointed out by Mr. R. H. Patterson, and he (Mr. Newbigger) thought they should not forget to acknowledge what was due to such men as Mr. Patterson, and also to Mr. Cusiter and Mr. Young; on this particular subject especially. There was just one other matter he should like to mention. Mr. Ball having come to the conclusion—wisely, as he thought—that it was desirable to retain or reinstate these light oils in the gas, they would all be exceedingly obliged to him if he would now set himself to solve the problem of how their retention or reinstatement in the gas could best be accomplished.

Mr. CARR said he experienced considerable pleasure in listening to the paper, which touched upon a very important subject in relation to gas manufacture. It was a question which, at all events, had of late exercised the minds of gas engineers more than any other; but whether it was going to be productive of good was very problematical. He was certainly much struck with the idea when Mr. Patterson laid it prominently before them. Mr. Patterson deserved their thanks for stating it before them in an understandable way, and it was at first generally supposed that a great deal of good could be obtained by the manipulation of gas in manufacture, so as to obtain the light oils, particularly as certain results had then been obtained which were unquestionably very promising. Mr. Ball had pointed out some of the difficulties which might accrue in working out this theory, and that after all there was a possibility that the advantage might be very dearly bought—if, indeed, it could be considered an advantage at all. Amongst the advantages or disadvantages of working gas in this way, several could be pointed out which Mr. Ball did not go into in his paper, and these were things that might arise in the manufacture of gas under circumstances which were expected to eliminate the whole of the light oils. One disadvantage was that they would have a thick heavy tar to deal with all through their apparatus until it arrived at the tar-well, and then, in the winter-time especially, it would be difficult to transfer it to the vessels which were to carry it to the distillery. In working out this theory, he thought two or three things were necessary to arrive at a solution. In the first place, they must work at a high temperature, and be sure they took out all the light oils in the retort, and then they must be sure that they were never brought into contact with the tar again, so that they might not be absorbed again by the tar, as they certainly would be if contact

took place. If this were done, the oils would afterwards have to be taken out by artificial means. He had tried to work on this plan for some time, but he had found many difficulties such as he had never anticipated. There were constantly stoppages in the ascension-pipes and hydraulic main, and several times he had changed the arrangements, but with only a very partial result. He adopted different kinds of valves, removed the hydraulic seal, raised the level of the hydraulic main, and canted the main so as to give a quicker flow to the outlet; but all these were unavailing, and he could not get the thing to work freely and easily as with the ordinary hydraulic main. These were a few of the disadvantages which would always occur in working out this theory, and he thought they were sufficient to make managers seriously consider whether it was worth while taking out the oils. He was beginning to think it was not.

Mr. VEEVERS said the question that arose in his mind was where the line was to be drawn between the light and heavy oils in connection with gas manufacture. If they went to the extreme point they still had oil, even when the tar attained the solidity of sugar or any other pure hydrocarbon. If they tried to retain the oils, there was the danger that they might be condensed farther away from the works. The illuminating power might be improved very much at the works, but the question was how far could the gas be carried before the naphtha was reduced again.

Mr. CLARKE remarked that, when Mr. Ball was reading his paper the thought occurred to him that they would have a great deal of trouble if they took out the whole of the oils during distillation, and he very much doubted whether they would be permanently retained in the gas. In his experience he had frequently noticed that when the light oils had been eliminated from the tar they had gone again into the tank, or been retained in the inlet or outlet pipes; and he, therefore, thought that unless there was a guarantee that they would be permanently retained in the gas it would not be wise to take them out of the tar. There could be no doubt about the difficulties they would experience in getting the tar from the works, and considering this, as also the depreciation in value, it would certainly be a question whether it was worth while doing it; and whether, if they did, it would pay in the end. He did not remember whether Mr. Ball gave them any real practical results, and he (Mr. Clarke) should be glad if he would tell them what was his own personal experience.

Mr. BARRATT said he had not had any practical experience in the elimination of the light oils, but he might say that the contractors even now grumbled at the small amount of light oils which they found in the tar from his works.

Mr. W. W. HUTCHINSON said he had not studied the question very carefully, but it appeared to him that before proceeding to carry out the scheme, the question for managers to determine was what was the saturation point of the gas, for it would be useless to put in the light oils merely to have them deposited in the mains. If this preliminary question were determined, they would then be able to see which was the more profitable course to pursue.

Mr. EASTWOOD said that for a length of time he had studied this subject very much in the same manner as Mr. Ball had, and he was very glad the question had been put in the form it had. As to the practicability of the scheme, he might say that in the first instance he adopted the course already referred to—of treating the gas (as it came into the hydraulic main) with steam. He maintained a temperature of about 160°, and the effect of this was to cause the tar to be so stiff that no pump would lift it. He had, therefore, to discontinue the use of steam. He saw he was taking too much of the light oils out of the tar, and must adopt some other method. He then tried the effect of tapping the pipe leading from the hydraulic main, so that he could convey away all the tar and liquid, and separate them from the other gases. This tar was brought direct into the system, so that the tar and liquor could settle by their own specific gravity, and the liquor be conveyed direct to the washer. During the experiment he found the temperature of the liquor to be about 85° or 90° Fahr., and the gas was enriched by about a half or three-quarters of a candle. When tested instantly it seemed to give about $\frac{1}{4}$ candles, but when tested from the street mains it only gave about three-quarters of a candle additional. As to the practicability of it, he thought there could be no question, and as to the permanency of the retention of the light oils in the gas he paid particular attention to the deposits in the syphon-boxes, but found none except in the tar-wells. Last summer, however, he had to take off the man-hole covers of the gasholders, and found a considerable quantity of tar adhering there, and it seemed to him that what the gas would not carry was deposited in the holder. With reference to the desirability of adopting this scheme, he candidly confessed that he thought there was not any. He believed the cost was in excess of any benefit which could be derived from the elimination of the light oils. Supposing they were getting 50s. a ton for their tar, and the pitch which it contained was worth only 14s. or 15s. a ton, if they took the naphtha out the tar would not be worth anything except for the pitch and dead oils, and they would soon find this was all they would get paid for by the tar distiller. His own practice was to take out what oils he could at 90° temperature, and beyond this he did not go. To prevent the tar being carried forward and deposited in the holders and purifiers, he had constructed a sort of sieve with fine meshes at the entrance to the condenser, and this was quite effectual. The gas went straight from the retort without a dip-pipe, and afterwards into the main, without coming in contact with the tar.

Mr. FRASER believed they were all of one mind as to the value of the paper Mr. Ball had read. Personally he said he had had some very painful experiences with reference to this question of tar distilling, in connection with a Company with which he was associated in London, but he was fully of opinion that they were on the right line if they tried to retain these light oils in the gas. They distilled their coal in iron retorts, had a descending pipe, and a large tank 9 feet long, 4 ft. 6 in. wide, and 3 feet deep. In their process of gas manufacture they heated the retorts to 300°, and filled the tank with ammoniacal liquor. Things went on for a few weeks, and then the hydrocarbons disappeared, and in their place they obtained tar, and in three months this was thick pitch. They managed to get 20-candle gas, though the venture proved a failure. The patent was to make gas from tar. He found great difficulty from the stopping up of the pipes, but he overcame this by putting in steam-pipes. The Company were under a contract to give gas delivered into the gas-holder at 1s. per 1000 feet. For his own information he fixed a meter and found it cost 20s. per 1000 feet to make gas from tar. What they did, however, was to make 20-candle gas from the light oils, and he was decidedly of opinion, from the experience he had had, that the light oils ought to be retained in the gas; although, if any one wanted to be careful of his money, he (Mr. Fraser) would advise him not to invest it in the manufacture of gas from tar.

Mr. S. HUNTER (Salford) said if he understood Mr. Fraser aright, his (Mr. Hunter's) opinions were the same as that gentleman's. It was a subject to which he had given his attention for some considerable time past, and the more he thought about it the more thoroughly was he convinced that there was something in it, and that the elimination of the light oils from the tar, and their retention in the gas, was both practicable and advisable. He gathered from one speaker—Mr. Clarke, he believed—that his doubt was whether it was advisable to retain the whole of the oils, or let them go into the tar-well. He did not think this was worthy of

their consideration. The question was more as to the retention of the light oils; and, as Mr. Veevers put it, it was a question where they should draw the line, and say which were the light and which the heavy oils. Practically, to his mind, it resolved itself into this—what did they realize for the tar with these light oils, and what amount could they take out with advantage to the gas, and what would be the loss to the tar? It seemed to him there was something in tar which would be profitable in the gas, but he could hardly agree with the statement that for every 1d. they took out of the tar they added 6d. to the gas. In Lancashire manufacturing towns they had to supply gas of a high illuminating power, and it was a question with them of using as little cannel as possible in order to retain the standard quality. If they could save a certain amount of cannel, they made their gas cheaper, and it was only a question whether they could obtain a better illuminating power by retaining the light oils or by using cannel. As to the practicability of the idea, he could quite see that if they carried the process to an extreme limit it would be a difficult thing for gas managers, but they had some methods before them of overcoming these difficulties, and at Rochdale the St. John process had been carried on, he believed, every day without a break, and had proved a very great success. He was at Rochdale a few days before the meeting, and Mr. Romans assured him the apparatus was increasing the illuminating power by 3 candles. He thought if the illuminating power could be increased by 1 or 1½ candles it would be better than allowing the oils to run away with the tar. At his own works they were erecting Aitken and Young's apparatus, but as yet he could not give any information as to its results.

The HONORARY SECRETARY said he had the pleasure, three months ago, of going over the South Metropolitan Gas-Works, and of inspecting the system adopted by Mr. Livesey. He found that they took the heavier tars off in a sort of trough. They did not use any hydraulic main, but had instead a sort of receiving-main, with two lots of ascension-pipes. The arched pipes were deeper at the back than at the front, forming a sort of arch. The thick tar went direct into the tar-tanks, and the gas passed above with the lighter oils into the receiving-main. They were not using any cannel at all in the house, and they assured him they had no difficulty in keeping the illuminating power up to the standard; but the tar was sometimes so thick that they had to open a pipe communicating with the receiving-main to allow a certain portion of the lighter oils to help it. He had no doubt that the retaining of the light oils in the gas by this process was very beneficial, and he was going to try some experiments of a similar kind in the testing apparatus he had, and he should carefully watch the results, which he hoped to communicate at some future meeting, although not perhaps exactly in connection with this subject, but still of interest to the members. During the last few days he had learnt that Mr. Livesey was now trying a new plan, by which he hoped to obtain a larger quantity of tar, and at the same time prevent the stoppages in the ascension-pipes, which most of them knew was an unmitigated nuisance. Instead of using an ascension-pipe to each retort mouthpiece, he had one large pipe put on each side of the bench, and from each mouthpiece he took a connection to this pipe with a valve to each of them. He was thus not only doing away with the hydraulic main, but was also abolishing a large quantity of piping and obviating probable stoppages. It was merely an experiment, and perhaps might not answer so satisfactorily as Mr. Livesey expected, but he (Mr. Hunter) thought it would.

The PRESIDENT remarked that for several years it had been his custom to use a wrought-iron main about 250 feet in length and 20 inches in diameter, conveying the gas direct from the hydraulic main, and discharging gas, liquor, and tar at the entrance to the condenser. Since the experiments made and published by Mr. Young and Mr. R. H. Patterson, he (the President) began to consider whether it was not necessary to retrace his steps, and he thought possibly he had been on the wrong track. Some two or three months ago he adopted White's valve, and a perfectly dry "hydraulic" main, from the bottom of which he took the tar directly it was made. Up to the present there had not been any settlement of solid pitchy matter. The temperature of the hydraulic had, he might say, a good deal to do with the formation of pitch. In another part of the retort-house he tried the experiment of taking away the tar and liquor constantly, and the whole, as it formed in the hydraulic main, was at once carried into the tar-well. It occurred to him that he must gain something from this, but he could not at present say that he had gained anything in illuminating power. Previous to this discussion he extracted what he considered to be the pith of Mr. Young's remarks on the subject. Mr. Young said the crude gas vapours, as they entered the hydraulic main, might be divided into two groups—viz., those which it was desired to retain as permanent gas, and those which were not desired. To the former belonged the hydrocarbon gas and vapours of volatile hydrocarbons; to the latter the denser hydrocarbons and sulphur compounds, these being solvents for the former in nearly equal proportions. To suddenly cool the whole would reduce the illuminating power, for thereby the solvent action of the denser hydrocarbons was allowed full play, and therefore brought down the illuminating power. In order to prevent this, the gas and vapours were cooled very slowly, in order that the vapour condition of the denser hydrocarbons might be reduced first, thereby causing them to be precipitated at a temperature which would lower their action as much as possible, and allow the gas to retain the vapours of the volatile hydrocarbons. This was the substance of what Mr. Young stated, and he (the President) thought a good deal of it was the basis of what was now being said in connection with the keeping of the light oils in the gas. Mr. Leicester Greville, from whom he had taken a similar extract, said that with the gas flowing at a temperature of 350° into the main, when the tar was taken out of the main it was found to contain 2.6 parts by volume of light naphtha. The specific gravity of the tar was 1.215. When the tar was drawn off at the hydraulic main it contained 1.3 per cent. by volume of light naphtha, and the specific gravity of the tar was 1.223. If the naphtha could be retained in the gas, he found it made 16-candle into 18-candle gas, so that the saving to be effected could not exceed three-quarters of a candle at the best. They had heard the difficulties which had to be contended against in connection with this matter. He (the President) could not say that he had come to any conclusion yet; but so far as his judgment went, he could not see that any practical benefit could be derived from taking the light oils from the tar. There might be some little advantage, but he had not yet been able to see it. On the whole, he thought it was very doubtful whether any substantial gain could be effected by taking the light oils away from the tar, and retaining them in the gas, and it was clear that they would be deposited somewhere if not sufficiently light. He had himself distilled tar, and found that when the heats were good a very small quantity below 9.20 in gravity could be taken away. Under the best circumstances, and when the best mode of distilling was carried out, there was very little indeed to be carried on with the gas. This was his experience, so far as it went.

Mr. BALL, in reply, said he did not profess to have had any practical experience on the subject, and his idea in writing the paper was simply to avail himself of all that had been said in reference to this question, in order to arrive at a decision on the point. Mr. Newbigging did not take the same view of the subject that he did. They were obliged to supply

gas of a certain illuminating power, and he thought the business of the gas manager was to produce it, and sell it as cheaply as possible, and it was with the idea of seeing whether this process could cheapen the production at all that he looked up the subject. He was exceedingly surprised to hear the remarks of Mr. Samuel Hunter. He certainly had no idea that for every 1d. deducted from the value of the tar they enriched the gas to the extent of 6d.; and while he did not question Mr. Hunter's statement at all, he must say that this was the first time he had heard anything like such an amount claimed. He had hoped to be able to give Mr. Cadel's experience with his arrangement during the past winter. He had promised to write to him (Mr. Ball) on the subject, but was unable to do so. As to tar distilling, he was sure the yield of benzol and toluol was worth about 11s. 3d. per ton, and assuming that they could take this out of the tar, the value of the tar would be depreciated to that extent. He was, therefore, at a loss to see how they obtained 6d. for every 1d. they took out of the tar. If it could be done at Leeds, and this saving effected, they would be glad to bring the price of gas down from 1s. 10d. to 1s. 8d. per 1000 feet.

On the motion of the PRESIDENT, seconded by Mr. FRASER, a vote of thanks was unanimously passed to Mr. Ball for his paper.

Mr. BALL having responded,

The reading of a paper by Mr. Smedley (Buxton), "On Six Months' Experience in Working Retorts without the Hydraulic Main," was deferred until the next meeting.

The PRESIDENT moved a vote of thanks to Mr. Carr for his services as President during the past year. He said no words of his were, he believed, necessary to commend the motion to the members, because they had all had an opportunity of judging of the manner in which Mr. Carr had filled the office. They certainly could not allow a gentleman of his ability to pass from the chair without indicating in some way their appreciation of the important services he had rendered to the Institution; and the least they could do was to convey to him their warmest thanks.

Mr. VEEVERS said that, as perhaps the oldest Past-President in the room, it afforded him very great pleasure to second the motion. Mr. Carr's many excellent qualities, combined with his professional abilities, had made him a most estimable President; and, feeling a deep interest in the Institution, it gave him much pleasure to second the vote of thanks.

The resolution was carried with applause.

Mr. CARR, in responding, said the greatest gratification he had had during his term of presidency was the kind assistance and sympathy he received all round. He did not know that he had earned or deserved all the good things which were said of him by the mover and seconder of the resolution. He could only say that he had discharged as well as he could the duties of the office to which they so unanimously and cordially elected him. He could only hope that anything he undertook in connection with the Institution in the future would be as well received as that which he had endeavoured to do in the past.

Mr. HUTCHINSON moved a vote of thanks to the Treasurer, Secretary, and Committee, for their services in the past year.

Mr. BRADDOCK seconded the motion, which was carried, and the meeting then ended.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Sixth Half-Yearly Meeting of this Association was held at Ryde, on Tuesday last—Mr. G. GARNETT, A. Inst. C.E., of Ryde, the President, in the chair—when the following new members were elected:—Mr. E. Farrend, Ryde; Mr. C. W. Hastings, Whitechurch; Mr. W. Lyon, Cosham; Mr. W. W. Monk, Bournemouth; Mr. W. H. Moody, Fareham; Mr. J. Newman, Sandown; Mr. J. Reed, Newport, Isle of Wight; and Mr. W. Sutherland, Shanklin.

The HONORARY SECRETARY (Mr. T. W. R. White, of Sherborne) then presented the accounts of the Association for 1880.

Mr. H. COCKEY (Frome) moved that £5 5s. be given to the Secretary towards his expenses in connection with his office. In doing so, he said that Mr. White had worked very hard for the welfare of the Association, and he thought his position must entail many items of expense that had not appeared in the accounts. He did not make the proposal in the way of remuneration, but merely as an act of justice.

Mr. T. HARDICK (Salisbury) seconded the motion, which was supported by the PRESIDENT, and at once agreed to.

The SECRETARY, in acknowledging the vote, said he was much obliged to the members for the kind way in which they had passed the resolution. He had done his best for the Association, and would take the opportunity to invite every member to co-operate in working for its good and securing new members. If they would do this, its growth would be more rapid in the future than it had been in the past. Including those just elected, the Association numbered 53 members.

A resolution, proposed by Mr. COCKEY, and seconded by Mr. T. STONE (Weymouth), was passed that the next meeting of the Association should be held at Weston-super-Mare.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

Gentlemen,—In assuming the chair of this Association, and undertaking the responsibilities of the presidential office, permit me, in the first place, to express my deep sense of the compliment you have conferred upon me by placing me in this honourable position, and my determination, aided by your kind co-operation and assistance, conscientiously to discharge the duties of the office, endeavouring to combine personal with professional rivalry, and a constant interest in the prosperity and usefulness of the Association. In the second place, allow me to tender you my grateful acknowledgments for the honour you have paid me in visiting Ryde to-day, and especially for selecting the Ryde Gas-Works for your first place of meeting for the current year. To Ryde I offer you a very cordial welcome, and earnestly do I hope that the visit, coupled with the interchange of thought and practical suggestions, will be not only interesting and instructive, but productive of many pleasing reminiscences; and that you will experience the fitness of our municipal motto, "*Amanitas, Salubritas, Urbanitas*."

In accordance with the usual custom, my present duty is to address you on some subject calculated to promote the prosperity and maintain the reputation of the Association. In the execution of this duty, I shall depart from the usual practice of travelling over the records of the past year, and taking a retrospect of all matters affecting gas interests which have occurred during this period, and simply lay before you a brief description of the Ryde Gas-Works. I am fully aware the works you are visiting to-day cannot lay claim to novelty of arrangement, excellency of construction, or superiority of management in any particular department; but I entertain a deeply rooted conviction that the visiting of establishments by the members of the Association at their half-yearly meetings (whether proving examples to imitate or subjects to avoid) must be regarded as an important factor in widening our experience. Judiciously studied by each of us, these visits tend to produce improvement in the working of the various undertakings committed to our charge; and as a

natural consequence, secure the prosperity of our several companies, and I would fain hope a *pro ratâ* pecuniary advantage to ourselves, for I am persuaded that it is not every gas manager (at all events in the provinces) whose remuneration is *quantum sufficit*, and certainly not *quantum meruit*.

In these eventful days, when every thinking man, be his occupation what it may, must feel the difficulty of keeping pace with the rapid discoveries in science and art, the gas manager is called upon to rise above the ordinary level of intelligence; and, if he would maintain his status, he must become versed in the various departments of physical science and their practical applications in every-day concerns of life, and thus be in a position to afford sound advice and valuable assistance to his directors and their customers, on the principle and value of any of the legion of so-called improvements and discoveries which are constantly being introduced to public notice in connection with artificial illumination. This intellectual capital, freely placed (as it always is) at the service of a company, should call forth a corresponding equivalent in reward; and I am not without hope that, in associating together for the encouragement and advancement of all matters connected with gas engineering, manufacture, and finance, we shall alike confer and reap a benefit, for by teaching we learn.

Our Association, with the addition to its numbers made to-day, now comprises 53 members, and most heartily do I congratulate you on the success which has hitherto crowned the efforts of the executive. I am assured that the great desire of these gentlemen has been to place the Association on a solid basis, and this, to a very pleasing degree, they have achieved. Much, however, remains to be done. Its usefulness and stability will be largely increased by inducing other gas managers in the district to enrol their names as members, and add their knowledge and experience to the common stock, an illustration of the advantages of which is presented to-day by one of our new members, Mr. W. W. Monk, of Bournemouth, who has promised to read a paper on "Monk's Patent Dip-Seal Regulator and Superheated Steam Re-volatilizing Apparatus." Another paper of considerable importance is promised to be read by Mr. W. S. McGregor, of Ringwood, on "The Education of Gas Consumers," as a fitting sequel to which I venture to suggest the desirability of one of our members favouring us at our next meeting with a paper on "The Education of Gas-Fitters."

I must claim the indulgence of those who are "nothing if not critical," whilst I endeavour to take an express journey from coal to coal gas manufacture, as practised at the Ryde works, and to give a running commentary on the general conduct of the business of the Company, simply reminding you of the advice of the great Apostle to the nations, "Prove all things; hold fast that which is good." The coal carbonized is Waldrige, from the Newcastle district, occasionally mixed with about 2 per cent. of small household coal, taken from the town merchants in exchange for coke. No cannel is used. The retorts are of the same pattern as those in general use in the district—21 in. by 14 in., by 9 ft. long—yielding, on the average of the six months ending December last, 6427 cubic feet per mouthpiece, and for some months, when worked with 4-hour charges, 7000 cubic feet. Under this working, the retorts were only once scurfed, and no inconvenience arose from choked ascension-pipes, whilst the tarry matter flowed freely to the well. This result I attribute to a great extent to the dip-pipes having a very slight seal, regulated by a bridge valve at the end of the hydraulic main. The crude gas then passes through 200 feet of 18-inch wrought-iron condensing main, placed at a high level inside the new retort-house, from which it is exhausted and driven forward through the condenser and scrubber to the purifiers. These arrangements can all be by-passed when required, the great advantage of which, in controlling temperature, was demonstrated during the severe frost of the past winter, when, with the exposed thermometer sometimes showing as much as 30° of frost, no naphthaline was present in any of the apparatus or connecting-pipes on the works, and the complaints of consumers from naphthaline formation in the service-pipes did not amount to one a day. The purifiers are four in number, 12 ft. by 12 ft. by 4 ft. 6 in. deep, the first three being charged with oxide. Each purifier has two tiers of screens with a thickness of 1 ft. 6 in. of purifying material on the bottom and 2 ft. on the top. The fourth or catch purifier contains lime on one screen only, 4 ft. in thickness. The average quantity of gas passed through each oxide purifier before changing is 2½ million feet, and the lime purifier 8 million feet. The pressure required to overcome the resistance of the purifying process varies from 1 to 5 inches. After passing the station-meter, and before entering the gasholders, the gas is constantly tested for illuminating power by a Lowe's jet photometer, under the charge of the engine-driver, who has also charge of a second jet on the governor outlets. In addition to a third jet in the office, the illuminating power of the gas is daily tested by Methven's illuminating power standard, attached to a Letheby photometer, provided with the recent unique appliances for using candles or standard introduced by Mr. F. W. Hartley, of London. Methven's illuminating power standard has now been in use at these works for six months, and during that time 28 careful comparisons have been made between it and standard sperm candles, with the following average result:—

Methven's standard	15.73
Standard candles	15.69

Showing the very small difference of 00.04

From the experience gained with this standard as to accuracy and economy of time effected by its use, I cannot too strongly recommend its adoption. In addition to the tests for illuminating power (the gas being already free from sulphuretted hydrogen), the gas is constantly tested for sulphur compounds and carbonic acid by Harcourt's colour test, the average result being 15.3 grains of sulphur and 0.25 grain of carbonic acid per 100 cubic feet of gas. It is proposed to increase the purity of the gas, and at the same time reduce the cost of purification during the current year by the addition of a self-regulating washer, by Mr. R. Good, of Carshalton; and two extra purifiers, 25 ft. by 20 ft., by 5 ft. deep, by Messrs. E. Cockey and Sons, of Frome.

The washer which you have had the opportunity of examining in its partially completed state to-day, is 8 feet high and 10 feet in diameter, and contains three separate compartments, one above the other, each of which can be charged with any kind of liquor. In each compartment there are 232 2-inch pipes for passing the gas, sealed to any required depth in the purifying liquor. It is proposed to use strong liquor in the bottom, with weak liquor in the middle, and clean water at the top wash. It will be evident that this washer can be increased to any desired extent by additional compartments added at the top when required, and is pre-eminently fitted for gas purification in closed vessels. I have been led to adopt this washer from the experience gained by Mr. R. Good, at the Carshalton Gas-Works, during the past five years, and in illustration of its efficiency now submit two test-papers for tar and ammonia, taken on Saturday last from the outlet, the gas blowing through a ¾-inch pipe full on to the papers exposed for two minutes. The entire absence of tar is shown by the plain paper, one effect of which is that, with a make of 150,000 cubic feet per diem, the pressure required to overcome the resistance of the purifiers never exceeds 5-10ths. The average cost of purifica-

tion at Carshalton per 1000 feet of gas made, extending over a period of five years, is less than ¼d.

Before leaving the gas-works it is essential to remark that the question, so often asked, "Is the Adoption of the Form of Accounts as Scheduled in the Gas-Works Clauses Act, 1871, by all Gas Companies or Corporations, desirable?" has been answered, so far as the Ryde Gaslight Company are concerned, by its adoption since 1872. The forms of account have been specially designed to meet the requirements of the Act, and the accounts prepared half-yearly since that time by Mr. Alfred Lass, of London. The confidence thus inspired amongst Directors, Officers, and Shareholders, and the improvements thereby effected, have tended much to establish the undertaking on its present firm basis.

Leaving the gas-works, I should be wanting in gratitude if I did not record my obligations to Messrs. W. and B. Cowan, the manufacturers of the Warner and Cowan unvarying gas-meter, and to Messrs. D. Bruce Peebles and Co., the manufacturers of Peebles's patent needle regulator, for the assistance their several inventions have afforded, whereby, during the severe frost of three winters, the public lighting of the district has been so carried out as to be satisfactory alike to the Gas Company and the Lighting Authority. It is worthy of record that the meters charged with glycerine and water have been allowed to run for a year and nine months without adjusting, and that the volume regulators have proved the acme of perfection, and thereby kept the Company and the Lighting Authority on those good terms so devoutly to be wished for.

Reverting to the business of our meeting, I have to call your attention to the beautiful series of specimens of products from the distillation of coal tar, kindly contributed by Messrs. Burt, Boulton, and Haywood, the investigation of which in their various groups, and the care bestowed on their preparation, leaves any commendation of mine unnecessary. The very fine castings of Spence's metal offered for your inspection will, I trust, induce you to follow my own example of introducing it into the various departments of your works, feeling assured, as I do, that its advantages will grow on acquaintance. I must also call your attention to Thorp and Tasker's aerometer now in action, the uses of which are so manifold and apparent as to require no words of mine to recommend it.

Gentlemen, amid manifold inconveniences, arising from a long and painful illness and other causes, I have done my best to meet the requirements of the day.

[In the course of the address, Mr. Garnett read a statement of the results of the past year's working of his Company; but, on applying for a copy of it for publication with our report, we were informed that "the working statement which he (Mr. Garnett) gave to the members must be considered private, for prudential motives, as far as this locality (Ryde) is concerned."]

A vote of thanks to the President for his address having been accorded, the reading of papers was proceeded with.

The first, by Mr. W. W. Monk, was a description of his patent dip-seal regulator and superheating steam re-volatilizing apparatus, a drawing of which, to accompany the paper, will be published next week.

The second paper, by Mr. W. S. McGregor, was on "The Education of Gas Consumers." This will appear, along with Mr. Monk's paper, in next issue.

The members afterwards, at the invitation of the President, dined together at the Pier Hotel. Mr. Garnett occupied the chair, supported by the Mayor of Ryde (Mr. C. Colenutt), Mr. Cornelius Nicholson, and Messrs. T. Hardick and S. W. Durkin, the Vice-Presidents of the Association. Mr. H. Cockey was Vice-Chairman. Among the toasts proposed at the close of the dinner was that of "Success to the South-West of England District Association of Gas Managers," coupled with the name of Mr. Garnett, who, in responding, acknowledged the efficient services rendered to him during his recent illness by his assistant, Mr. E. Farrand, to whom he presented a silver chronograph. Mr. Hardick subsequently proposed the healths of the readers of the papers (Messrs. Monk and McGregor), and Mr. F. W. Hartley the health of Mr. Cockey.

THE PRICE OF GAS IN PARIS.

The question of the price charged for gas in Paris, which, as our readers are aware, was for some time under the consideration of the late Municipal Council, and was the subject of some lengthy negotiations between them and the Directors of the Gas Company, was brought under the notice of the newly elected Council at their meeting on the 3rd inst., and the whole matter, with the various papers relating thereto, was again referred to the Streets Committee for their consideration. The two following propositions were likewise submitted:—

The Municipal Council invite the Administration to reopen negotiations with the Gas Company upon the following bases:—A reduction of 10 centimes per cubic metre to be made in the price of gas sold to private consumers and by meter, such reduction to be made in equal moieties—5 centimes on the 1st of July, 1881, and 5 centimes on the 1st of January, 1884. The Company's treaty to be prolonged for 15 years from 1905.

All prolongation of the present monopoly of gas supply is rejected. The City undertake to pay off the bondholders of the Company, either by a loan to be specially raised for the purpose, or by the unification of its debt, and to become their substitute. The City renounce all participation in the profits of the Company, with respect to gas sold by meter, until the decision of the tribunals has been given. The price of gas supplied to private consumers to be reduced to 20 centimes per cubic metre from the 1st of April next. All rights and interests of the City as respects the Company are reserved.

As bearing upon this question, the following figures, partly taken from the *Statistische Mittheilungen über Gas-Anstalten* may be of interest, as affording facilities for comparing the charge made for gas in Paris (about 6s. 9d. per 1000 feet) with the price paid in other important Continental centres:—

	Price per Cubic Metre.	Price per 1000 Cubic Feet.
Augsburg	30.28 c., or about 6s. 10d.	
Berlin	19.90	4 6
Bremen	31.16	7 0
Breslau	24.12	5 5
Cologne	19.90	4 6
Danzig	21.16	4 10
Hanover	22.00	5 0
Leipzig	27.42	6 2
Odessa	28.38	6 6
St. Petersburg	32.14	7 6
Vienna	21.23	5 0

In none of the above places do the Company share their profits with the Municipal Authority, as do the Paris Company, not even at Augsburg, Bremen, or St. Petersburg, where the prices are higher than in the French capital.

SWINDON WATER-WORKS COMPANY.—The annual general meeting of this company was held on Monday last week—Mr. P. H. Mason in the chair. The report submitted showed that the Directors recommended a dividend of 8½ per cent., free of income-tax. The net result of the working of last year, including £103 13s. 10½d. brought forward from the previous year, made a total of £2168 2s. 3d. disposable by the Shareholders. The report, which was adopted, also showed the number of houses supplied by the Company to be 3424.

STRATFORD-UPON-AVON CORPORATION GAS SUPPLY.

At the Meeting of the Stratford-upon-Avon Town Council this day fortnight, the Gas Committee presented their annual report, in the course of which they made the following statements:—

During the past year the whole of the bond debt, amounting to £2500, has been paid off, and a further expenditure of £939 1s. 3d. on capital account has taken place, leaving a balance in hand of £391 0s. 11d.; and to provide for additional working capital, and to meet anticipated extensions, your Committee recommend that a further sum of £2000 be raised by debenture stock, the same to be issued in £100 debentures.

The balance carried to profit and loss from the revenue account amounts to £2772 1s. 9d., and after paying all interest due, a net balance remains of £1330 9s. 7d., from which the sum of £300 has been taken to the sinking fund to provide for the redemption of loans and annuities, making a total of £904 16s. 2d. to the balance of this account.

During the past year 21,438,800 cubic feet of gas have been sold, which shows an increase of 987,800 cubic feet, and an increased rental of £225 4s. 10d. This year your Committee consider very satisfactory, taking into consideration the depressed state of trade.

The Manager (Mr. J. S. Cranmer) having called your Committee's attention to the quantity of unaccounted-for gas, which is now very considerable, your Committee intend adopting means to reduce the same to within reasonable limits.

Your Committee consider that the time has now arrived when they can with confidence recommend to the Council that a reduction be made in the price of gas, and after fully discussing the question as to the extent of the same, resolved, by a majority of five to three, that the following scale be recommended, viz.:—Tiddington and Alveston, from 4s. 7d. to 4s. 2d. per 1000 feet; within the borough, consumers of less than 100,000 per annum, from 4s. 2d. to 4s. per 1000, consumers of more than 100,000 and less than 250,000 per annum, from 4s. to 3s. 9d. per 1000, consumers above 250,000 per annum, from 3s. 9d. to 3s. 6d. per 1000. The above price to take effect on April 1 next.

Mr. COLBOURNE said the present report was the most important he had had the honour to present to the Council since he had been Chairman of the Gas Committee, inasmuch as it comprised a general statement of the affairs of the gas department during the past year. He was happy to tell them that this was one of the departments of the Corporation which was yielding a considerable income. It was hoped the proposed reduction in price would lead to an increased consumption of gas, and that the Committee would be able to show as good and satisfactory a balance-sheet next year as this. The Committee had based the reductions on the principle of the sliding scale which was in operation before the Corporation took over the gas-works from the Company. The Committee could with confidence ask the Council to adopt the report.

Mr. JUSTINS seconded the motion.

Mr. GREEN said about two years ago a public meeting was held, when a very strong opinion was expressed in favour of a uniform rate for gas rather than a sliding scale. He hoped that the sliding scale would have been discontinued before now, but was sorry to see the objectionable principle was to be kept up. He could not look at this matter from a commercial point of view, and he contended that it was unjust to charge a poor person more money than a wealthy one. They were both rate-payers, both equally interested in the property, and both equally responsible. If gas could be made, at a profit, at 3s. 6d. per 1000 feet, they ought not to charge more for it in the case of poor people. He failed to see the justice of one person who had three or four places of business in the town having the quantity of gas burned lumped together in order to bring him under the lowest scale. There was the same expense in breaking up the streets to lay the service-pipes at each of his places of business as in the case of a person who had only one shop. It was his intention to propose as an amendment that gas should be supplied to all consumers in the borough at one uniform rate, and that rate as low as it could possibly be fixed. He would like to see the price brought down to 3s. 6d. per 1000 feet, believing that gas could be profitably made at this rate. He objected to the sliding scale also on the ground that those who burned gas were helping to pay the rates of those who did not consume it, and in the case of those who paid on the higher scale—the poor people—the injustice was more keenly felt. He had made a few rough calculations on the subject, from which he found that the surplus would reduce the rates something like 9d. in the pound. Why should consumers of gas, by the money they paid for the commodity, relieve to this extent those who did not burn gas? In conclusion, he quoted a number of figures to prove that with one price, and that 3s. 6d. per 1000 feet, after deducting £300 for the sinking fund, a sum of £400 per annum could be appropriated to the reduction of the rates.

Mr. COLE seconded the amendment.

Mr. GREEN said he had left Alveston and Tiddington out of his calculations, as this was a separate parish, and the consumers there were not expected to derive any benefit from the profits realized on the undertaking.

Mr. MARIES remarked that if gas were offered to poor people at 3s. 6d. per 1000 feet it would be an inducement for them to burn it. It appeared that the greatest profits had been realized on the lowest scale, showing that it was the lowest scale that paid best.

Mr. EAVES also supported the amendment, contending that all rate-payers were equally interested in their property. There was one responsibility, and there should be only one rate; but he suggested that 4s. per 1000 feet should be the charge, and that 6d. should be deducted in the event of the accounts being paid within 14 days. This would be an inducement to consumers to pay promptly.

Mr. COLBOURNE pointed out that if this plan were adopted it would raise the price to the large consumers.

Mr. STILGOE and Alderman KENDALL also spoke on the subject; the latter remarking that there was something to be said in favour of Mr. Green's view of the question.

The MAYOR said the matter had been frequently discussed both at the Council and at public meetings; and there was something to be said on both sides. They were aware that the supply of gas was a business undertaking, that the gas-works had been acquired by the ratepayers, and were being managed by the Council for their benefit. The question was whether they would continue to conduct the supply on ordinary business principles, or whether they would deviate from them. He must say that he was not in favour of making wholesale reductions.

The amendment was then put to the meeting. The result of the voting was—for the amendment, 7; for the original motion, 12. The latter was consequently declared carried.

GLOSSOP GAS COMPANY.—The ordinary meeting of this Company was held on Monday, the 28th ult.—Mr. C. Greaves in the chair—when the balance-sheet and report of the Directors for the past half year were approved. The report congratulated the Shareholders on the favourable results of the Company's working during the last six months, and anticipated that, if the staple trades of the district continued to flourish, a corresponding statement would be presented for the current half year. The Directors recommended the payment of maximum dividends on £33,750 of old and £2500 of new capital, together with £360 towards arrears of dividends in former years; the carrying of £100 to the reserve fund, £88 to the depreciation fund, and the balance (£133) to next account. Mr. E. Shaw and Mr. D. Shipley were re-elected Directors of the Company; Mr. J. Rowbottom being appointed on the Board in place of Mr. S. Robinson. Mr. J. Potts was then re-elected Auditor of the Company; after which it was resolved—"That the thanks of the meeting be given to the Manager (Mr. J. Dalghiesh) for his very able and efficient services.

EASTBOURNE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday, Feb. 28.—Dr. JEFFERY in the chair—when the Directors reported that the revenue account showed a net profit for the past half year of £3306 8s. 3d. Deducting therefrom £500 14s. 6d., for interest on debentures, &c., there remained the sum of £2805 8s. 9d., which added to £1536 18s. 3d. (the balance brought forward from last account), would give a total sum of £4342 7s. available for dividend. The Directors therefore recommended the payment of dividends at the rate of 10 per cent. per annum on the £20,000 original capital of the Company, and 7 per cent. per annum upon the £30,000 capital raised on the "B" shares, free of income-tax, leaving £2292 7s., the balance of net profit, to be carried forward.

[The Company's original share capital under their first Act of Parliament—viz., £20,000 of 10 per cent., and £30,000 of 7 per cent. shares—is all paid up; but none of that authorized by their Act of last year (£150,000) has been issued. They have £12,500 of mortgage bonds at 5 per cent. The total expenditure for works, &c., to June last was £68,099; and £884 was added to capital account during the past half year. Sales of gas in the six months, July to December, realized £8452; meter-rents, £163; and residuals, £1657. Manufacture of gas cost £5224; distribution, £871; rents, rates, and taxes, £323; management, £419. These sums with various small items of receipt and expenditure made the totals of £10,313, and £7007; leaving £3306 to be carried to profit and loss account.]

The CHAIRMAN, who moved the adoption of the report and accounts, said that the affairs of the Company were in a very satisfactory condition, and would, no doubt, be as prosperous in the future as to enable the Company to pay good dividends.

Mr. BENNETT seconded the motion, which was agreed to; as was also a vote of thanks to the Chairman for presiding.

DOVER GASLIGHT COMPANY.

The Half-Yearly General Meeting of this Company was held on Tuesday, the 1st inst.—Mr. W. R. MOWLL in the chair.

The CHAIRMAN read the Directors' report, which stated that the revenue during the half year ending the 31st of December last was somewhat less than in the previous half year, owing mainly to the reduction which had taken place in the price of gas supplied to private consumers. A similar reduction must, the Directors stated, be anticipated during the current half year, in the amount received for the public lamps, owing to a lower price having been accepted under the new contract which came into operation on the 1st of January. The whole of the authorized capital having been exhausted, the Directors advised the creation of 500 new shares of £10 each, to be issued as required. The report concluded with a recommendation that a dividend of 7½ per cent. per annum should be declared, the arrears of dividend for the year 1867 paid, and the balance carried forward.

The following accounts were annexed to the report:—

Dr.		Profit and Loss Account, for the Half Year to Dec. 31, 1880.		Cr.	
Coals	£4,339 2 7	Sale of gas, less discounts and bad debts	£10,238 11 4		
Purifying material	121 12 6	Coke, tar, and other residuals	2,367 19 7		
Repairs of works, &c.	2,477 15 1	Meter and fittings rentals	244 0 7		
Wages	813 4 3	Profit on gas-fittings	133 12 9		
Lamps—lighting, cleaning, &c.	254 18 4				
Rents, rates, and taxes	440 11 9				
Salaries, commission, and Directors' fees	797 14 4				
Interest on loans	195 0 0				
Incidental expenses	86 7 8				
Solicitor's charges	9 3 4				
Balance	3,448 14 4				
	£12,984 4 3			£12,984 4 3	
Balance-Sheet, Dec. 31, 1880.					
Capital raised	£61,500 0 0	Cost of works, less depreciation	£73,011 8 10		
Statutory mortgages	10,000 0 0	Book debts	9,030 5 1		
Premiums on new shares	8,007 15 7	Coals, coke, sundry stocks, and plant	3,194 4 1		
Reserve-fund	3,824 11 6	Invested in Consols	3,324 11 6		
Insurance-fund	1,183 0 0	Invested in Canadian bonds	973 17 0		
Deposits from consumers	370 6 3	At Banker's	2,997 13 4		
Sundry liabilities	1,087 13 3				
Balance	6,558 11 3				
	£92,531 17 10			£92,531 17 10	

The CHAIRMAN, in moving the adoption of the report, remarked that the prosperity of the Company was as great as the Shareholders could wish. During the half year dealt with in the report, the whole of the business had, he said, been carried on without anything like a hitch. It was true that the balance-sheet did not show any increase in the receipts for gas, as compared with the corresponding six months of the previous year, but this was because the price of gas had been reduced. If the balance-sheet had not shown this result, it might have been said that the Directors had reduced the price of gas, and yet their receipts were as large as before. The fact was the town had saved hundreds of pounds by this reduction in price. During the half year under consideration there had been an addition of 47 new consumers. The manufacturing operations had been perfectly satisfactory, for, after allowing for leakage, 10,067 feet of gas had been produced from every ton of coal carbonized. This proved that the work in the retort-house had been conducted with great efficiency. The Manager carried on all negotiations with prudence and astuteness; the rental was well collected, so that the Company lost next to nothing by bad debts; and he might add that they were well served all round. They had not received a single complaint of a nuisance arising from the way in which the works were carried on. This was not a mere accident, but was solely because the Directors had given orders that the greatest possible care should be taken in the manufacture of gas, so that no inconvenience should arise. Complaints were occasionally made of a deficient supply of gas; but when these complaints were investigated, it was found that the fault was in the foulness of the consumers' pipes or fittings. He next alluded to the various improvements that had been effected in the works during the past half year, and concluded by recapitulating the Directors' recommendations as to the dividend to be declared, after the payment of which £500 would remain to be carried to the reserve fund.

Mr. E. BOTTLE seconded the motion, and it was carried.

On the motion of the CHAIRMAN, seconded by Mr. T. W. Fry, it was unanimously resolved to create 500 new £10 shares, to meet the increasing demands upon the resources of the Company.

The CHAIRMAN remarked that he had forgotten to refer to the electric light. He said he had no fear as to its effect on the value of gas shares. If at the end of the present contract for lighting the streets of Dover the Town Council saw their way to using the electric light, the increased use of gas for lighting and warming houses would be such that there would be no doubt of the full dividend being continued; in fact, the owners of gas stock might, he thought, rest satisfied that their money was nearly as safe as if it were invested in Consols.

Mr. BARNETT proposed a vote of thanks to the Chairman for the attention he gave to the business of the Company.

Mr. CHIDWICK seconded the motion, which was cordially adopted.

The CHAIRMAN thanked the meeting for the compliment paid him, and in so doing said that when the Directors assumed the management of the Company they took upon themselves a large amount of responsibility, but they secured all the skilled assistance that could be had. Mr. R. H. Jones continued the management of the works with as much zeal as when his own pocket was in question; and, guided by Mr. T. N. Kirkham, one of the most eminent gas engineers in London, nothing was spared to keep up the efficiency of the works. He then called attention to the gas exhibition which had been organized, under the Company's auspices, in the Wellington Hall, to which reference is made in another column, and the proceedings closed.

HASTINGS AND ST. LEONARDS GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 3rd inst.—Mr. G. SCRIVENS, J.P., in the chair—when the following report was presented:—

Your Directors have, in each of their last seven or eight reports, referred to the general enlargement and remodelling then being carried out in the factory; and they now have the pleasure to report that the whole of the alterations, at different times referred to, are now virtually finished and in operation.

The enlargements were commenced in 1876, by the erection of new workshops and stores, which were finished in 1877. These have been most beneficial, especially as they have been the means of concentrating the whole of the men on one spot, and consequently under one superintendence. These buildings consist of gas-fitters' shop, carpenters' shop, paint shop, oil store, and a large warehouse 60 ft. by 32 ft. 6 in. over the whole, for fittings and general goods.

The second lift to the large gasholder was finished in 1878, being 110 ft. in diameter by 24 ft. deep, and containing about 228,000 cubic feet, which, together with the first lift, gives us a capacity in this holder alone of about 450,000 cubic feet; and the whole has worked with the greatest satisfaction ever since its completion.

The three old and inefficient boilers have also been replaced with two new ones of much larger calibre, each of the new ones having double flues, and being of a capacity to answer the requirements of the Company for some time to come. The boilers are each of an internal length of 22 ft. 6 in., and diameter of 7 ft., and are most efficient pieces of necessary plant. A new shaft 60 feet high, on a solid concrete 12 feet cube base, was also erected for the service of these boilers, the whole of which has been satisfactorily at work for the last eighteen months.

In 1879 the new purifying house was commenced, and considerable difficulty had to be encountered in getting a foundation. This, however, was overcome, and the building completed by Christmas of that year. The purifying house is 106 ft. long by 33 ft. wide, and 18 ft. 3 in. pitch, in which are fitted four 20 ft. by 20 ft. cast-iron purifiers, each 5 ft. deep, and a new and improved hydraulic travelling lift for hoisting the covers. All the requisite pipes, connections, and valves for these purifiers are also fitted in the house. This house has also a revivifying shed over it, being of the same length and width, and a pitch of 10 ft. to the eaves and 20 ft. to the top of the ridge. This shed has a fireproof floor of the most approved construction. The whole of this part of the works has been completed and at work since Jan. 1, 1880.

A new retort-house (called No. 2) is also just now finished. Here also, as in the case of the purifying house, considerable difficulty had to be met in preparing a foundation, the entire soil being simply bog. The retort-house (which is capable of enlargement) is at present 87 ft. 6 in. long by 65 ft. wide, the height to the ridge being 55 ft. It is capable of containing eight settings of 20 ft. through retorts; and everything has been so constructed that West's charging apparatus can be adopted at any future time, should it be felt desirable to do so. The house was sufficiently finished to be opened for work, by the Chairman, on Dec. 2 last, and has been satisfactorily at work from that date to the present time.

The sale of gas during the last few months has been such, that had it not been for the assistance received from the new retort-house, it would have been all but impossible to have kept the borough fully supplied with gas during the past winter. Happily, however, the work was finished in time to be ready for use when the greatest strain was put on the make, and we have consequently gone through the heaviest make we ever had with ease and pleasure.

The only part of the Company's plant that is now at all inadequate to the make of gas is the scrubbing and washing capacity, which has not been remodelled for some years. This, however, can, considering our large purifying space, and with attention, stand over for another year or two.

During the time that the above remodelling has been progressing, about £6000 has been expended in new mains, which have been laid down within the borough, for the supplying of new districts and the remodelling of others; and we have now the satisfaction of knowing that no district is in any way inefficiently supplied.

Your Directors cannot conclude this report of the great extensions of and additions to the works made during the past five years, without acknowledging that all plans and specifications connected therewith have been designed, and the undertakings carried out solely under the superintendence of their Manager and Engineer, Mr. A. H. Wood, without difficulty or accident.

The accounts, duly audited, leave a balance of £4547 8s. 10d. for the past half year; and it is proposed to pay a dividend at the rate of 10 per cent. per annum on the £25 shares, and a dividend at the rate of 7 per cent. per annum on the £20 shares, amounting together to £3378 2s. 6d.; leaving a balance of £669 6s. 4d. to be carried forward with the previous unappropriated balance.

The CHAIRMAN, in moving the adoption of the report, said it was longer than usual because it gave a *résumé* of the alterations which the Directors had made to the works during the past five years. The Directors thought it right to give this information, so that the Shareholders might see that there was something substantial to show for the large outlay. They believed that the works were now in first-rate order. New mains had been substituted for those worn out, which was an advantage to consumers, and also a saving to the Company. More gas was used in the year 1880 than in any previous year, and he saw no reason why the quantity consumed in the current year should not be equally great.

Mr. J. TURNER seconded the motion, which was adopted.

Subsequently, at the request of the Chairman,

Mr. A. H. Wood (the General Manager of the Company) made a few interesting remarks as to the present position and future prospects of the electric light in regard to gas and gas supply.

Mr. ELKIN then moved, and Mr. VENESS seconded a vote of thanks to the Chairman; and this being carried unanimously,

The CHAIRMAN, in responding, said 50 years had passed since he was first connected with the works. He could not expect to be connected with them very much longer; but he would do his best as long as he could.

ILFRACOMBE GAS COMPANY.

On Wednesday, the 2nd inst., the Annual Meeting of this Company was held, when the CHAIRMAN (Mr. T. D. Wivill) moved the adoption of the report of the Directors on the Company's affairs during the past year. It stated that the profit and loss account (after allowing for interest on loans, Directors' and Auditors' fees, &c.), showed a balance of £1434 13s. 6d. available for dividend, out of which the Directors recommended the Proprietors to declare a dividend (free of income-tax), at the rate of 7 per cent. on the "A" and "B" shares, and 4 per cent. on the "C" shares; also 3 per cent. arrears of interest on class "A" and "B" shares, which would leave a balance to be carried over to the current year.

Mr. FRINCH seconded the motion, and it was at once agreed to; and the dividends recommended were declared. It was also resolved to add, as in former years, £100 to the reserve fund.

The retiring Director and Auditor having been re-appointed,

Mr. GOULD proposed that a vote of thanks be given to the officers of the Company. He said the Company had good officers, and placed all confidence in Mr. F. R. Child, the Manager; Mr. Gemmell, the Secretary; and Mr. McCalpin, the Collector. They all did their duty well, and the Directors were perfectly satisfied with their conduct.

The motion was carried and suitably acknowledged; after which a vote of thanks was passed to the Chairman and Directors, and the proceedings terminated.

CANTERBURY GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held on Monday, Feb. 28.—Mr. G. FURLEY presiding.

The SECRETARY (Mr. J. Burch) having read the notice of meeting, the following report of the Directors was presented:—

The consumption of gas is steadily increasing, and this is doubtless attributable in a great measure to the large reductions which have from time to time been made in the price. The manufacturing plant is in good working order, but the increased demand for gas has necessitated the attention of the Directors to the carbonizing power, with a view to its extension; and under the advice of Mr. Jones, C.E., some additional retorts and machinery will be erected during the forthcoming season, which he believes will enable the Company to meet the increasing demand for three or four years.

Your Directors at the last half-yearly meeting proposed that, for the then current half year, the gas consumers should be allowed out of the accumulated profit a bonus of 5d. per 1000 cubic feet. This was done to test the price at which the consumers should in future be charged for their gas. The result shows that such a large reduction (combined with an increased expenditure during the last six months) has diminished the net profit derived from gas and water slightly below what is necessary to provide for the usual dividend of 8 per cent. per annum to the Shareholders. As it is expected that this additional outlay will not in future be required, the Directors feel that instead of a bonus the price of gas should be reduced from 3s. 4d. to 3s. per 1000 cubic feet, and they trust that the future profits will enable the Company to maintain the price at this moderate figure, provided that there is no advance in the price of coals.

The additions made to the water-works at the pumping-station are all working satisfactorily, and the plant generally is in efficient order. During the last half year attention has been given to the question whether it would be practicable and desirable to burn the chalk precipitate, so as to convert it into lime for softening the water. After various experiments and tests had been made, it was decided to erect a bed of ovens for the above-named purpose. The work has been most satisfactorily designed and carried out by Mr. Buckley, the Resident Engineer, and the result so far justifies your Directors in believing that all the lime required by the Company for softening purposes will henceforth be made on the works, at a reduced cost.

The accounts show a balance of £5587 8s. 5d. standing to the credit of profit and loss, and your Directors accordingly recommend that the usual dividend for the half year, after the rate of 8 per cent. per annum, free from income-tax, be declared and paid.

The CHAIRMAN, when moving the adoption of the report and accounts, made reference to the proposed reduction in the price of gas. He said: The Directors have given a great deal of consideration to this matter, and think a reduction to 3s. per 1000 feet in future will enable them to retain for the Shareholders the dividend to which they are entitled; and that this price will show that, compared with other towns, gas is supplied in Canterbury at a cheap rate. In considering this matter, we thought it necessary to engage Mr. Jones, our Consulting Engineer, to inspect the works, which he states are well looked after. But as every year the concern increases, our Manager, Mr. May, states that we shall want an addition to the retort-house accommodation. Mr. Jones advised us that the available retorts will last about three or four years, but by this time we must be prepared to make a further extension of our plant. This will involve some alteration in the present appliances. Fortunately we have a sum of money—£1500—which we propose to set apart towards what is required for the renewal of the works, and we also propose to take for the purpose £500 a year from the floating balance of the Company. You will see that in the reduction we propose, as compared with the price paid for gas in 1879, the Company give the consumers the benefit of over £2000 a year. The water-works are now proceeding in a satisfactory way, and we are endeavouring as far as we can to improve them. We shall, however, take care that whatever is done will be done carefully and economically.

Dr. REID seconded the motion, and it was agreed to.

Mr. T. F. COZENS congratulated the Directors upon their successful management of the Company's affairs. He proposed that the Board remain at ten, as at present, and that the same remuneration as previously awarded be continued.

Mr. MILES seconded the motion, and it was carried.

The CHAIRMAN thanked the meeting for their renewal of confidence.

Alderman Hart, Mr. W. H. Linom, and Mr. Amos, the retiring Directors, were re-elected; Mr. Lancaster was appointed Auditor; and £5 5s. each was voted to the Kent and Canterbury Hospital and the Dispensary.

An extraordinary general meeting was then held to consider the propriety of converting into stock the existing 800 "A" shares of the Company.

On the motion of the CHAIRMAN this was agreed to, and the meeting terminated.

TROWBRIDGE WATER COMPANY.

The Ordinary General Meeting of this Company was held at the Company's Offices in Cambridge on the 26th ult.—Alderman PEED in the chair.

The SECRETARY (Mr. W. Peed) read the Directors' report, which stated that the past year had been an exceedingly unfavourable one, owing to the number of empty houses and the depressed state of trade in the district supplied by the Company. Another check to increased demand for the water had been the continued succession of wet seasons; but the Directors had good reason to believe that when trade in the Western Districts revives, and seasons assume a more normal aspect, the necessities for an ample supply of the Company's water will proportionally increase, and the remuneration to the Shareholders be augmented. They recommended a dividend on the consolidated stock and on the amounts paid up on the new shares (issued under the Acts of 1873 and 1878) of 3 per cent., free of income-tax, which would leave a balance of £6 19s. 4d. to be carried forward.

[The Engineer and Manager (Mr. H. Tomlison, A.I.C.E.) reported that during the past year water from the Company's works had been laid on to 278 premises, the income from 272 of which was £162 per annum; the remaining 6 services being supplied through meter, and the amount derivable therefrom would be at a minimum rate of £2 per annum each. He reported the general condition of the Company's works as satisfactory.]

The CHAIRMAN, in moving the adoption of the report, said the Directors could only express their regret that the bad seasons were affecting the Company in common with landed proprietors and others; but they were not discouraged, for of all the essentials of life a good and wholesome supply of water was most needed. He had every reason to believe that the Company would progress. The Directors had had a statement prepared showing the number of houses supplied with water, and the result of this inquiry showed that they were supplying about half the number in the district, and they had every reason to believe that when they supplied the better class of houses the concern would flourish as all companies of a similar nature did.

Mr. D. ADAMS seconded the motion.

Mr. COULSON asked whether the position of the Company was perfectly safe from compulsory purchase by the Local Authorities.

The CHAIRMAN said only an Act of Parliament would authorize them to do so, and before this could be passed the Company would have a word to say on the subject.

Mr. TOMLISON referred to the last case of this kind, which was that of the Stockton and Middlesbrough Water Company, and which was settled on terms most satisfactory to the Company. They were compelled to sell their works, but at such a price that the Shareholders received £970 for every £100 share.

The motion was carried unanimously, and the dividends declared.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

When a gas consumer is told that it is possible to effect a saving of 25 per cent. by the use of proper appliances for controlling the pressure, at which gas is supplied by corporations and companies, he, if he has paid the slightest attention at all to the subject, will in all probability give a significant shrug of the shoulders, and, it may be, will be inclined to doubt whether his informant is a knave or a fool. And there is no great difficulty in understanding how this comes about. In this department of business, almost more than any other that I can imagine at the present moment, there has been enough swindling to sink the reputation of the whole profession, and the dupes of the rogues who practise these arts have therefore every reason to feel sceptical when the subject is broached. Who is not familiar with the appearance of that man who, from motives of the purest philanthropy, devotes the remaining energies which he has at command to the propagation of a more general knowledge of the principles which govern the flow of fluids? In his capacious pockets he carries a large supply of new "patent" burners, the construction of which is simplicity itself. Of course, it is on the absence of detail that he principally relies. By a dexterous movement he shows at a glance that, with any other burner than his, there is a great loss in the shape of unconsumed gas, and the proof positive is the deposit upon a sheet of white paper held above the flame of a certain amount of carbon. He asks you to reduce the pressure at the meter by a half, and then, by inserting his "patent" burner, he demonstrates that with one-half of the gas you have an equally large flame, and no deposit of carbon shown by the paper test. As a rule, it is only after the smart demonstrator has sold a supply of burners at a high percentage above their commercial value, that the consumer discovers he has been most successfully swindled. But there are other departments in which the consumer is attacked. The regulation of the pressure has long engaged the attention of the most eminent gas engineers, as well as of other engineers who have no claim to eminence except in a sense the reverse of complimentary. From a thousand and one sources these regulators have been put into the market, and by every device that human ingenuity can suggest, forced upon the unsteady and often unintelligent gaze of gas consumers. They are sometimes mechanical devices which, with a steady consumption, attain a very good result; sometimes they are automatic, and give equally good results with varying pressures; and sometimes they are of such a description that it would be difficult, even upon searching inquiry, to discover wherein their merits lay. But still good results are claimed and duly heralded abroad. One would almost think that to bring gas regulators to Edinburgh looks like carrying coals to Newcastle; yet it has been done, and Yorkshire has the honour of entering the camp with a regulator, the advantages accruing from the use of which are so manifest, that I am afraid the laurels which have long adorned the brow of Mr. D. Bruce Peebles will speedily fade. The regulator to which I refer is called "Fearnley's Universal Gas Regulator," and by its use "a saving of 25 per cent. could be realized. The conditions of purchase being that, if a saving cannot be shown in ten minutes, the regulator to be removed free of charge." Then again, "The vast superiority of this regulator over all others is, that it takes possession of the gas before it enters the meter, which is the only true way to derive a saving." Who, having once read this announcement, would fail to procure one immediately? There is no intricate mechanism to go wrong. The apparatus is simplicity itself, for it mainly consists of two wires on a drum, these wires being attached at the one extremity to a lever at the meter. The wires can be carried any distance off, and as a dial with an index is provided, the owner of the establishment in which the invention is placed is able to turn this index so as to regulate the flow for the number of lights he desires to keep burning. In fact, it possesses all the simplicity of an ordinary tap, which, of course, it resembles, although the dial and the index would lead many people to think that there was something mysterious about it. The inventor of this ingenious appliance undoubtedly thinks that it ought to be everywhere, and this week he or his representatives have invoked the aid of the Civil Magistrate to compel a shoemaker in Leith to retain an apparatus of this description. John Leckie, the shoemaker in question, through some means or other, probably on the score of economy, was induced to allow one of these regulators to be introduced into his shop, and after all the work had been done he had the temerity to question the efficacy of the apparatus. He not only refused to pay the price of four guineas, but ordered the whole thing to be removed. He was not to be allowed to get off so easily, however. He has been brought before the Sheriff this week, and in the course of his evidence said that when the saving was to be tested, his shop was in comparative darkness, and even then a saving of 25 per cent. was not shown. Notwithstanding his protestations, decree was given for the four guineas, with expenses. By this time he has probably realized that he has paid dearly for his whistle.

On Tuesday evening a meeting of the Gas Corporation of Arbroath was held to dispose of the applications for the vacant post of Manager of the works. As I mentioned last week, the short list consisted of Mr. D. C. Niven, Dunoon; Mr. R. S. Carlow, Port-Glasgow, and Mr. W. Taylor, Elgin. On a vote being taken, Mr. Taylor was rejected;* and on a second vote, between Mr. Niven and Mr. Carlow, the latter gentleman was chosen by the casting vote of the Chairman. Mr. Carlow is to be congratulated on the appointment. The difficulties which he has had to face, and which, by indomitable perseverance, he surmounted at Port-Glasgow, will all the better qualify him for the office at Arbroath. Like Bailie Nicol Jarvie, he has been "in great tribulation;" but it is to be hoped that he will soon recover his natural buoyancy of spirits.

Last week Mr. Frank Scott, Manager at Tillicoultry, delivered a lecture to the Tillicoultry Literary Association, on "Gas." He gave a popular exposition of the manufacture of gas, as well as some wholesome advice on the proper method of burning. He declared that, after repeated experiments, he had come to the conclusion that the old iron burner was a great gas waster.

In Inverness the Gas Commissioners have had various applications for the extension of their mains to districts outside the existing supply. With some of these applications the Committee have been authorized to deal, while with others there have been refusals. I was a little astonished to find that in the Highland capital there still prevails a feeling against the introduction of larger lamps for the better lighting of the streets. A question was recently raised as to whether, on a public place, one of the

new improved lamps should be placed; but by a majority it has been resolved to put up two of the ordinary description. This is a degree or two worse than Edinburgh. Yet the supply of the large lamps here is slowly but steadily increasing. I do not know whether it is that the makers cannot supply the demand, or that the lamps are only obtained as the funds of the Corporation permit such an extravagant outlay, but every other week sees the introduction of a new lamp. The sight at the Post Office after dark is very fine, and the same effect is now being produced down Leith Street. It is quite evident that one of these improved lamps might advantageously take the place of three ordinary lamps.

At the monthly meeting of the Town Council of Montrose on Thursday, Provost Jaap stated that the adoption of the Burghs Gas Supply (Scotland) Act had been registered, and he gave notice of this motion—"The Council, considering that the Burghs Gas Supply (Scotland) Act, 1876, has been adopted within this burgh, remit to the Treasurer's Committee, with instructions to ascertain on what terms it is probable the Montrose Gas-Works may be acquired by the Corporation, and such other information as the Committee may think it necessary that the Council should be in possession of, before resolving on further procedure, and to report."

From time to time there have been complaints made, both outside and inside the chambers of the Water Commissioners of Edinburgh, as to the quality of the plentiful supply of water which was some time ago introduced. The result was that Professor Crum Brown and Dr. Buchanan were asked to prepare separate analyses of the following waters:—Gladhouse, taken at the point where discharged into the Edinburgh pipe; the mixed water of Portmore and Gladhouse, unfiltered; the Moorfoot water at Alnwickhill, after filtration; and the filtered water at Alnwickhill as delivered for consumption—taking the water at such times as they might consider advisable to obtain fair analyses. The results of the analyses thus made have been sent in tabular form to the Trustees, and lead the reporters "unhesitatingly to the opinion that all these four samples of water are of excellent quality, and well adapted for the water supply of a town." It seems that all the chemists, numbering about a dozen, who at different periods have analyzed these waters, have, with the exception of Dr. Frankland, pronounced them excellent. Despite this almost irresistible evidence, a voice was heard at the meeting of the Trustees on Thursday against trusting too implicitly in this proof. Ex-Provost Wood, of Portobello, said that the water is now infinitely superior to what it was at Midsummer last year. This was to be kept in view, and the meeting was not to gild the matter too brightly. The general verdict, I think, will be one of satisfaction.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the last meeting of the Kilmarnock Corporation Gas Committee it was resolved to clear off the Standard Assurance Company's mortgage of £8000 at the ensuing Whitsunday term. The Committee also had under consideration the question of raising the sum of £9000 on mortgage, the individual sums to be borrowed not being less than £100, and the interest to be at the rate of 4 per cent. for five years, and 4½ per cent. for seven years. By this arrangement the townspeople possessed of small sums of money will be encouraged to take an interest in an important Corporation undertaking, by getting a better return for the loan of their money than is obtainable by banking it. A very large proportion of the money required has already been offered, and the greater proportion of those persons who have offered loans desire to lend the money for the period of seven years.

It is again my duty to refer to the strange conduct of the Directors of the Dalry Gas Company, in regard to the summary dismissal of Mr. Brown, the Manager of their works. The treatment which this gentleman is receiving at their hands has called forth no fewer than four additional letters, which are published in this week's issue of a local newspaper. Hitherto the Directors of the Company have not attempted to say anything in their own defence. One of the correspondents, who signs himself "Another Shareholder," says that for a number of years the directorate of the Company was held by men who were gentlemen in every sense of the word, and who understood the duties of a manager, so that by working together, Directors and Manager, they made the concern one of the best and most lucrative of the kind in Scotland. And he goes on to say that during the past few years death has made sad havoc amongst them, and that unfortunately, as their successors, there were appointed persons who were suddenly made rich, and came into the possession of gas shares. He urges that the Shareholders should be up and doing, as it is evident that the parties who have been made Directors by mistake, with their little brief authority, are intent on exemplifying the truth of the homely proverb about the beggar on horseback. The subject is a very unpleasant one, and the sooner a satisfactory explanation of Mr. Brown's dismissal is forthcoming the better.

Much interest has been excited in Glasgow and certain towns in the West of Scotland by the announcement that Mr. J. W. Swan, of Newcastle-on-Tyne, is to discourse on the electric light, with special reference to his own incandescent lamp, before the Philosophical Society of Glasgow, next Wednesday evening. Considering that the Society's place of meeting is capable of seating only about 300 persons, while the number of members is well-nigh 700, it is difficult to see how accommodation can be secured by all those who wish to be present on the occasion, and who are not limited to the ordinary members, as there are doubtless hundreds of other persons who are desirous of hearing Mr. Swan, and of seeing his ingenious and interesting lamp in action.

The Water Commissioners of Dumbarton are seriously considering the propriety of increasing their water supply storage. It is not unlikely that before long there will be submitted for consideration a somewhat extensive scheme, on account of the rapid increase of the town.

A report on the water supply of Helensburgh was submitted to the Police Commissioners of the town at their meeting held last Saturday. It stated that the consumption of water last month was about 13 million gallons, as against 16 million and 17 million gallons in previous months. There had been a great many bursts in the pipes during the recent frosts, one of them extending to a length of about 60 yards in the Clyde Street main. In moving the adoption of the report, Bailie Forsyth remarked that there was not a house on the hill at present without water.

The agent for the Marquis of Bute has made arrangements for introducing a supply of water for Kilchattan Bay, a rapidly rising watering-place in the Island of Bute, at an estimated cost of £1000.

So far as the water supply provisions are concerned, the Oban Burgh Bill has passed the Committee stage in the House of Lords. The Bill provides for a storage of 60 million gallons of water, so as to supply a population of 10,000 inhabitants with 30 gallons per head per day. The estimated cost is £4000.

There is still a want of animation in the Scotch pig iron trade, notwithstanding a slight spurt in warrants. The closing quotation yesterday at noon was 49s. 2d. cash; but lower prices were taken during the week.

Large orders for coal for foreign ports are now in hand, particularly for Odessa, France, and the Mediterranean ports. Prices remain tolerably firm for some varieties of coal.

* In reference to this matter, Mr. Taylor sends us a communication, in the course of which he says: "A letter from David Chapel, Esq., written and posted in Arbroath on the 4th inst., wherein I was summoned to attend a meeting on the 9th, at which the appointment was to be made, reached me in Elgin to-day—10th inst.—at mid-day. I had therefore no intimation of the date of the meeting, nor the chance of being present, as requested, which I would and could have done had Mr. Chapel's letter reached me, or a supplementary telegram, in the event of a miscarriage in these days of blocked lines and overdue correspondence. I feel this explanation is necessary in my own interests, as I presume my chance was lost, not on the score of professional qualification or character, but by reason of my absence as above explained."—ED. J. G. L.

SALES OF GAS SHARES.—On Thursday, the 3rd inst., Messrs. Spelman sold by auction in Norwich some shares in the British Gaslight Company at from £33 to £34 each.—On Friday last, Messrs. Howgate and Chapman sold by auction 10 £5 new shares in the Osett Gas Company, at £8 1s. each; 111 £5 original shares in the Mirfield Gas Company, at £10 11s. each; 10 original £5 shares in the Wakefield Gas Company, at £12 2s. 6d. each, and 20 £5 "B" 5th shares at £9 3s. 6d. each; also 25 £5 shares in the Rothwell Gas Company, at £7 18s. 6d. each.

DARTMOUTH GAS COMPANY.—The annual general meeting of this Company was held on Monday, the 7th inst.—M. Fox, Esq., J.P., in the chair. The Secretary (Mr. R. Crauford) read the Directors' report, which showed the year's receipts to be £2138, and the expenditure £1542. A dividend of 10s. per share, which would absorb £350, was agreed to. It was mentioned that considerable outlay would be required this summer for new retorts, and some additions to the works generally were also contemplated. The advisability of extending a gas supply to Kingswear and Stokefleming was again mooted. Alluding to the electric light, the Manager of the works (Mr. Tall) said he did not believe it would supersede gas in Dartmouth for the next 30 years. Messrs. R. Soper and R. W. Egg, the retiring Directors, were re-elected, as was also Mr. R. L. Fox, Auditor.

CARSHALTON GAS COMPANY.—The half-yearly meeting of this Company was held on Tuesday, the 1st inst. Mr. Newton, who occupied the chair, moved the adoption of the report of the Directors, which congratulated the Shareholders on the prosperity of the Company. The increase of revenue was not large—a fact that was attributed to the reduction of 3d. per 1000 feet in the price of gas, and the mildness of the season at the end of the past year. The balance available for dividend was £2161, leaving a balance of £723 15s. to be carried forward to the profits of the succeeding year, and allowing for £100 that had been carried to the reserve fund. A dividend at the rate of 10 per cent. was recommended, free of income-tax. The report and balance-sheet were unanimously adopted, and a resolution was passed agreeing to the declaration of a dividend at the rate named. A vote of thanks to the Chairman terminated the proceedings.

CLEATOR MOOR GAS COMPANY.—The annual general meeting of this Company was held on the 25th ult., when the Directors presented their report, together with the statement of accounts for the year ending December last. The balance-sheet showed that the receipts on revenue account were £2238, and the expenditure £1353, leaving a gross profit of £885. As no deduction has ever been made from the cost of the works for depreciation, the Directors considered it necessary to write off the sum of £428 as depreciation. After providing for this and for dividend on the preference shares, bank interest, bad debts, &c., and taking into account the reserve fund of last year, there remained a balance of £488 available for division. Out of this the Directors recommended a dividend of 5 per cent. per annum, which will absorb £384, and leave a balance of £104 at the credit of the reserve fund. During the year 1880, an amount of £1032 was expended on capital account; but this was rendered necessary, owing to extensions to Cleator, the provision of a new engine, &c.

ACKWORTH, FEATHERSTONE, PURSTON, AND SHARLSTON GAS COMPANY.—The annual meeting of this Company was held last Tuesday—Mr. A. Wardman in the chair. The Secretary (Mr. J. Watson) read the notice convening the meeting, also the particulars from the balance-sheet; after which Mr. W. Oldfield, the Manager, presented the working statement. This showed a considerable increase in all the items of receipts. The report further showed that 10,109 cubic feet of gas had been produced per ton of coal carbonized; that the leakage account had been reduced from 26 to 11 per cent.; and that the works are in a state of very good repair. The Chairman moved the adoption of the report and balance-sheet, which was seconded by Mr. J. Smith, and carried unanimously. It was then resolved that a dividend of 5 per cent. be declared, leaving a balance of £127 to be carried forward. Mr. Denton, in very complimentary terms, proposed a vote of thanks to the Chairman, Directors, and Officials of the Company, which was seconded by Mr. R. Holt, and carried unanimously.

THE HALIFAX CORPORATION AND THE SALTERHEBBLE GAS SUPPLY.—Some time ago the ratepayers of Salterhebble petitioned the Halifax Corporation to supply their district with gas, instead of leaving them to obtain their supply from the Elland Gas Company, as they have for some years done. The cause of this preference on the part of the Salterhebble ratepayers is the probability that the Halifax Corporation, having lowered their price 1s. per 1000 feet, will in the course of another year or so make a further reduction, bringing the price below that which the Elland Gas Company could afford to sell their gas. As the Company have all their pipes laid to Salterhebble, and have an Act of Parliament empowering them to supply the place, they are inclined to resist the sending of Halifax gas there. Counsel's opinion has already been sought on both sides; but now the question has been submitted for settlement to four arbitrators—two on behalf of the Elland Company (Mr. R. Walker, Chairman, and Mr. W. A. Walker, Engineer), and two for the Halifax Corporation (Alderman Riley, Chairman of the Gas Committee, and Mr. W. Carr, the Engineer).

FATAL ACCIDENT AT A GAS-WORKS.—On the 5th inst., Mr. W. Carter, Coroner for the Eastern Division of Surrey, held an inquiry into the death of Thomas Goldsmith, aged 47, who was found in a trench at the South Metropolitan Gas-Works, Rotherhithe New Road, on the 28th ult. It appeared from the evidence of several witnesses that the deceased and

other labourers were employed in deepening a trench at the works, to draw off water which had percolated from the works to the earth. While deceased was down the hole he was seen to stagger; and, on being brought to the surface, life was found to be extinct. Dr. Browning, the Medical Officer of Health for Rotherhithe, deposed that on the morning of Feb. 28 he was called to the gas-works, and saw the deceased lying in the engine-room. Galvanism and other remedies were resorted to, but without effect. The body was pale and warm, but there was no appearance of a fit. Witness examined the trench where the deceased had been working at the time of his death, and there collected samples of air for analysis. He had since performed a *post mortem* examination, the result of which, together with his analysis, proved that deceased had died from the sudden inhalation of poisonous gases—carbonic oxide and ammonium sulphide, arising from the escaping liquid in the trench. The Jury returned a verdict of "Accidental death."

THE PURCHASE OF THE NEWCASTLE-UNDER-LYME GAS-WORKS BY THE CORPORATION.—At the last meeting of the Newcastle (Staffs.) Town Council, the agreement between the Corporation and the Gas Company, to enable the latter to carry on their undertaking until the purchase by the Corporation is completed, was brought forward in order that the common seal of the Corporation might be affixed to it. Mr. Briggs, in moving that the seal be affixed, said it was an agreement between the Corporation and the Company, whereby the gas undertaking might be carried on until such time as the Arbitrators made their award, and the property was transferred to the hands of the Corporation. When the arbitration proceedings were under consideration in London, the question arose as to what time should be fixed for the transfer, and by agreement it was decided that the time should be the 30th of June last year. There were various reasons why this time should be fixed, the main one being that the accounts had been made out by the joint accountant up to this date. The question had arisen as to what percentage should be paid by the Corporation upon the award from the period from which the works and plant were virtually transferred to the Corporation—the 30th of June, 1880—up to the time of payment. At first it was proposed to make the interest 5 per cent. per annum; but this was altered, and it was agreed that the rate should be 4 per cent. The Assistant Clerk having read the agreement, it was ordered that the common seal of the Council be affixed to it.

DOUGLAS (ISLE OF MAN) GAS COMPANY.—The ninety-second half-yearly general meeting of this Company was held on Monday, the 28th ult.—Mr. G. W. Dumbell in the chair. The Directors reported that the profits made in the half year ending Dec. 31 last amounted to £2959, and exceeded those for the corresponding period in the previous year by £669. This was accounted for by the greatly increased returns for coke, tar, and ammoniacal liquor; the latter item being an entirely new source of revenue. There had also been a great increase in the consumption of gas, consequent upon the past visiting season being so successful. Arrangements had been made for the erection of additional retorts, and new condensers and scrubbers were in progress. In consequence of the large outlay incurred in extensions of plant, over and above that which was required to erect the new gasholder and tank, the Directors recommended that a call of one-tenth of a share at par be made upon the Shareholders. They also recommended that the dividend for the half year be £1 10s. per share. Better working results, consequent on the great improvements in the manufacturing plant now in progress, were anticipated by the Directors, who would, they said, be prepared in a short time to give the public the benefit by further reducing the price of gas. The Chairman moved the adoption of the report, which, after some conversation relative to the proposal of the Directors to raise further capital for the extension of the works, was agreed to. Some discussion then took place as to the desirability of amending the rules under which the Company work, and the proceedings closed with the usual votes of thanks.

Register of Patents.

APPLICATION FOR LETTERS PATENT.

974.—THORN, F. W., Maida Vale, London, "Improvements in gas brackets specially adapted for lighting the interior of bakers' ovens, but also applicable to other purposes." March 7, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3630.—PEEBLES, D. B., Bonnington, N.B., "Improvements in and connected with apparatus for governing or regulating the flow or pressure of illuminating gas." Sept. 7, 1880.

3685.—WILLIAMS, H., and MALAM, J., Southport, Lancs., "Improvements in and relating to atmospheric air and gas motor engines." Sept. 10, 1880.

3695.—PARKER, J. F., Gravelly Hill, Warwick, "Improvements in the manufacture of gas for illuminating and heating purposes, and for melting and reducing metals from their ores." Sept. 10, 1880.

3730.—POPE, A., Slough, Bucks., "Improvements in the manufacture of gas and in apparatus therefor, and for lighting and heating railway carriages, and for similar purposes." Sept. 13, 1880.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending March 9, 1881.

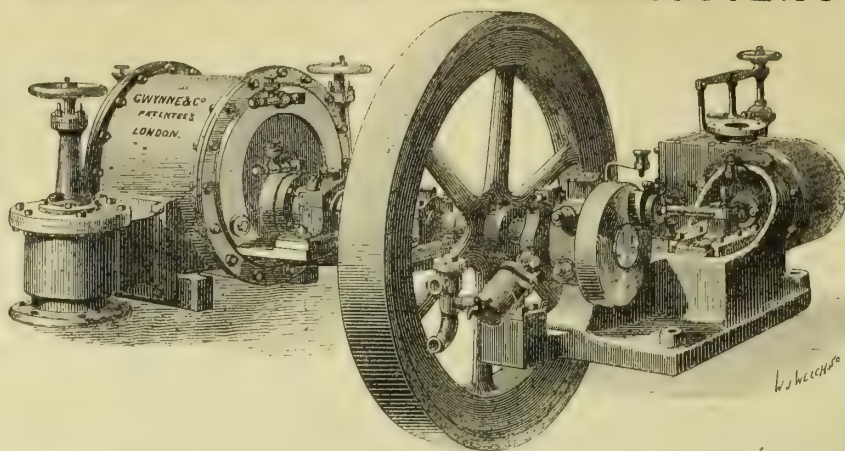
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.4	17.2	17.3	8.2	5.6	6.8	0.3	0.0	0.1	None.	In excess.
	Camden Town	17.9	16.8	17.3	16.2	13.6	14.8	0.0	0.0	0.0	"	"
	Dalston	17.4	16.9	17.1	18.1	12.0	16.4	0.2	0.0	0.0	"	"
	Bow	18.0	17.1	17.7	13.7	11.9	12.6	0.6	0.3	0.4	"	"
	Chelsea	17.2	16.8	17.0	19.2	15.6	16.9	0.4	0.0	0.2	"	"
	Kingsland Road	17.8	16.8	17.2	15.9	14.2	14.8	0.3	0.1	0.2	"	"
	Westminster (cannel gas) . .	22.2	21.1	21.5	3.8	3.6	4.2	1.2	0.4	0.7	"	"
South Metropolitan Gas Company . .	Peckham	17.3	16.7	17.0	14.1	10.7	12.7	0.6	0.0	0.3	"	"
Commercial Gas Company	Old Ford	17.9	17.1	17.5	18.7	14.0	15.9	0.3	0.1	0.2	"	"
	St. George-in-the-East . . .	18.0	17.1	17.5	12.4	9.1	10.1	0.4	0.2	0.3	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.

Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

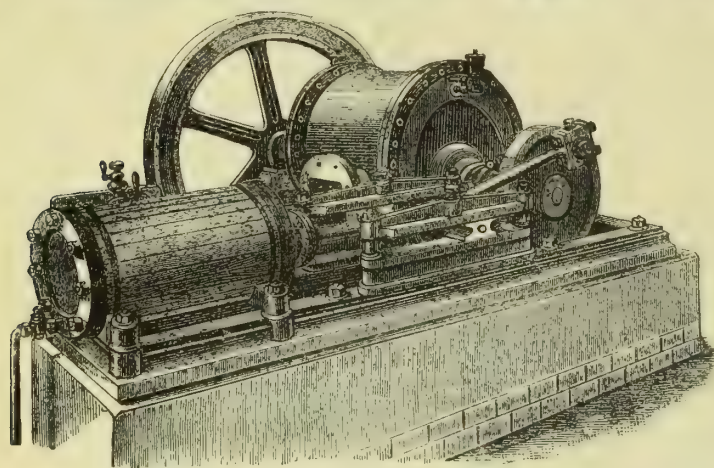
Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE
OSCILLATION, FRICTION, AND POWER.

TO WORK BY BELT OR WITH

ENGINE COMBINED.



G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT PAGE 462.]

GEORGE WALLER & CO.,

Makers of BEALE'S EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
SELF-ACTING BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

PHENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED. Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, Votes for the Masonic School, for a Son of the late William C. Watson. ANY VOTES can be exchanged. Kindly send to **MAGNUS OHREN, Gas-Works, SYDENHAM.**

WANTED, by a Single respectable Young Man, a Situation as Gas-Fitter. Can do Service or Main Laying. Would have no objection to go abroad. Address **W. DAY, 15, Woodbridge Road, GUILDFORD.**

WANTED, by the Advertiser, a Situation as DRAUGHTSMAN or Assistant in a Gas-Works. Well up in details of Construction, Manufacture, and Distribution. Aged 30. No objection to go abroad. Address **No. 726, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

WANTED, by the Advertiser, a Situation as FOREMAN or Clerk in charge, or Inspector, Collector, and Meter-Fitter, &c. First-class testimonials. Address **No. 728, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

ADVERTISER is open for Engagement as WORKS MANAGER, or TRAVELLER for a good firm of makers of Gas Appliances (Burners, Stoves, &c.). Could introduce several new specialities. No objection to going abroad. Address **No. 730, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

RE-ENGAGEMENT wanted as Manager or SECRETARY and MANAGER of Gas-Works, or ASSISTANT in large Works, by one who has for the last 12 years been Manager of Gas-Works in a large provincial city. Aged 34; married; abstainer. Can leave present situation at brief notice. Highest recommendations. Address **No. 727, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

TO GAS MANAGERS.

THE Cowes Gaslight and Coke Company require a Competent MANAGER for their Works at West Cowes, in the Isle of Wight. He must be thoroughly acquainted with the Manufacture and Distribution of Gas Extension and General Repairs of Plant. Make under 15 millions. A residence with good garden, coals, gas, &c., found on the premises. The person appointed would have to commence his duties on the 24th of May next. Application, stating salary required and enclosing copies of testimonials, to be sent on or before March 31st, to **T. HALLIDAY, Secretary, 59, High Street, WEST COWES.**

WANTED to Purchase, a good Second-hand SCRUBBER, round, about 16 ft. high by 3 or 4 ft. in diameter. State price delivered on rail. Particulars to be sent to the undersigned. **W. S. M'GREGOR, Manager.** Gas-Works, Ringwood, March 12, 1881.

WANTED, Supply of Screened and Unscrened COALS for GAS PURPOSES, for One or Three years, from the 1st of May next. Tenders (endorsed) stating price per ton delivered at the Company's Works; to be sent on or before the 1st of April next, addressed to **Mr. C. H. Minchin, Normanby, Middlesbrough, the Chairman of the Company.** Gas Company's Office, South Bank R.S.O., March 12, 1881.

SECRETARY wanted by the Southbank and Normanby Gas Company. Must be an experienced Accountant, who understands Book-keeping by double entry on the most approved principles; also the Preparation of the Annual Balance-Sheets, the Collecting of Accounts, and the routine of an Office. Salary £120 per annum.

Applications to be made in town handwriting, stating age and present employment, accompanied by testimonials, to be sent to **Mr. C. H. Minchin, Normanby, Middlesbrough, the Chairman of the Company,** not later than the 22nd inst.

Gas Company's Office, South Bank R.S.O., March 12, 1881.

GAS PLANT FOR SALE.

THE Gas Committee of the Bolton Corporation invite TENDERS for the Purchase of all or any of the following APPARATUS.

Set of four Purifiers, each 12 ft. square by 5 ft. deep, and having five tiers of wooden sieves in each chamber. There is a dry-surfaced Centre Valve, with Connections, 12-in. diameter throughout. The whole is in excellent condition, having been erected four years ago by Messrs. R. Dempster and Sons.

Set of four Purifiers, each 9 ft. square by 5 ft. deep, with five Tier Sieves. To this set is an Hydraulic Centre Valve. All Connections are 12 in. diameter.

One Musgrave's Exhauster capable of passing 50,000 cubic feet per hour. This is strongly built and in tolerably good repair.

About 10,000 yards of 2-in. bore cast-iron turned and bored Gas-Main, coated and in good condition.

For further particulars apply to **Mr. Fraser, Engineer, Gas Offices, Bolton.**

Tenders to be sent to the undersigned, and early offers are desired, as the apparatus has to be removed for extensions to be immediately proceeded with.

By order,

R. G. HINNEL, Town Clerk.

Town Hall, Bolton, March 8, 1881.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 22, 1881.

THE RETROSPECTIVE APPLICATION OF THE GAS-WORKS
CLAUSES ACT, 1871.

A DECISION of the greatest importance to a large number of Gas Companies throughout the United Kingdom was given by Justices Grove and Lindley, in the Queen's Bench Division of the High Court of Justice, on Monday, the 14th inst., in the matter of the appeal by the Dudley Gaslight Company against a conviction by the Justices of Dudley. The proceedings before the Justices have already been reported in the JOURNAL,* and the offence with which the Company were then charged consisted in not keeping and selling to Mr. E. M. Warmington, a ratepayer and also Town Clerk of Dudley, a copy of the annual statement of their accounts, made up to Dec. 31, 1877, in the form, and containing the particulars specified in schedule B to the Act 34 & 35 Vict., cap. 41, commonly cited as the Gas-Works Clauses Act, 1871. At the trial before the local Bench the defendant Company did not deny the facts, but pleaded that as their undertaking was regulated by a private Act of Parliament passed in

1853, and by the Gas-Works Clauses Act of 1847, which was incorporated with their special Act, they were not bound to comply with the general Act of 1871; thus putting forward in their own defence the difficulty of construing the wording of the Acts which has in many other cases exercised those in similar circumstances.

The argument against the Company was based on three points, arising out of the primary fact of their having obtained an Act in 1853 incorporating the general Act of 1847. In the latter Act, in clause 49, there occurs the proviso that nothing in the Act itself, or in the special Act which incorporates it, shall be deemed to exempt the undertakers from any general Act, subsequently passed, relating to gas-works. This is explicit enough as a disclaimer of finality; but in addition to this the Company's special Act of 1853 expressly admitted the liability of the Company to subsequent general legislation. The third and most important point relied on by the prosecution was the first clause of the Act of 1871, which states that the "Act of 1847 and this Act shall be construed "together as one Act." In support of their argument, the prosecution quoted the case of the *Commercial Gas Company v. Scott*, which turned upon the applicability of the 1871 Act, through the Metropolis Gas Act, 1860, to the Metropolitan Companies who had adopted the Act of 1847. The Justices, as we have said, favoured the views of the prosecution, and fined the Company £50, but granted a case for the consideration of the Superior Court, and this has resulted adversely to the appellants. After hearing the Counsel for the Company, the Court dismissed the appeal without calling upon the respondent's Counsel, and refused the appellants leave to appeal against their decision.

It therefore stands recorded without a shadow of ambiguity, or hope of reversal as long as the Acts of Parliament remain as they are, that all incorporated Gas Companies who do not comply with the 1871 Act are transgressing the law, although their own special Acts may be antecedent to that Act; the sole condition necessary to bring them under the operation of the later general Act being their previous acceptance of the Act of 1847. It is impossible to over-estimate the importance of this recent decision to those Companies upon whose legal status it directly bears. It simply means the sudden and in many cases unexpected imposition of what to them must appear to be a new set of regulations, certainly uncalled for, and possibly regarded—while still deemed a necessity to be accepted at some perhaps distant day—in no very kindly spirit. It is unnecessary now to inquire how it has happened that the full scope of a general measure has remained undetermined for ten years. This is the fact, and however much it may be argued that such a delay in testing the legal meaning of the very first clause of an Act of such widespread importance, goes to show that when it first became law the interpretation was well understood, but that with the lapse of time its principle became dimmed, and that therefore a purely verbal interpretation thereof has become possible, the reality remains that we have no longer to deal with hypotheses, but with the fact that a universally retrospective action has been given to an Act which does not contain any exact verbal provision to this effect.

The gist of the whole past difficulty was that the Act, now declared to be fundamentally retrospective in its action, also contains a clause expressing, in so many words, that its provisions are to apply to every gas undertaking authorized by any special Act to be afterwards passed, while in the same clause not a word is said as to any retrospective action, which thus depends solely upon the construction of the three points mentioned particularly with reference to the Dudley Gas Company. It has been said that the Courts are disinclined to give a retrospective operation to any statute, if any other interpretation of its meaning is possible. In the present case, this disinclination has been overcome on perhaps the slenderest possible provocation. Still, it must not be forgotten that the late decision is not altogether a precedent. The single instance of the *Commercial Gas Company v. Scott*, although somewhat different in detail, and even in principle, shows that some six years since there was no difficulty to the legal mind in giving sanction to the principle of constructive retrospection in connection with the same Acts. For peculiar reasons, this decision was not appealed against at the time, and it has now taken a solidity which it then perhaps lacked; at all events, it has since become a power to be reckoned with, as the Dudley and many another Gas Company have now found. Much time and trouble might be spent in investigating the phraseology of the potent clauses in the 1847-71 Act (as it should now be written), to disinter the meanings, conflicting

* See Vol. XXXV., p. 877.

and divergent, which it might be made to bear. All such labour would, however, be worse than wasted, as it might arouse vexation, but could do no good, until a new general Act relating to gas undertakings is about to be laid before Parliament; by which time, perhaps, all the Companies whose powers date from between the two crucial periods when the first and second existing Acts were passed, will have accepted the inevitable consequence of renewed application for legislative facilities, and will thus have ceased to be interested in the immediate question.

THE LEGALITY OF CORPORATION TRADING.

A gas rating question of a novel character has arisen at Birmingham, and from a recent announcement that a distress warrant against the Corporation of Birmingham has been obtained by the Overseers of the West Bromwich Union, for payment of a poor-rate of £342 8s. 10d., alleged to be due in respect of a portion of the Corporation gas-works, it would appear as though the dispute had arrived at the acute stage. Probably in connection with this local difficulty, the whole subject of the principle upon which the assessment of the Birmingham Corporation Gas-Works should rest, has been raised in the form of a case prepared for Counsel's opinion by Mr. Hedley, which will be found in another column. The central matter in dispute appears to be whether the Corporation, upon inheriting the undertaking of a trading Company—the said undertaking, moreover, being carried on by them in a trading spirit—are entitled, as fully as were the former owners of the business, to certain allowances from the gross annual value of the concern, by way of tenants' profits and interest on tenants' capital. It is shown that the Act vesting the gas-works in the Corporation contains a clause enabling them to carry their surplus revenue to the credit of the borough fund. This is called, by the Town Council, the contemplation by the Act of their carrying on the gas supply as ordinary traders, and consequently as determining their status as such. The Counsel who were consulted—Mr. R. E. Webster, Q.C., and Mr. W. Cunningham Glen—in forming their favourable opinion on the claim by the Corporation to the deductions before mentioned, proceeded upon this basis, strengthened, of course, by the knowledge of the fact that the Corporation do carry on the gas supply as traders, making as much profit as they choose, irrespective of the distinction between gas consumers and ratepayers. It naturally follows that if the profit is made, its ultimate destination is immaterial.

Strictly, on the facts as they exist, we believe Counsel to be right. The Corporation are undoubtedly traders in point of fact, and as such they have a formal right to the ordinary deductions from the gross assessment of gas-works carried on for the purposes of profit. But beneath this consideration of things as they are, lies the greater problem of whether they are built on a foundation of truth or of error. If the Corporation have no right to be traders—if the passage in their Act already referred to is, as we fully believe, to be read, not as constituting the Corporation traders in the ordinary acceptance of the term when applied to a Gas Company, but only as directing the mode of disposal of any surplus remaining after the discharge of the regular working and capital expenses, out of a revenue calculated to just meet those charges—then they must either reconsider their whole practice, or must pay the full rate without deductions, even if they continue at their own peril to carry on the gas supply on the same principles. The entire question of the legality of Corporations making a profit from gas supply is, in reality, the momentous issue now at stake under this apparently local dispute about some £300 of rating. It will not help the Corporation of Birmingham much to urge their right, as traders, to deductions, great or small, if it should be proved against them that they have assumed in error the mercantile status. And if the fundamental principle is fairly opened up, it cannot be reassuring to the Corporation to remember that in the course of their litigation on the West Bromwich award, the late Lord Chief Justice Cockburn expressed himself strongly against their views in this matter, while the present Lord Chief Justice carefully abstained from dilating on the question at that time. It must be of general benefit to have the problem presented by trading Corporations finally settled once and for all, and it will not be any surprise to us if this should really be the result of the present litigation between the West Bromwich Overseers and the Birmingham Corporation. There would certainly be a good fight over it, but we cannot suppose that the Corporation are less desirous than other people to become acquainted with the law, or less willing to fulfil their legal obligations when known.

GAS COMPANIES' MEETINGS.

Two suburban Gas Companies have recently held their half-yearly meetings. The Crystal Palace District Gas Company of course paid full dividends, and carried forward a handsome balance. It is very creditable to the management of this Company that they have succeeded in reducing the price of gas to 3s. 6d. per thousand cubic feet in spite of the natural drawbacks incidental to their situation in a scattered suburban district. It is, however, a district which, if never likely to be densely populated, is yet becoming more valuable every year, from the constant influx of new residents. The Directors' report is respectably dull, but there was a time when the work of the Board was of a more stirring character, although it is probable that both Directors and Proprietors prefer the present solidly monotonous style to that of earlier and stormier days.

The Harrow District Gas Company are not yet in the position of the south-eastern suburban Company just mentioned. They have only recently, by the completion of a long-needed line of railway, been brought fully within the magic circle wherein dwell the greater number of the class of City men who make suburbs populous. For some years the Company have been waiting for the extended prosperity which they imagine is now about to be given them. They are at least doing all in their power to meet it by steadily reducing the price of gas, by which they are even now finding considerable advantages. It must be satisfactory to the public to know that, although condemned by the past stagnation of the district, for which they are not responsible, to charge a rather high price for gas, the Company are willing, without waiting to receive full dividends, to make all possible concessions, with a view to extending the consumption, and thus permanently reducing the price.

THE PLUMBING INTEREST OF HALIFAX ATTACKED BY THE CORPORATION.

VESTED interests are awkward to deal with; and this truth holds good whether the interests are large or small—indeed, it sometimes happens that a great popular cry is raised concerning a threatened interference with rights which are perfectly worthless to their owners until their impending destruction makes them dear. An example of this occurs at Halifax, where a local inquiry has been held in reference to an application by the Corporation to the Local Government Board for sundry powers of administration, among others being the sale or letting of gas-stoves and fittings. As in other towns, all the local talent engaged in plumbing and smithing was up in arms against the proposal, on the part of the Corporation, to take away business from a hard-working and deserving body of ratepayers. They met in secret conclave, and appointed a Solicitor to represent them, and state their case with all the advantages of professional eloquence before the Inspector. A sad story was accordingly unfolded of ruined trade in consequence of the Corporation having already opened a shop for the sale of gas-fittings, &c.; and, to crown it all, it was alleged that the Corporation were losing money by the transaction. It subsequently transpired that the authorities had only taken up the business after it had been tried by several tradesmen, and had been dropped on the score of its returning too little profit. The people of Halifax were so untrained in the use of gas for cooking, &c., that there was no business at all in this line when the Corporation entered upon it, merely to extend the use of gas; and the amount of loss caused to the tradesmen must be estimated by the fact that the Corporation have as yet sold only eight stoves since their shop has been opened. So much for the value of popular clamour.

A NARRATIVE FROM GERMANY.

We publish in another column the annual report of the Directors of the German Continental Gas Company of Dessau, which will, as usual, be found interesting not only as a record of an extremely well-managed undertaking, but also by its picturesque methods of expression, and for the evidences it affords of thorough supervision working through a highly regulated system. There is every reason why Herr Oechelhäuser, who presides over the undertaking, and whose name in connection with the early introduction of gas generator furnaces is well known in this country, should revel in the effective grouping of those facts and figures, respecting the working of the Company, which are collected with so much care. When it is considered that the Company's business is scattered over sixteen widely separated places, none of which is of first-class magnitude, and the smallest cannot muster 300 lights—many of the stations being, moreover, subjected to great climatic vicissitudes—the statement that for the past

six months the average leakage account on the entire gas production did not exceed 4.44 per cent., must be considered the most powerful testimony to the perfection of the management. There can be no doubt that the knowledge that every day's work is represented, in some particular way, in the carefully prepared statistics issued from head-quarters, acts as a constant incentive to the exercise of unremitting care and foresight by every local officer and responsible engineer in the Company's service; while, on the other hand, the Company know how to reward those who serve them faithfully. In every respect such records as this confer the greatest honour on all concerned. We wish more of our own Gas Companies or Gas Committees would evince less fear of publicity than they do, and would tell us more fully and pleasantly than is their wont how their business is progressing. It is difficult to see how any one, except bad managers, could be damaged by so doing, for the bare skeleton of every gas undertaking under parliamentary control must be periodically published. As we see by the example of our German friends, it would be very easy to take another step in the same direction, and make the annual or semi-annual history of a great gas supply most pleasant as well as instructive reading.

Water and Sanitary Affairs.

THE Metropolitan Board have resolved to present a petition to the House of Commons, against the East London Water Bill, asking that the balance of the share capital, which the Company now have power to raise, "may be limited to £50,000, on such terms as may appear desirable." Seeing that the Company sought for power to raise fresh capital to the extent of £560,000, this is a very serious cutting down of the figures. The House of Lords agreed to leave the Company in the undisturbed possession of their existing power to raise £95,000, at the same time validating their over-issue of £95,000 debenture stock. The House of Lords granted very little, but the House of Commons is to be asked to grant still less. There is something supremely absurd in the idea of a Company going to Parliament to have some of its powers taken away; but the East London Company have unfortunately placed themselves at the mercy of their tormentors by the over-issue of debenture stock. The pretext put forward by the Metropolitan Board is that the ordinary stock will command such a premium as to double the nominal amount, so that the issue of £95,000 in stock or shares will probably realize about £200,000. This, in the opinion of the Board, is a larger amount than the Company should have power to raise without again bringing its affairs under the review of Parliament. The Company having managed their affairs well, so as to make their property valuable in the market, are to have their wings clipped, so that their undertaking may be purchased at a lower price when the Metropolitan Board, or some other body, proceeds to buy. This is the encouragement given to Companies who in times past accepted the risk which "public authorities" did not care to encounter. The procedure is—first, to give permission; secondly, to interfere and regulate; and, thirdly, to harass and "buy up."

The *Builder* of Saturday last, in an article entitled, "The London Water Supply Question again Urgent," offers some remarks which are in one part tolerably fair to the Water Companies, but which are vitiated in another part by a view we cannot but think erroneous. Our contemporary very properly points out the error of the former Registrar-General in calculating that the stock of the London Water Companies could be purchased at par. But the *Builder*, in proceeding to discuss the purchasing clauses of Sir R. Cross's Bill, falls into an error very similar to that of Major Graham. Figures are quoted, without a due recognition of the fact that a million sterling at seven per cent. is as good as two millions at three and a half per cent. There seems also a lack of perception as to the functions of discount. Money to be received in the future is a very different thing in the market from money "down on the nail." Through an oversight here, the *Builder* represents that the cost of buying up the Water Companies' undertakings would have been as much as £35,787,557. The real boon conferred on the Proprietors of the London water-works by Sir R. Cross, would have been that of making their income secure. There was nothing in the terms of the Bill to make the income higher than before, or higher than it would be supposing the Companies to remain in the undisturbed possession of an improving property. Even so far as the security went, the gain to the Shareholders was not a thing which they sought after. The Companies simply desired to be let

alone, and if the public did not choose to agree to this, it was hardly fair that the Shareholders should be deprived of their legitimate returns in order to make a popular bargain.

Cardiff is under the necessity of increasing its water supply, but is undecided as to the method. The Water Company from whom the Town Council purchased the existing undertaking a short time back, had a scheme in hand which would have been completed by this time, had not the transfer taken place. The Corporation are carrying out part of the Company's scheme, by executing works to draw a larger supply from the River Ely. But the river water is hard, and is not of a character to receive the approval of the Medical Officer of Health. Another plan consists in taking a supply from the Llanishen Brook—a costly undertaking, which also formed part of the Company's project. Its expense furnishes a ground of objection. The Corporation some time since engaged the services of Mr. John Taylor, C.E., the Engineer of the late Company, to report upon the subject; but this gentleman's inquiry was limited by the instructions given to him, and the Town Council have just decided that they will have a report of a more comprehensive character, to be drawn up by the Borough Engineer (Mr. Williams), assisted by some eminent civil or mining engineer. The new inquiry is to include "every available source of water supply within a reasonable distance of Cardiff." Among the proposals which will have to be considered, is one for drawing a supply from the Aber Brook, for which a plan has been prepared by Mr. G. A. Lundie, M. Inst. C.E.

The Birmingham, Tame, and Rea District Drainage Board are about to launch into a fresh outlay for the purification of the sewage of their district. Application is to be made to the Local Government Board for sanction to borrow £180,000 for the purchase of land and the construction of works. The scheme is that of a sewage farm, and, guided by the experience gained on the sewage lands at Saltley, it is considered that dairy farming is a very hopeful method to adopt. It is also argued that there is scope for a big establishment of this kind near Birmingham, which, unlike some other large towns, appears to be chiefly supplied with dairy produce by small dealers. The works include a circular conduit eight feet in diameter, and about two miles and three-quarters long, extending from the existing sewerage works to the new farm. The conduit will pass under the River Tame, across the Saltley farm, and thence through private lands and under public roads, or through lands acquired, or agreed to be acquired, by the Board, the fall throughout being two feet per mile. The surplus capacity allowed in the conduit for increase of population will be available for storage, and, aided by the sixteen small tanks at Saltley, a total storage room will be obtained for about eight million gallons, or nearly two-thirds of a day's flow of present dry weather sewage. It is thus hoped to dispense with the construction of storage-tanks on the new land, and to avoid the undesirable practice of using sewage during the night. The land now to be purchased consists of 48 acres of freehold, situated at Tyburn, but the total quantity of land obtained or arranged for is 867 acres, of which about 783 acres will be available for the treatment of sewage. About forty acres will be employed for intermittent filtration. At the meeting of the District Drainage Board at which the extension scheme was adopted, one of the speakers congratulated Alderman Avery and others upon the completion of the estate at Saltley, as recommended by the Sewage Committee of the Birmingham Corporation, of which they were members ten years ago.

In a recent paper on "River Water," read before the Chemical Society by Dr. Tidy, reference is made to the criticisms of Professors Tyndall and Huxley on the statements previously put forth by the author, and the latter of the two learned Professors is asked whether he can give a single well-authenticated case wherein a drinking-water in which the chemist failed to detect manifest contamination has caused disease. The following queries are addressed to Dr. Frankland:—As the dangerous element in a water is entirely outside his ken or detection, what, in his judgment, is the good of water analysis? Seeing that 100,000 germs may be present in a gallon of water, each germ being capable of imparting disease, and yet be undetected by the most refined chemical processes, how can he report any water to be wholesome? What are his grounds for reporting a water containing 0.1 of organic carbon to be of good quality, and a water containing 0.4 of carbon to be of inferior quality, seeing that the first may contain millions of germs, while none may be present in the second? Dr. Frankland's replies, as given in the discussion which followed the reading of Dr. Tidy's paper, are as

follows:—That water analysis tells us whether water has been contaminated with sewage, and, if so, when; that a water is reported as wholesome and fit to drink when it has been "filtered exhaustively" through a thousand feet of porous material; and, finally, that if a river water contains 0.4 of organic carbon, it has a highly disagreeable peaty taste. The President had a question of his own for Dr. Tidy—namely, whether he had any proof that germs or bacteria became oxidized. Dr. Tidy replied that the best proof of organic matters being oxidized was afforded by statistics. Dr. Frankland, on the other hand, contended that as bacteria withstood the action of cyanogen and sulphurous acid, it was difficult to see why they should commit suicide by bursting their envelopes by endosmosis, as suggested by Dr. Tidy. It is encouraging to learn, from these remarks, that if filtration goes to the extent of a thousand feet of chalk or other porous material, there is some chance of Dr. Frankland being satisfied. Mr. T. Hawksley was glad to find that the sea remained inoffensive, after the sewage of millions of people had been running into it for years. On the whole, the controversy may be said to turn mainly on the question addressed by Dr. Tidy to Professor Huxley. Yet Dr. Tidy objects to the discharge of raw sewage into a river, and says he should "prefer deep well water" to any other. Practically the question comes to one of caution, apart from those extravagant theories which create imaginary terrors.

Notes.

OXYGEN GAS-WORKS.

The question of the economical production of oxygen has much occupied the ingenuity of chemists. According to the *Revue Industrielle*, this problem is now in a fair way of being solved. There is at present in Paris an oxygen gas-works which is capable of supplying nearly 11,000 cubic feet of oxygen daily. This is, of course, a small beginning; but it is a great advance from the scale of laboratory production to which this gas has long been confined. No details are yet available concerning the process adopted in the manufactory, nor is the lowest selling price stated. The cost is, however, said to be moderate, and capable of reduction if the gas is largely consumed. Our contemporary remarks on the importance of this subject, as a cheap supply of remarkably pure oxygen, such as is said to be that produced at the new establishment, will probably exercise a very considerable influence on the question of lighting as well as on the progress of metallurgy and practical chemistry. The gas as sold in Paris from this first factory on the new system is said to be very cheap, although the works may be considered somewhat as of an experiment. The most important thing about the present announcement is the fact that, under any circumstances, the production of good and cheap oxygen in abundant quantity is established.

THE PUBLIC LIGHTING OF PARIS.

A report has been recently made by M. Vauthier upon the cost of lighting the city of Paris at the present time. It is stated that there are in the French capital 41,286 street gas-burners, or proportionately 1 light to about every 48 inhabitants, and to every 364 square metres of the public thoroughfares. The 16th arrondissement is the best lighted in proportion to its inhabitants, and the 11th arrondissement is the worst provided in this respect. The public gas-jets thus accounted for are divisible into two great classes, one including those burners which are alight all night, and the other comprising those which are extinguished between midnight and one o'clock, when the street traffic is generally over. A burner of the old pattern, burning at least 10½ hours per night, costs about £3 14s. 6d. per annum; a burner of the new model, requiring more careful supervision and maintenance, costs about £4 3s. 6d. per annum. The old-fashioned street lantern is still represented in Paris by 80 petroleum and 361 colza lamps, fixed in the streets, alleys, and courts which are not classed among the public thoroughfares. A petroleum lamp costs £6 15s. 6d. per annum, and a colza oil street lamp costs £6 18s. per annum; but there is nothing said about the comparative efficiency of these lamps as compared with gas.

A NEW LIQUID HYDROCARBON.

The announcements multiply respecting the extraordinary properties of the inflammable hydrocarbon liquid introduced by M. Friedel. The *Journal de l'Eclairage au Gaz* states that at a recent meeting of the Société d'Encouragement des Arts, &c., some remarkable experiments were made with this liquid, which boils at about 100° Fahr., and is said to burn with a brilliant white flame of a comparatively feeble temperature. On the occasion in question, a large can containing a supply of the liquid was set on fire by applying a light to its mouth, the spirit was then poured while flaming into lamps. The flame, spreading on all sides, simulated the beginning of a great conflagration, but was eventually extinguished by the lightest puff of wind. Any one in need of a light, but without a lamp for properly burning this liquid, may do so by dipping the corner of a pocket-handkerchief or the finger of a glove into it; and thus may be made a temporary torch, which when blown out will be found to leave the improvised wick without the slightest injury. Lamps intended to burn this spirit are constructed in such a manner that they are extinguished if thrown down. It is said to be extremely

difficult to form an explosive mixture with the vapour of the new spirit and air, and that in any case the explosion cannot be made violent. The liquid has a slight and not disagreeable odour, and is not dear. It is sold at present at 1 fr. per kilogramme, and its production is said to be unlimited. It has on other occasions been said to be a product of the Galician mineral hydrocarbons.

THE EFFECTS OF GAS-PURIFIER EXHALATIONS ON THE LUNGS.

M. Poincaré sends a communication to the *Comptes Rendus* respecting the alterations in the pulmonary organs produced by a long stay in the purifying-houses of coal gas-works. He says that animals kept constantly for eight months in a purifying-house show, upon *post mortem* examination, certain alterations of pulmonary tissue, consisting in part of an accumulation of epithelial cells in widely disseminated alveolar patches, but principally of a prodigious nucleary proliferation of conjunctive tissue. Sometimes there appeared to be indications of true interstitial pneumonia, or occasionally the pellets were in small globular masses, which, by crowding, formed fibrous matter, showing at once, upon microscopic examination, the structure of the granulations of the so-called granular meningitis of infants. It remains to be seen whether, after a still longer stay in the purifying-house, these small masses will be found susceptible of degeneration, or will give place to a process of suppuration. This may be determined with animals, and M. Poincaré proposes to test the result by experiments which will last for another year. But before arriving quite at the last possible stage of the process, it has appeared to him of urgent importance that the first results here given should be published; for, as he believes, they go to show that the exposure of children suffering from whooping-cough to the atmosphere of a purifying-house is not without danger.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE WATER SUPPLY OF THE METROPOLIS.

SIR,—The interests involved in this question are so great, and the precedent which will in all probability be formed is of such importance, that I trust you will admit to your columns a few observations upon the aspect of the matter as presented to us in your issue of to-day.

I would venture to submit that the policy of compromise adopted by the Lords' Committee is the wise one, and, indeed, the only course that could have been pursued under the circumstances brought before them. The first and paramount consideration is the necessary supply of water pending the settlement of the purchase of, or otherwise dealing with the Companies. This the Lords' Committee had to face, flanked as it were by most complicated and important side issues (suggested on the one hand by the Local Government Board, and on the other by the Metropolitan Board of Works) issues which raised questions far beyond the immediate need of the public, or of the East London Water-Works Company. These confusing elements left the Committee no choice, as I submit, but that of adopting a temporary provision which removes from the Company the plea of want of means to furnish an immediate increased supply, and affects to an infinitesimal degree the amount to be hereafter paid for the purchase of the whole of the Companies. Pending the greater scheme, I sincerely trust the House of Commons' Committee will adopt the Lords' recommendations; it would be lamentable were a premature step now to be taken, which might prejudicially operate either against the public or the Companies.

I should like, with your permission, to refer to the suggestions of the Local Government Board as set out in Mr. Richardson's letter; and to point out wherein I think they are unreasonable. Upon the auction clauses they state: "The auction clauses are not advantageous to the consumer until the maximum dividends are paid and back dividends satisfied." This is strictly true, but painfully fallacious inferentially. The auction clauses embrace a great principle of fiscal economy, and along with the sliding scale should be adopted upon every possible occasion. The goal of maximum and back dividends would then be brought so much nearer, and with it the inevitable benefit to the consumer. Both the Companies and the public lose by failing to acquire this non-dividend bearing capital; and it is much to be regretted than an important Public Department should thus lightly esteem so sound and desirable a theory. The whole four suggestions of the Local Government Board appear to be framed upon the supposition of the Company paying their maximum dividends forthwith; but this is far from being certain, and hence the suggestions are troublesome, if not erroneous. Mr. Richardson appears to be at one with the Local Government Board upon the suggestion that "nothing should be granted which would in any way enlarge the Company's present rights." And then an elaborate system is set up as to the raising of future capital and the appropriation of profits. But as these "surplus profits" must be paid by the consumer before they can be applied as the "nucleus of a redemption fund," or in any other way, how much more simple it would be to declare that *all* new capital shall be raised *pro tem.* by loan, at tender. The final suggestion of the Metropolitan Board, that they should be the registered proprietors of the stock to be created (*this* to bear profits!) is the most extraordinary proposal that has ever come, I should think, even from this remarkable body. It is the thin end of the wedge, not by any means "overlooked," which begs the whole question of control, but upon which the public and Parliament will probably have much to say before deciding.

London, March 15, 1881.

I. A. CROOKENDEN.

THE Water-Works Committee of the Leeds Corporation, at their last meeting, appointed Mr. T. E. Bower, of the Leicester Corporation Water-Works, to the position of superintendent of reservoirs, and other water-works of the Corporation outside the borough. There were 165 candidates, and from these six were recommended by a Sub-Committee from which to make a final selection.

Parliamentary Intelligence.

HOUSE OF COMMONS.

MONDAY, MARCH 14.

A requisition to withdraw his petition against the Cleator Moor Local Board Bill was presented from Lord Leconfield.

TUESDAY, MARCH 15.

A petition in favour of the Beverley Water Bill was presented from owners, lessees, and occupiers in Beverley.

A requisition to withdraw their petition against the London Sea Water Supply Bill was presented from the Conservators of the River Thames.

The Birkenhead Corporation (Gas and Water) Bill was referred to a Select Committee, consisting of Mr. J. W. Pease (Chairman), Sir R. Blennerhassett, Mr. C. Sykes, and Baron De Worms; to meet on Tuesday, March 22.

The Barrow-in-Furness Corporation Bill was referred to a Select Committee, consisting of Mr. Leveson Gower (Chairman), Lord Burghley, Mr. C. Clarke, and Mr. H. T. Davenport; to meet on Tuesday, March 22.

GAS AND WATER COMPANIES' BILLS.

Mr. STANHOPE asked the President of the Board of Trade whether his attention had been called to the fact that the Court of Referees refused local authorities *locus standi* in the case of Bills promoted by gas and water companies, where such companies sought only for powers to raise additional capital; and whether this was in conformity with the practice of the House of Lords and the Board of Trade in similar cases.

Mr. CHAMBERLAIN said his attention had been called to the fact referred to. He was informed that the practice of the House of Lords in similar cases was at variance with that of the Court of Referees, and certainly the practice of the Board of Trade had been to afford *locus standi* to local authorities, as representing the ratepayers, who had a considerable interest in the matter of the supply of gas and water.

WEDNESDAY, MARCH 16.

A requisition to withdraw their petition against the Barrow-in-Furness Corporation Bill was presented from the Justices of the Peace for the County Palatine of Lancaster.

THURSDAY, MARCH 17.

A requisition to withdraw their petition against the Matlock Water Bill was presented from Edward Hall Garton and others.

FRIDAY, MARCH 18.

A requisition to withdraw their petition against the Reading Corporation Bill was presented from the Great Western Railway Company.

HOUSE OF LORDS COMMITTEE.

TUESDAY, MARCH 1.

(Before Earl CADOGAN, Chairman; and Lords SALTERSFORD, MASSY, DE FREYNE, and CHELMSFORD.)

COLNE AND MARSDEN LOCAL BOARD BILL.

This Bill—which is promoted by the Colne and Marsden Local Board for the purpose, primarily, of sanctioning the acquirement by them of the works and undertaking of the Colne Water-Works Company, and to construct new water-works—came to-day before a Select Committee of the Lords, constituted as above.

Mr. MICHAEL, Q.C., who appeared for the Local Board, said the Bill was promoted by the Urban Sanitary Authority of Colne and Marsden, and its objects were various. They included the purchase of some existing water-works, the construction of others, and the widening of certain streets, &c. All the works proposed must be carried out within ten years, and if not completed the powers which under the Bill would be created would lapse, except with regard to those which had been executed before that time. The population of the district, which was rapidly increasing, was 12,000, the area rather more than 5000 acres, and the rental value £32,000. This was a typical case of the difficulties in the way of a local authority in carrying out the responsibilities imposed upon them by the Legislature, owing to conflict of authority. The Public Health Act of 1875, which consolidated all other Acts that before then were a difficult and heterogeneous mass of legislation, threw the responsibility on the urban and rural sanitary authorities of providing a proper and adequate supply of water for the whole of their districts. For this purpose ample powers were allowed by the Legislature for the construction of water-works, the laying down of pipes, the sinking of wells, and other things incident to a water supply. But a provision was inserted by the Legislature that if there existed in any part of the district water-works sanctioned by Act of Parliament, and with parliamentary restrictions and obligations, then before proceeding to construct water-works, notice should be served on those supplying water, complaining that the supply was not of a proper character. Notice being thus served, if there was any dispute, then recourse was to be had to arbitration. In pursuance of this provision, notice was served by the promoters of the present Bill upon the Colne Water Company. They were called upon to provide an adequate supply, but they could not do so. For years negotiations took place, and legal proceedings were instituted, but nothing came of them. The only way out of the difficulty was for the promoters to take powers under the Public Health Act for the purchase of the works. This had been accomplished, and the Company had agreed to accept £13,500 for their undertaking. No sooner had the promoters come into possession, than they had ample evidence of the insufficiency of the works. The reservoir was a small one, holding about 5 million gallons, and immediately after its acquisition by the promoters it ran dry, and the Board had to sink wells at once to provide a proper water supply. The reservoir was supplied from springs, which were totally insufficient, and the Colne and Marsden Board had obtained from their Engineers a scheme, to which there was no opposition, by which at least 380,000 gallons of water would be supplied in the very hottest part of summer, equal to 25½ gallons per head per day, instead of, as at the present, 5 gallons. It would also give to the stream such compensation as would allow 570,000 gallons a day to flow down for the compensation of any persons interested in the river. There was no opposition to the Bill, except as regarded one portion of the scheme, and this objection was raised by a Mr. England. But before proceeding with this he described what was proposed to be done by the Bill. It was proposed to take a piece of land for the purpose of dealing with the sewage of the district. Among all the plans for disposing of sewage one of the most easy to carry out, and one most followed now, was to take a small piece of land and drain it to the depth of 6 or 7 feet—making it a filter, in fact. The land would then be divided into furrows, on the top of which vegetation of various kinds would be grown, and at the bottom of the furrows the sewage water would be allowed to pass. Percolating through some 6 feet of soil, it would, as it were, become burnt, and the water would be rendered pure enough to pass into any stream of sufficient capacity. Of course, this must be carried out so as not to be a nuisance, as provided by the Public Health Act. The effluent water would be generally purer than

the stream into which it flowed. Power was asked to borrow money to the extent of £100,000. Of this £3600 would be required for the extension of the water-works, £13,500 for the purchase of the existing water-works, £5500 for widening streets, £20,000 for the land and sewage system, £12,000 for markets, and £13,000 for a public hall and offices. As he had said, there was no opposition except that from Mr. England.

The CHAIRMAN: Is there not a petition from Mr. Catlow?

Mr. MICHAEL said there was no appearance on his petition. Mr. England's position was this: He was Chairman of the Local Board, a gentleman of position, and an active promoter of the Bill, and it was only because the Bill came into conflict with his private interests that he was found in opposition. He opposed, and claimed compensation in regard to the water scheme, from the fact that, being a millowner, and having to construct a reservoir for his mills, he had used his surplus water to supply houses on his own estate. He had also erected further works, and supplied other houses in the district. He (Mr. Michael), however, contended that really Mr. England had no *locus standi* in opposition to the Bill.

The CHAIRMAN asked if the water under the Bill would not be supplied to the district now supplied by Mr. England.

Mr. MICHAEL said that it would; but Mr. England had no authority to supply, and might refuse to do so at any time. He went on to argue that Mr. England had no claim for compensation. The Legislature had determined the matter by saying that the only persons to be considered are those having powers given them by Parliament, and having corresponding obligations laid upon them. Nothing would be done that would affect Mr. England's status as a proprietor of private water-works.

Mr. PEMBROKE STEVENS, Q.C., then addressed the Committee on behalf of Mr. England. This gentleman, he said, had, in conjunction with his brother, been for 20 or 30 years the only supplier of water to the people in his district. It was all very well for the Board to talk of the authority they would exercise under the Public Health Act, but practically they had not done anything, and Mr. England supplied hundreds of houses to which his water was the only supply, and very naturally thought that his claim would be taken into consideration. He supplied the whole of the southern side of the river, and some on the northern side. He had placed his resignation in the hands of the Board, and claimed to have his case heard. Section 51 of the Public Health Act, 1875, did not, as his learned friend supposed, confine the dealing of local boards solely to water companies empowered by statute, but it stated "any" water-works, not "statutory" water-works, and water companies were defined to be persons or bodies of persons supplying water for profit. He granted that the position of a statutory water company was stronger, because, if they did their duty, then a local board could not take action. It was a well-recognized practice in the purchase of the undertakings of gas and water companies, that the better position of a company carrying on its work under an Act of Parliament carried with it an enhanced price. They obtained 20 years' purchase; whereas companies without Acts occupied a lower position, represented by 16 years' purchase. Mr. England for 20 years had been laying down, with the authority of the predecessors of the present Board, water mains and services; and for six years at least, with the knowledge and assent of the Board, had supplied the inhabitants with water.

Mr. MICHAEL said his learned friend had to show how the Bill would touch Mr. England's interest.

Mr. STEPHENS referred to clause 21, and the power to supply the same district as Mr. England supplied.

Mr. MICHAEL said they merely went into the streets, as required under the Public Health Act. Mr. England's tenants could still take his water, for his status need not be altered.

The committee-room was then cleared, and their lordships consulted for a few minutes; after which

The CHAIRMAN announced that the Committee were unanimously of opinion that Mr. England had no *locus standi* as a petitioner against the Bill, and therefore they were unable to entertain his petition.

[The Bill was accordingly referred to Earl Redesdale as an unopposed measure; and reported by him to the House on Tuesday last.]

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, MARCH 14.

(Before Justices GROVE and LINDLEY.)

DUDLEY GAS COMPANY, APPELLANTS, v. WARMINGTON, RESPONDENT.

This case came before the Court on appeal from a decision of the Dudley magistrates [see JOURNAL, Vol. XXXV., p. 877], who had convicted the appellants, under the 35th section of the Gas-Works Clauses Act of 1871, for having failed to supply the Local Authority with an annual statement of their accounts, and to keep copies of the same at their office, to sell to any applicants desirous of purchasing them.

Mr. WILLS, Q.C., and Mr. ANSTIE appeared for the Company; Mr. H. MATTHEWS, Q.C., and Mr. LAWRENCE for the Corporation of Dudley, who were the actual respondents, Mr. Warmington being Town Clerk.

Mr. WILLS, in arguing the appellants' case, stated that the Dudley Gas-light Company were incorporated by special Act of Parliament passed in 1853, and by section 2 of the Act it was provided that the Gas-Works Clauses Act of 1847 should form part of the statute; and by section 49 of the Gas-Works Clauses Act it was provided that nothing should prevent any general Act of Parliament thereafter passed, affecting gas supply, from applying. By section 35 of the Gas-Works Clauses Act of 1871, it was provided that the undertakers should fill up and forward to the local authorities, on or before the 25th of March of each year, an annual statement of their accounts, made up to Dec. 31 of the previous year, and keep at their office copies of the same for sale to any applicant, at a price not exceeding 1s. for each copy. In the case stated for the decision of the Court it appeared that the respondent had applied in March, 1879, for a copy of the accounts of the appellants for the year ended in December, 1878, and that they having no such copy, as their accounts had not been made up, had of course been unable to give him one. By section 38 of the Gas-Works Clauses Act of 1847, it was obligatory on gas companies to make up annual accounts and cause them to be sent to the clerk of the peace of the county in which the gas-works were situated; and the copy so sent was to be kept by him, and be open to inspection by all persons, at all reasonable hours, on payment of 1s. for each inspection. Though the special Act of the appellants was passed in 1853, the conviction against them was not under the Act of 1847, but under the provisions of that of 1871. It was contended for the respondent that as the Gas-Works Clauses Acts of 1847 and 1871 were to be construed together as one Act, and the provisions of the latter Act were to be held to repeal and supersede such of the provisions of the Act of 1847 as were inconsistent with it, the magistrates' decision ought to be upheld; but the appellants contended that the conviction was bad, as their real transgression, if any, had consisted in not making up their accounts, and not in refusing to give a copy of them to any applicant, for which the magistrates had imposed the penalty on them. The questions

for the Court to decide were whether the Gas-Works Clauses Act of 1871 applied in the present case, and whether the complaints had been made within the necessary time. The appellants further contended that the Act of 1871 was only future and prospective in its operation, and was not intended to apply to special legislation already passed; that before such a result could be attained a clause must be inserted in a private Act of Parliament, stating that it was desirable to make it applicable.

Their lordships, without calling on the Counsel for the respondents, confirmed the conviction, and refused to grant the appellants leave to appeal against their decision.

COURT OF GENERAL ASSESSMENT SESSIONS.

WESTMINSTER.—MONDAY, MARCH 14.

(Before Mr. P. H. EDLIN, Q.C., Assistant-Judge, and a Bench of Justices.)

The sittings of this Court for the hearing of appeals under the Valuation (Metropolis) Act, 1869, were continued to-day.

LONDON GASLIGHT COMPANY.

In the case of *The London Gas Company v. St. Andrew, Holborn-above-Bars, and St. George-the-Martyr*, it was arranged that the gross value should be reduced from £2922 to £2630, and the rateable value from £2855 to £2570; both parties to pay their own costs.

The appeal in the case of *The London Gas Company v. St. Giles-in-the-Fields and St. George, Bloomsbury*, was dismissed by consent; and the respondents agreed to pay £40 costs.

In the matter of *The London Gas Company v. St. George, Hanover Square*, the gross value was reduced from £7300 to £6590, and the rateable value from £6900 to £6210. No order was asked as to costs.

TUESDAY, MARCH 15.

SOUTH METROPOLITAN GAS COMPANY.

Mr. MEADOWS WHITE reminded the Court that it had been arranged that the South Metropolitan Gas Company's cases should be in the paper for to-day to be mentioned. Mr. Webster was in the case, but would not be present.

Mr. ROWLAND WILLIAMS said at the previous hearing it had been arranged that the respondents were to be supplied with certain information from the books of the Company for the year 1880; but he regretted that this information had not yet been furnished.

The CHAIRMAN said he remembered it was decided that, for the convenience of Counsel on both sides, the case should be postponed for a week, but that it should be named to-day, so that the respondents might inform the Court if they had been supplied with the information they required. He was surprised that the appellants were not represented by Counsel, as the Court could not proceed in their absence.

Mr. BESLEY suggested that possibly the other side had not been able to get all the information needed by the respondents.

The CHAIRMAN thought this was probably the explanation for the non-supplying of the information. If the appellants were anxious for further time, they had only to ask the Court for it.

Mr. WILLIAMS believed it would meet the convenience of all parties if the case were allowed to be called on next day.

Before the adjournment of the Court,

Mr. GREEN stated that the appellants had not yet been able to complete the report the respondents desired, as to the accounts for 1880.

It was then arranged that the case should be mentioned next day.

WEDNESDAY, MARCH 16.

On the Court resuming business this morning,

Mr. POLAND said the respondents had not received the calculations they required for 1880. A specific request had been made for detailed information upon certain points; but, as Mr. Webster would need a longer time to get out the figures that were required, he (Mr. Poland) did not wish to say anything that would raise a controversy, but trusted that the next time they met to consider the case the information desired would be forthcoming.

Mr. WEBSTER said it was impossible to have prepared all the information the respondents needed. Among other things they had asked for was the number, size, and age of each meter used by the Company. He needed scarcely to say that this would involve each house being visited, and the examination of thousands of meters, as well as the task of tracing the meters through a series of books. The appellants were anxious to supply all reasonable information; but he (Mr. Webster) thought this was scarcely reasonable. As to the accounts for 1880, they had been in the respondents' hands for weeks past.

The CHAIRMAN asked whether there would be time before Tuesday next (to-day) to furnish the respondents with Mr. Ryde's amended estimate based on the accounts for 1880.

Mr. WEBSTER said this could be done at once.

Ultimately it was decided that the case should be taken on Friday next (the 25th inst.), and the Chairman expressed a hope that by this time the requirements on both sides would be fairly met.

ASHTON COUNTY COURT.—THURSDAY, MARCH 10.

(Before Mr. JOSEPH ST. JOHN YATES, Judge.)

GAS COMPANIES AND THEIR LIABILITY TO CONSUMERS.

A curious case was tried to-day, in which the question raised was as to the liability of a gas company for damages for discontinuing the supply to a consumer who had been found illegally using gas. It appears that the plaintiff in the action, one Joseph Dobbin, who was the owner of a stall in the market, appeared at the Ashton Borough Police Court on the 14th ult. in answer to a summons charging him with laying a pipe to the main of the Ashton Gas Company without consent. He pleaded guilty "under certain circumstances;" which from the evidence adduced seem to be as follows:—He had a meter connected to his stall in the market, and during the severe weather in January it became frozen. He went down to the gas office and explained the circumstances, and was told what means to take to thaw the water. He said, "All right," and went away, and on the following day a fitter went and inspected the meter, and said something about thawing it if Dobbin would get some hot water. He declined, however, and said he had decided to do without the gas and use lamps. This was about three o'clock on Saturday afternoon, and the same evening the gas was seen to be burning, and on the place being examined at six o'clock it was found that the meter had been disconnected, and an india-rubber tube put to connect the Company's pipe with the burners on the stall, so that gas was being consumed without passing through the meter. On being spoken to about it, Dobbin admitted that he had made the connection, and that he was using the gas. In justification of his conduct, he said he had paid a quarter's gas bill in advance, and therefore thought he was entitled to the gas. The Magistrates, however, took a different view, and fined him 20s. and costs, or, in default, 14 days' imprisonment; whereupon he commenced this action, his claim being for 30s. damages against the Company, for neglecting to supply him with gas on the 21st and 29th of January.

Mr. YATES appeared for the Company.

Plaintiff, who conducted his own case, said that in September last the

Company requested him to pay his account quarterly, and in advance. During the recent severe frost his meter became frozen, and he went to the Company on the 20th of January and asked them to thaw his meter. A man came, but did not do it, and as he was without light he (plaintiff) took the meter away on Saturday night and made a connection by means of an india-rubber tube, so that he could go on with his business on the Saturday evening in the market. Mr. Clarke, the Company's Manager, stopped this, and on that and the following Saturday evening he was without gas. The Company summoned him before the Magistrates, and he was fined 20s. and costs for burning the gas without passing it through the meter.

His Honour: Served you right.

Plaintiff: I am aware of that, but I am summoning them now.

His Honour: For cutting your gas off?

Plaintiff: Yes; and as I paid a quarter's account in advance, I contend that they were compelled to provide me with gas. I had no fraudulent intention, and they did not allege that I had any.

Mr. YATES said the answer to the case was very simple. By the 18th section of the Gas-Works Clauses Act, 1847—an Act which was incorporated with the Act of the Ashton Gas Company—it was provided that every person who improperly used or burned gas should be liable to a penalty of £5, and the Company might cut off the gas from the house or premises of the person so offending, notwithstanding any previous contract with him. This entirely set on one side the plaintiff's contention that the Company were bound by any agreement or contract to continue the supply of gas after he had improperly made the connection for which he was fined in the police court.

His Honour at once gave a verdict for the defendants.

Plaintiff asked if the Company were not bound to keep his meter in order.

Mr. YATES replied that they were not, and referred him to the section of their Act which provides that the meters, &c., shall be kept in order by the owner of the premises.

Miscellaneous News.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Albion Tavern, Aldersgate Street, on Thursday last—Professor ERASMUS WILSON, F.R.S., in the chair.

The SECRETARY (Mr. Magnus Ohren, Assoc. M. Inst. C.E.) having read the notice convening the meeting, the following report and accounts were submitted:—

The Directors report that the general working of the Company during the half year has been satisfactory.

The price of gas has been reduced to the general consumer to 3s. 7d. per 1000 cubic feet from the last Christmas quarter, and will be reduced to 3s. 6d. from Lady-day, 1881.

The reports of the Gas Examiners of the parishes supplied by the Company, as to the illuminating power of the gas and its freedom from sulphuretted hydrogen and ammonia, continue to be satisfactory.

The Directors going out of office by rotation are Mr. Frederic Lane Linging and Mr. C. Lea Wilson, who, being eligible, offer themselves for re-election. The Auditor going out of office by rotation is Mr. Alfred Layton, who, being eligible, offers himself for re-election.

The Directors recommend the declaration of a dividend for the half year ending Dec. 31 last at the following rates per annum, viz.:—6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares; all less income-tax. This will amount to £11,048 2s. 1d., and the sum of £2359 18s. 11d. will be carried forward to the profit of the succeeding half year.

[Out of the £437,500 of authorized share capital, the Company have raised £298,754 10s.—viz., £50,000 of preference (6 per cent.) stock; £125,000 of ordinary 7 per cent. stock; £75,000 of ordinary 10 per cent. stock; and £48,754 10s. of new ordinary 7 per cent. shares. The total expenditure on capital account to Dec. 31, 1880, was £271,991; the net addition since June last (after allowing depreciation on meters and gas-stoves, to the extent of £659) being £1100. The balance of the subjoined revenue account is raised, by the undivided profits for the first half of 1880, interest on deposits, &c., to £17,486; £4000 of which is carried to the reserve fund. The amount of this fund, at Dec. 31, was £26,550; of the contingent fund, £10,300; and of the insurance fund, £3135. The quantity of coal and cannel carbonized during the past six months was 24,103 and 1136 tons respectively. The residuals were 26,318 dozens of 4-bushel sacks of coke and breeze; 234,888 gallons of tar; 504,780 gallons of ammoniacal liquor; and 169 tons of sulphate of ammonia. The statement of gas made, sold, &c., showed: Quantity made, during the half year, 252,897,000 feet; sold, 229,431,300 feet; used on the works, &c., 2,966,500 feet; total accounted for, 232,397,800 feet; not accounted for, 20,509,200 feet, being 8.1 per cent. of the quantity sent out.]

Dr.		Revenue Account, for the Half Year ended Dec. 31, 1880.		Cr.	
Coals, including all expenses	£21,054 12 6	Sale of gas—			
Purifying materials, wages, &c.	927 18 2	Private rental . . .	£38,632 7 4		
Salaries of Engineer and Officers . . .	657 3 10	Public lamps . . .	3,987 16 11		
Wages and gratuities . . .	3,918 18 9	Rental of meters . . .	630 8 1		
Maintenance of works, &c.	4,891 8 1	Residual products—			
Salaries of Inspectors, &c.	740 6 9	Coke, less labour and cartage . . .	8,336 19 3		
Maintenance of mains and service-pipes . . .	1,342 2 6	Breeze . . .	232 2 2		
Repairing, &c., meters and gas-stoves . . .	1,222 7 4	Tar . . .	1,951 14 7		
Lighting and repairing public lamps . . .	698 16 4	Sundries . . .	5 2 0		
Rents . . .	30 5 6	Sulphate and ammoniacal liquor, less acid, labour, &c. . .	2,176 0 1		
Rates and taxes . . .	1,917 12 3	Rents . . .	108 4 8		
Directors' allowances . . .	750 0 0				
Salaries of Secretary, Accountant, Clerks, &c. . .	624 4 10				
Collectors' commission . . .	472 19 10				
Stationery and printing . . .	241 6 6				
General establishment charges . . .	284 5 2				
Auditors . . .	50 0 0				
Bad debts . . .	200 6 1				
Workmen's sick fund . . .	25 0 0				
Do. superannuation fund . . .	25 0 0				
Insurance fund . . .	208 10 6				
Horses and carts . . .	207 5 0				
Total expenditure . . .	£40,490 9 11				
Balance . . .	15,570 5 2				
	£56,060 15 1	Total receipts . . .	£56,060 15 1		

The CHAIRMAN said the Directors were happy again in having to come before the Proprietors with a very satisfactory report, and an equally satisfactory balance-sheet. The Company's works were proceeding with business-like regularity. They were supplying the consumers, and were making preparations for that increase in their number which it had been the Directors' good fortune to have to deal with almost since the commence-

ment of the undertaking. It would be seen that the consumption of gas was increasing; and to provide for it, the Directors were constructing a tank for a new gasholder—a work which would be done during the present year, and in the spring of next year they would put up the holder. The Shareholders would also observe in the report that the Directors had steadily kept on with that progressive harmony which they felt should exist between themselves and the consumers. After they had overcome the first expense attendant upon the floating of the Company, their next, and he might say almost their first thought, was as to the best method in which the consumers might be benefited by the success of the undertaking. The Directors recommended to the Shareholders year after year a reduction in the price of gas to such an extent and at such periods as might seem to be warranted by the healthy condition of the Company's existence, and the Shareholders had never been backward in giving their support to these recommendations, with a view of carrying out those changes for the benefit of the consumers which the Directors had thought it desirable to bring before them. He need not remind those present that the Company was somewhat exceptional in its position—occupying a locality where there was a good deal of uphill and downhill, which required special mains for certain portions of the district, and it was not a work conducted upon a perfectly plain surface where streets were crowded together and consumers likewise. The Shareholders could therefore hardly expect to be in the position of those who were supplying districts in the Metropolis itself. Nevertheless, it was a matter of pride to the Directors, and he thought it would be matter of satisfaction to the Shareholders, that they should be in a position to say that, commencing at Lady-day, they were going to reduce the price of gas to 8s. 6d. per 1000 feet. They might almost vie with some of the Metropolitan Companies in the moderate charge which they were now making for their gas; and that it was not an inferior article was shown by the reports of the chemists appointed by the parishes supplied by the Company, whose tests showed it to possess all those better qualities which were thought desirable in gas. Then, as the final completion of the ordinarily successful working of the Company, he might point to the last paragraph of the report, in which it was shown that, after having added a fair amount to the reserve fund, so as to secure themselves against any variations which might chance to take place, they were enabled to carry something to the account of the current half year. These were the chief points of the report, and he trusted and believed the Shareholders would consider them perfectly satisfactory. There might not be any brilliancy about the report, but there was a sterling backbone to it, which was perhaps better than brilliancy itself. He concluded by moving—"That the report of the Directors, and the balance-sheet confirmed by the Auditors, be received, adopted, and entered upon the minutes."

Mr. ALFRED WILLIAMS seconded the motion, which was unanimously adopted.

The DEPUTY-CHAIRMAN next moved, and Dr. FREDERIC HETLEY seconded, the declaration of the dividends as recommended, and the resolution was carried unanimously.

On the motion of Mr. BEETON, seconded by Mr. OGG, Mr. Frederic Lane Linging was re-elected a Director, as was also Mr. C. Lea Wilson, on the motion of Mr. HYSLOP, seconded by Mr. JAMES GLAISHER, F.R.S.

Messrs. LINGING and WILSON having returned thanks for their re-election,

Mr. WILLIAMS moved, and Mr. BEETON seconded the re-election as an Auditor of Mr. Alfred Layton, and the motion was carried unanimously.

Mr. LAYTON, in acknowledging his re-election, expressed his gratification at the very satisfactory addition which had been made out of last half year's earnings to the reserve fund, to which £4000 had just been transferred.

Mr. WEBSTER then moved a vote of thanks to the Chairman and Directors, whose services he warmly eulogized.

Mr. R. H. JONES, J.P., seconded the motion, and as a consumer of the Company's gas expressed his obligations to them for the promised reduction in price.

The motion having been carried unanimously,

The CHAIRMAN acknowledged the compliment, and thanked the Shareholders for the cordial manner in which they had received it, as well as for the support they always accorded the Directors. He would, he said, take the opportunity of proposing a resolution which bore upon the soundness of the undertaking in every way, in acknowledgment of the services especially of those who, not being Directors, took an active part in the business of the Company—the Auditors, to whom they were indebted for the careful scrutiny which they gave to the accounts; the man at the helm, the Engineer, who guided the process of their manufacture; and their long-tried and well-trusted Secretary, who managed so well all affairs which belonged to the internal economy of the Company. They were indebted to all these gentlemen for the zealous manner in which they co-operated with the Directors in promoting the welfare of the concern. They felt that they could rely on them without fear of failure, and he believed the Shareholders knew the Directors sufficiently to feel, at any rate, that they all rowed in the same boat. He moved a vote of thanks to the Auditors and Officers of the Company.

Mr. NEWTON seconded the resolution, which was carried unanimously.

Mr. GLAISHER briefly returned thanks on behalf of his colleague and himself, and for the Officers generally.

A vote of thanks was then passed to the Chairman, and the proceedings terminated.

ORMSKIRK GAS COMPANY.

The Annual Meeting of this Company was held on Wednesday, the 9th inst.—Mr. J. ROBINSON in the chair—when the Directors' report was received and adopted. It recommended a dividend of 10 per cent. for the past year, and 2 per cent. towards past deficiencies of dividend. It also stated that a reduction had been made in the price of gas, the present net charge being 4s. per 1000 feet, and 3s. 10d. to the public lamps. The statement of accounts, as printed and circulated with the report, was then submitted to the meeting for the purpose of being passed, whereupon

Mr. BRADLEY, a local Solicitor, asked the Chairman if the form of accounts had been approved by the Board of Trade.

The LAW CLERK (Mr. W. PARR) replied that it had not been approved by them.

Mr. BRADLEY said that, this being so, the form of accounts was not in compliance with section 35 of the Gas-Works Clauses Act, 1871, which required that the accounts should be in the form set out in schedule "B" of the Act; and by the same section a penalty of 40s. per day was imposed upon the Company so long as such non-compliance existed. He pointed out that the accounts submitted to the meeting omitted a statement of share capital account, and a loan capital account, and improperly inserted what was called a depreciation account. By the Gas-Works Clauses Act of 1847, the only fund allowed to answer the purpose of the depreciation account was called the reserve fund, which might be set aside and invested to the extent of one-tenth of the nominal capital.

After some discussion between Mr. PARR and Mr. Bradley, the former stated that he was prepared to advise the Directors that they were not

bound by the provisions of the Act of 1871, as the Company were incorporated in 1853.

Mr. BRADLEY then made some observations upon the substance of the accounts. He stated that, as he understood them, they showed a dealing with the Company's revenue as capital in a manner not authorized by the Acts of Parliament, and to the prejudice of the Shareholders and consumers of gas in the district, inasmuch as the Company were bound, after setting aside 10 per cent. per annum on the shares, and 10 per cent. upon the nominal capital, for the reserve fund, to apply the excess in a rateable reduction of the price of gas to the consumers. He concluded by moving that the accounts be not passed, and that an Accountant possessing the confidence of the Company and of the Shareholders should be called in to examine the accounts, and report as to how far they were accurately made out and in accordance with the Acts of Parliament.

No one seconding this proposal,

Mr. BRADLEY said he had in kindness to the Company attended the meeting and taken the course he had done; but as they thought proper not to give effect to his suggestion, he would, in the interest of all parties, proceed under the Act of Parliament to get the appointment of an Accountant by the Court of Quarter Sessions, and at the expense of the Company.

HARROW DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Guildhall Tavern, Gresham Street, E.C., on Monday, the 7th inst.—JAMES GLAISHER, Esq., F.R.S., in the chair.

The ENGINEER and SECRETARY (Mr. J. L. Chapman, Assoc. M. Inst. C.E.) read the notice convening the meeting, and the following report and accounts were presented:—

The Directors have the pleasure of again submitting the half-yearly report and balance-sheet to the Proprietors.

It is very satisfactory to notice that, notwithstanding a reduction in the price of gas, the profit has been maintained at the same figure as in the corresponding period of the previous year.

The balance of the profit and loss account is £1161 9s. 1d. The Directors recommend that a dividend at the rate of 6 per cent. per annum be paid (free of income-tax), and that £150 be written off the parliamentary expenses, leaving a balance of £36 9s. 1d. to be carried forward to the next account.

Two of the Directors (Mr. James Glaisher, F.R.S., and Mr. John Chapman) and one Auditor (Mr. James Randall) retire by rotation, who, being eligible, offer themselves for re-election.

Revenue Account, for the Half Year ended Dec. 31, 1880.				Cm.			
Coals, including all expenses, £1060 11 7				Sale of gas—			
Purifying materials, &c.	34	7	0	Private rental—			
Salary of Engineer	125	0	0	7,942,500 feet at 5s. 9d.	£2283	9	10
Wages	201	3	0	1,184,100 „ „ 6s.	355	4	8
Maintenance of works, &c.	214	2	1	Public rental and by contracts	298	15	6
Repairs of mains and services	48	13	2	Meter-rental	81	5	6
Renewing and re-fixing meters	13	10	4	Residual products—			
Lighting public lamps	31	16	6	Coke, less labour and cartage	333	3	5
Rents, rates, and taxes	150	14	0	Tar, „ „ „	83	14	3
Directors and Auditors	150	0	0	Sulphate of ammonia	89	11	9
Salary of Secretary	25	0	0				
Collector's commission	30	0	0				
Stationery and printing	15	19	4				
General establishment charges	76	1	1				
Bad debts	5	6	8				
Total expenditure	£2185	4	10				
Balance	1340	0	1				
	£3525	4	11				
					£3525	4	11

The CHAIRMAN said that if the Shareholders had compared the present balance-sheet with that for the corresponding period of the year 1879, he thought they would have been forcibly struck with the similarity of both. The Company's business had not quite stood still, but the items were so nearly alike throughout the accounts that it would illustrate that which he had had to refer to so frequently—the fixity of Harrow, not going backwards or forwards, but its unity of existence. The Directors hoped, however, that a progressive movement would soon take place, of which, indeed, there were signs. The regularity and frequency of the train service, since the introduction of the new railway, must give great encouragement to any one wishing to visit or reside at Harrow. He heard that there were a good many applications for houses of £40 and £50 a year, and he was certain that the district must be filled up, with the increased railway facilities it now had. The Shareholders would find, on making a comparison, that the profits had been nearly the same as before, but that the gas sold had been something less. So far as he had been able to trace it, this had arisen from the brightness of the mornings and evenings and the fineness of the weather up to Christmas—so different from that which had prevailed since, and in consequence of which he believed that the next half year would show that more gas had been sold. There was everything, he thought, to cheer the Company onward. They were holding their own easily, and from what he heard they had every prospect, at no distant date, of a considerable increase in their business. He concluded by moving the adoption of the report and balance-sheet.

The DEPUTY-CHAIRMAN (Mr. John Chapman), in seconding the motion, observed that he could endorse all the Chairman had stated. The Company had not made very rapid advances, but nearly all the property in the middle of Harrow was now occupied, and as to the upper part of the town, he believed there was hardly an empty house to be found. This was a very great improvement, and he believed the new railway must increase the resident population. He considered that the Shareholders could look forward very hopefully. The Company now had their coal brought nearer to the works by a mile and a half, and they obtained it more cheaply.

Mr. CORBET WOODALL asked if the reduction in the price paid for coal was owing to the new railway or to lower contracts made by the Directors. He noticed that the favourable character of the balance-sheet, on which he congratulated the Directors, was due to the fact, not that they had had an increased rental, as they had been vainly hoping for for some time past, but to their having been able to buy their coal more cheaply, and to the reduction made in the expenditure on repairs and maintenance of works. As to the falling off in the rental, to which the Chairman had referred, he believed that the experience of almost all gas companies in the past half year had been that, if they had not lost rental, they had lost some proportion of the ordinary increase.

The CHAIRMAN: All the companies in the north of London, and some in the south.

Mr. WOODALL observed that, in his opinion, the present balance-sheet entirely justified the action of the Directors in reducing the price of their gas, seeing that they had been able to meet their expenses and provide the dividends without difficulty. He trusted that every means would be used to greatly increase the rental of the Company, which, as he stated at the last meeting, was all that was needed to increase the dividends. He hoped that every possible encouragement would be given to the people of Harrow to burn gas.

The CHAIRMAN, in reply, stated that the lesser price of coal—1s. per ton—was in a great measure owing to the more economical working. The Shareholders would observe that the parliamentary expenses had been brought down to a very low figure. The Directors were quite alive to the

importance of increasing the rental, and were doing all they could to this end. Last week he put to Mr. Ohren, the Secretary of the Crystal Palace District Gas Company, the question whether gas could be used economically for heating purposes at 6s. per 1000 feet, and he replied in the affirmative, adding that of course it could be used with still greater economy if the price were 5s. 6d. per 1000 feet. He (the Chairman) had urged that gentleman to put a paragraph in his report that gas could be used with advantage for such purposes at 6s. per 1000 feet. Although the electric light, as far as he had seen and heard of it, was merely used as an advertisement, and not commercially, still there was the great fact before gas companies that there was a rival, whereas up to recently they had been without one. It was a light that might be able to hold its own with respect to large places, but he did not think gas companies would be injured by it, and perhaps they might be benefited if it led to gas being used for other purposes for which it was applicable.

The motion was then put and carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. MAGNUS OHREN, a resolution was passed declaring the dividend recommended in the report, and the writing of £150 off the parliamentary expenses, which now stand at £500, having been reduced to that figure from £2100.

On the motion of Mr. WOODALL, seconded by Mr. BROADBERRY, the retiring Directors were then unanimously re-elected, and briefly returned thanks.

Mr. MAGNUS OHREN, in moving the re-election, as an Auditor, of Mr. James Randall, remarked, as to the Chairman's observation about the electric light being simply an advertisement, that he could give the Shareholders a few figures bearing out this statement. The charge to the Metropolitan Board of Works for the electric lights on the Thames Embankment was at the rate of 2½d. per lamp per hour. If these lamps burnt the same time that gas lamps burnt it would be 4400 hours, and this at 2½d. per hour made the price £45 17s. per lamp per annum. The gas lamps at the side of them burnt 5 cubic feet per hour, making 22,000 feet in the year. This at 3s. per 1000 feet came to £3 6s., and the charge for lighting, repairing, &c., would, he supposed, be about 16s., making £4 2s. per lamp per annum. If the Metropolitan Board wished to increase the light on the Embankment, and were to put up three gas lamps in the place of one electric lamp, the cost would be £12 per annum against £45 17s. He thought these figures spoke for themselves. It should also be remembered that the cost he had mentioned was only the charge made to the Metropolitan Board—they did not know the actual cost, which might be double, and very likely was.

Mr. GLAISHER seconded the motion, and it was carried unanimously.

Mr. RANDALL, in reply, expressed a hope that what had been shadowed forth by the Chairman and Deputy-Chairman would be realized, and that he should have the pleasure of auditing accounts showing a larger dividend.

Mr. C. HORSLEY next proposed a vote of thanks to the Secretary and Engineer, than whom, he said, no one could give more attention to his duties.

Mr. RANDALL seconded the motion, and

The CHAIRMAN, in supporting it, stated that it was richly deserved. Part of the diminution in the amount paid for coal was owing to the good management of their Engineer.

The resolution was carried unanimously.

Mr. CHAPMAN, in reply, spoke of the benefits of the new railway in enabling the Company to get cheaper coal, but observed that they had not yet felt the advantage of increased residents in the neighbourhood. They hoped to see in the coming spring a great many more houses occupied. He would, he said, do his utmost to promote in every way the welfare of the Company.

On the motion of Mr. BROADBERRY, seconded by Mr. OHREN, a vote of thanks was passed to the Chairman and Directors; and, in reply,

The CHAIRMAN said that earnestly as they would work for, and wished for an increased dividend, it must be remembered that the consumers were paying a high price for gas, and the Board must do what they could to diminish it. He believed, if they could reduce the price, the greater consumption would make up for any loss which the reduction might cause. He then moved a vote of thanks to the Auditors.

The DEPUTY-CHAIRMAN seconded the motion, and it was carried unanimously.

Mr. RANDALL having acknowledged the compliment, the proceedings terminated.

BRISTOL UNITED GASLIGHT COMPANY.

The Half-Yearly General Meeting of this Company was held on Wednesday last—Mr. F. TERRELL in the chair.

The SECRETARY (Mr. H. H. Townsend) read the notice convening the meeting, and the following report was presented:—

Notwithstanding the general reduction of 2d. per 1000 feet in the price of gas, which took place from and after Jan. 1, 1880, equivalent to nearly £4000 on the half year's rental, a large proportion of the amount reduced has been made up by the increased consumption, and which but for the mild and open weather of the later months of the year would doubtless have been greater still. Since the commencement of the present year the demand for gas has been far larger than in the corresponding period of last year. The severe weather experienced in the month of January caused, while it lasted, much interruption to both the public and private lighting, but by the efforts of the officers of the Company remedies were promptly applied, and the inconvenience to the consumers lessened as far as it was possible to do so.

The works of the Company at Stapleton are in a satisfactory condition, and admirably answer their intended purpose. The large gasholder in course of erection there is very nearly completed.

The Directors having received repeated applications for a supply of gas to Westbury and also to Avonmouth and Shirehampton, have embraced the earliest opportunity in their power to accede to the request of the inhabitants of those districts. This is now rendered practicable by the erection of the new works at Stapleton, without which it could not be accomplished.

The Directors recommend that a dividend at the rate of 10 per cent. per annum on the capital of the Company entitled to dividend be declared, subject to the deduction of income-tax.

The CHAIRMAN, in moving the adoption of the report and accounts, expressed a hope that the Shareholders had found them satisfactory. They would have seen that a reduction of 2d. per 1000 feet was made to the general consumers from Jan. 1, 1880. This reduction did not perhaps appear very considerable to the consumers, who might think it small; but it was not a small affair to the Company, for it meant a diminution of nearly £4000 in their receipts. However, he was glad to say that they were fast recovering from its effects. The consumption in the past two months had considerably increased over the two corresponding months of last year. This was principally accounted for by the weather, which had been very severe, and more gas was required both for lighting and heating purposes. The Directors had had repeated applications within the last four or five years from the districts of Westbury, Shirehampton, and Avonmouth, to light them; but they had not been able to comply with the request, as they had not sufficient gas to allow of their doing so; but since the works at Stapleton had come into operation they were in a position to supply these important districts, and it was their intention to do so. Since the last half-yearly meeting they had to regret the removal by death of their esteemed friend and colleague, Mr. J. Lucas. He was a

most constant attendant at the meetings of the Board, and was particularly useful, especially in financial matters. The Directors had nominated Mr. J. D. Brain as his successor, and from his business qualities, and being one of the largest Shareholders, he would be an acquisition. He (the Chairman), in common with the other Directors, was not actuated by any feeling of alarm, although the newspapers and certain gentlemen still insisted that the electric light would be the ruin of gas companies. He was happy to say that the Company was still in a flourishing condition, and he hoped it would long continue to be so. He certainly should not disturb any holding he had in the Company on account of the electric light.

Mr. W. SPARK seconded the motion, and said he hoped the Shareholders would consider the report a satisfactory one. The progress of the Company was most encouraging. The works at Stapleton, as the Chairman had said, would enable the Company to supply new districts, and by the beginning of next winter Westbury would be lighted with gas. Some people might ask why, as the Company were earning 10 per cent., they should spend more money. The answer was that they were anxious to fulfil their obligations under their Act of Parliament, and, having a monopoly, they should do their best for the benefit of all residing in their neighbourhood. The Directors believed they were adopting a wise and sound policy in doing this, and he hoped all the Shareholders would endorse their policy. With regard to the electric light, so little did it disturb him that he did not intend to part with a single shilling's worth of his holding. He believed gas would long maintain its position, and that it need not fear competition.

Mr. G. WILLS said both the Chairman and Mr. Spark were very sanguine as to the continued prosperity of the Company, and he hoped they were right. He certainly joined them in his determination not to sell the property he had in gas companies, whether in Bristol or London; but he thought it quite necessary to look forward. Some year and a half ago, when there was a scare about electricity, he addressed a letter to the Chairman, in which he ventured to suggest that attention should be given to the improvement of the application of gas to cooking and heating purposes, and that some reward should be given by this and other gas companies for the best treatise on the subject, so that if ever they lost their customers for lighting purposes they might supply more gas for heating and cooking purposes. He did not know whether the Directors had done anything with reference to this matter. If they had, he was sure it would relieve the minds of a good many persons who held stock.

The CHAIRMAN said Mr. Wills had given them very excellent advice, as he did some year and a half ago. He (the Chairman) mentioned that the increased consumption of gas in the last two or three months was in consequence of gas being used for heating purposes, and he believed there would be a still greater increase.

A SHAREHOLDER said it should be recollected that the price of the electric light was double the price of gas. Until electricity was reduced to the price of gas, they had nothing to fear.

Dr. HIGGETT asked if their Engineer could give them the difference in price between gas and the electric light.

The CHAIRMAN said the electric light people did not admit them into their confidence.

Mr. S. JONES said in Liverpool the cost of lighting the streets with the electric light was double that of gas.

The ENGINEER (Mr. W. Fiddes) said it would not much matter if the lighting of the public streets were taken away, for it only amounted to 8 per cent. of the consumption, and at the rate the Company were going on they would recover this in one year, for they were increasing their consumption at the rate of 10 per cent. He had noticed the electric light in Bristol, and from his general knowledge of electricity he could reply to Dr. Higgett's question, although, of course, it must be taken for granted his calculations were rough. He thought the Shareholders need not be at all nervous about the electric light. The number of electric lamps used in Bristol was 6, and they displaced 25 public gas lamps. The engine employed was a 12-horse power one, capable of supplying 12 lamps, but it only supplied 6. A 12-horse power engine would take 25 feet of gas per horse power, so that to keep the engine in motion to produce the electricity for the number of hours the street lamps were lighted would consume 1,200,000 feet of gas, which at 2s. 8d. per 1000 feet would cost £160. To this must be added the charge for interest, wear and tear of engine, and renewal of the electric machine, showing a cost for the 12 lights of £413 12s. The price the Gas Company offered to the Board of Health for lighting the lamps was £166 13s. 4d. for every 50 lamps, so that they had this amount as against £413 12s. He did not believe either that the electric lamps gave the light claimed for them.

The motion for the adoption of the report was then put, and carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. METTIER, a dividend at the rate of 10 per cent. was declared.

The CHAIRMAN then moved that the fee of the Auditors be increased from 40 guineas to £50 per annum, remarking that the work had increased, and that it was performed in an excellent manner.

Mr. W. SPARK seconded the motion, and it was agreed to.

Mr. H. GRACE, one of the Auditors, thanked the Shareholders for the vote.

On the motion of Mr. G. WILLS, a vote of thanks was passed to the Chairman and the Board of Directors.

The CHAIRMAN, in reply, said the Directors would adopt the same course as they had done in past years, and he hoped the Shareholders would be satisfied.

The meeting then terminated.

METROPOLIS WATER SUPPLY.

THE METROPOLITAN BOARD OF WORKS AND THE EAST LONDON WATER COMPANY'S BILL.

At last Friday's meeting of the Board, the Parliamentary Committee presented a report, in the course of which the following passages occurred, in regard to the East London Water Company's Bill in Parliament:—

Your Committee have considered the question of the course which the Board should take with regard to the East London Water Bill when it comes before the House of Commons. Your Committee stated, in the report which was presented to the Board last Friday, that the Company had now power to raise a further sum of £95,000, ordinary stock or share capital. As this, if disposed of by auction or public tender, would probably produce a sum equal to double the nominal amount of the stock, it appears to your Committee that, looking to the circumstances of the Company, this is more than it should have the power to raise without again bringing its affairs under the review of Parliament. Your Committee are of opinion that the amount which the Company should be enabled to raise should be limited to £50,000 of ordinary stock or share capital, and that this should be disposed of by auction or public tender, and allotted to the highest bidder. They recommend that a petition to this effect be presented to the House of Commons.

After some discussion a resolution was carried to the effect that the Board should present a petition to the House of Commons against the Bill, asking that the balance of the share capital, which the Company now have power to raise, may be limited to £50,000, to be issued "on such terms as may appear desirable."

DEATH OF MR. H. BOWEN, OF CARDIFF.

We regret to announce the death, on Tuesday last, in his 60th year, of Mr. Henry Bowen, of the Cardiff Gas-Works. Mr. Bowen may be said to have had a life-long connection with the gas industry, as when only 18 years of age he entered the office of the Salford Corporation Gas Department, where he was associated with Mr. John Lees Cocker, the present Secretary and Engineer of the Merthyr Tydfil Gas Company. While engaged there he displayed qualities which caused him to be entrusted with duties in connection with the various departments of the gas-works, and he was eventually appointed superintendent of mains, services, &c., and chief inspector of meters. In 1847 he was selected, from among a number of candidates, to fill the appointment of Manager to the Cardiff Gas Company, the extension of whose works he personally superintended, as also the erection of those of the Pontypridd Gas Company, on the formation of this undertaking in 1851. At the Cardiff Gas-Works Mr. Bowen rose step by step from the position of Manager to that of Engineer, Secretary, and Managing Director, and in discharging the duties incidental to each of these offices, he earned the confidence and esteem alike of Directors and Shareholders. In 1859 he was elected a member of the Cardiff Corporation, and in 1873, being then almost the oldest Councillor, he was unanimously chosen Mayor. As Chief Magistrate for the year he was unremitting in his attention to his duties, although his official position at the gas-works necessarily occupied much of his time every day. In 1875, on the extension of the borough under the Cardiff Improvement Act, Mr. Bowen was elected Alderman, and this office he filled at the time of his death. In addition to being a borough magistrate, Mr. Bowen was largely connected with all corporate affairs, while there was scarcely a public institution of any kind in which he was not concerned as Chairman or Deputy-Chairman. Mr. Bowen was one of those men who rise by their ability and the earnest zeal with which they discharge every duty entrusted to them, and he has left behind him a name that will be long associated with the improvements of the borough of Cardiff.

Referring to Mr. Bowen's death, one of the local papers—the *Western Mail*—says: "A short sketch of the career of Mr. Henry Bowen may be of interest to our readers. He came to Cardiff in the year 1847, as Manager of the Cardiff Gas-Works, and prior to this date he was an absolute stranger to the town. For 1½ years he had been in the employ of the Salford Corporation, and the experience which he had there obtained in the inspection of meters and fittings, and the superintendence of the laying of mains and service-pipes, &c., eminently qualified him for the position which he was elected to fill. At that time the population of Cardiff was 18,000, and the works of the Company consisted of one gasholder only; but extensions had been determined upon, and in the report for the year 1848 the following sentences occur, viz.:—'The Committee of Directors, in making their report, beg to refer to the latter part of their report of last year, which stated that the enlargement of the old works required an alteration in the future management. The Committee considered, with the greatest care and attention, how that alteration could be best made with regard to the general interests of the Company, and in doing so they decided on electing a Manager, who should also act as general clerk, and for such purposes they elected Mr. Henry Bowen. The enlargement of the works has since been continued, and will, the Committee hope, be completed during the present year.' The growth of the town since this period has been very rapid, the population being now estimated at close upon 90,000, and upon Mr. Bowen has to a great extent devolved the duty of making provision for the continuously increasing demand. Two Acts of Parliament have been obtained, and at the present time the works of the Company comprise three gasholders of 112 feet in diameter, in addition to which there is a fourth in course of construction, the diameter of which is 120 feet. When Mr. Bowen came to Cardiff the largest main the Company had was 8 inches, now they have some that measure 24 inches. Again, at his advent the price charged for gas was 10s. per 1000 feet; now it is 2s. 10d. per 1000 feet in the borough, and 3s. 4d. per 1000 feet outside the borough. These facts indicate the great changes which have taken place, and it may be assumed that no mean ability was required to grapple with the difficulties which those changes involved. Mr. Bowen was equal to the task, and everybody connected with the Company will lament the loss of so valuable a servant. He was, as we have stated, engaged as Manager, but he was subsequently appointed Engineer and Secretary. Eventually he retired from the Secretaryship and was elected Managing Director, which post he held at the time of his death. But Mr. Bowen is better known to the general public as a member of the Cardiff Corporation than as an official of the Cardiff Gas Company."

LEICESTER CORPORATION GAS AND WATER SUPPLY.

At a Special Meeting of the Leicester Town Council last Thursday, the Gas and Water Committees presented the reports of their departments for the half year ended Dec. 31, 1880, which were adopted on the motions of Mr. DOWNING and Alderman BARFOOT respectively.

The Gas Committee stated that from the accounts it appeared that the net profit, after paying interest on the mortgage debt and dividends on the debenture stock issued as the consideration for the purchase of the works, and upon the new stock and debentures issued, was £10,310 9s. 10d. Out of this sum there had been paid £1002, being the half year's amount of sinking fund on the original capital debt of £476,651 12s. 6d., leaving a balance of £9308 9s. 10d., which added to the balance of net profit (£9815 1s.) for the half year ending June 30, would make a total of £13,123 10s. 10d. to be paid to the district fund at the close of the current financial year (the 25th inst.). The Committee felt that this state of affairs justified them in recommending that there should now be a further reduction of 2d. per 1000 feet made in the price of gas in the borough—i.e., from 2s. 8d. to 2s. 6d.; and they also recommended that the price be reduced 2d. per 1000 feet at Belgrave—i.e., from 3s. to 2s. 10d., which would make the price there the same as at Stonegate. These reductions in prices will reduce the income of the undertaking by a sum of about £1500 per annum.

The Water Committee reported that the accounts of their department for the past half year showed that the net profit after paying interest on the mortgage debt and dividends on the debenture stock issued as the consideration for the purchase of the concern, was £2112 10s. 3d. Out of this sum £767 had been paid, being the half year's amount of the sinking fund on the original capital debt of £452,434, leaving a balance of £1345 10s. 3d. "The Council," the report continues, "is aware that the Transfer Act authorizes the establishment of a reserve fund, which may amount to £5000, and that all net profits since the acquisition of the undertaking have been placed to such a fund, which, with interest, now amounts to £4234 10s. 11d. Your Committee recommend that from the profits of the last half year the sum of £765 9s. 1d. should be added to the reserve fund, thereby increasing it to the maximum amount (£5000); and that the balance of the net earnings of the half year, £580 1s. 2d., be paid to the district fund at the close of the current financial year (the 25th inst.)."

THE ASSESSMENT OF CORPORATION GAS-WORKS.

ALLOWANCE FOR TENANTS' PROFITS.

An interesting question as to the valuation of the Birmingham Corporation Gas-Works for purposes of assessment has recently arisen, in which the propriety of an allowance to the Corporation for tenants' profits was under consideration. A case, setting forth the facts and contentions on both sides, was prepared by Mr. Thomas F. Hedley, the senior member of the firm of Messrs. Hedley, Mason, and Hedley, of Birmingham; and this was submitted to Mr. R. E. Webster, Q.C., and Mr. W. Cunningham Glen, who have just given their opinion on it.

As the matter of valuation and assessment is of deep interest at the present time, and the principle involved is applicable to other corporate undertakings besides Birmingham, we give below a copy of the case and opinion:—

Case.

The Birmingham Gas-Works are the property of the Birmingham Corporation, and are vested in the Corporation by the 38 & 39 Vict., c. 178.

By section 11 (sub-section 3) of this Act, the annuities payable by the Corporation under the scheduled agreement with the Staffordshire Company (for the purchase of their gas-works) are, by virtue of the Act, "charged on, and made issuable out of all other the gas undertaking for the time being of the Corporation, and the income arising therefrom, and on, and out of the borough fund and borough rate for the time being of the borough."

By section 33 all the powers and authorities of the Gas Company are transferred to and vested in the Corporation, subject to the following exceptions:—(1.) "The provisions of the Gas-Works Clauses Act, 1847, incorporated with any of those Acts, with respect to the amount of profit to be received by the undertakers when the gas-works are carried on for their benefit, shall not apply to the Corporation." (2.) "The provisions of those Acts relating to the constitution, or capital, or the dividends, or the application of the profits of the respective Company."

By section 36 the application of the gas revenue is provided under eight heads, and the last paragraph of the section provides that "they (the Corporation) shall from time to time carry to the borough improvement rate or fund the net surplus remaining after the fulfilment of the several purposes aforesaid."

It is suggested, on behalf of the Unions in which some parts of the gas-works are situate, that, in valuing the gas-works for the purpose of assessing the works to the rates made for the relief of the poor, no allowance should be made to the Corporation, as a public body, for tenants' profits; and such suggestion is founded on the decision of the High Court of Justice, in the case of the *Mersey Docks and Harbour Board v. Overseers of Liverpool* (L. R., 9 Q. B., 84, Nov. 19, 1873), in which case the appellants (the Mersey Dock Board) contended they were entitled to deduct tenants' profits, as would be done in the case of a trading company. The Court took time to consider this question, and Justice Blackburn subsequently delivered judgment, and held the Mersey Dock Board were not entitled to a reduction in respect of tenants' profits, and is reported to have said that the Mersey Docks Act, 1858, "requires that all the rates shall be appropriated in payment of all expenses and charges of collecting the rates and several other purposes therein specified. If the premises were let to a tenant, it must be to a tenant subject to this Act, bound to hand over the rates received (after deducting the charges and expenses of collecting the rates) to those purposes, and the persons paying the dock rates would have a right to object to any part of them being applied to pay tenants' profits, excepting so far as an allowance for that might be included in the expenses and charges in collecting the rates. But all the expenses and charges of collecting the rates actually incurred by the Mersey Dock Board, who are occupiers, are allowed for and deducted, and the contention of the Board is that we are bound, contrary to the fact, to suppose that the premises are let to an actual tenant, who would, contrary to the provisions of the Mersey Docks Act, levy in dock rates a sum, in addition to all actual expenses of collection, for his own benefit. In such a case as the present, where an actual demise on any terms would be impracticable, and where a demise on the terms that the tenant should receive a profit beyond the expenses of collection would, if practical, be illegal, we think no deduction should be made on account of tenants' profits."

It is contended for the Corporation that the Birmingham gas-works are distinguishable from the Mersey docks:

Firstly, that if the gas-works had remained vested in the Gas Company that Company would have been entitled to a deduction for tenants' profits.

Secondly, that the Corporation gas-works are distinguishable from the Liverpool docks, as in the Liverpool docks no person derives any personal advantage or emolument whatsoever from the money received by the Dock Board in respect of the use of the docks, and all the rates are appropriated to the purposes specified in the Act; whereas the Birmingham Corporation Gas Act provides that the Corporation shall from time to time carry to the borough improvement rate or fund the net surplus or profit of the gas-works under their control, so that every ratepayer in the borough of Birmingham derives a personal advantage from the net surplus or profit of these gas-works.

Thirdly, a considerable portion of the gas-works under the control of the Birmingham Corporation are situate outside the borough, and the ratepayers in such districts have, of course, no interest in the reduction of the Birmingham improvement rate by the application of the surplus profit.

Fourthly, that the net surplus or profits on the manufacture and supply of gas are not like the tolls or dues for the use of docks, but are the profits of manufacture or trade.

Fifthly, that the Act vesting the gas-works in the Birmingham Corporation contemplates the Corporation making a profit which is to be carried to the credit of the borough fund, which fund is liable for any deficiency or loss arising from the gas-works.

It may, however, fairly be contended for the Unions that, as all the persons interested in the borough fund, to which the net surplus or profit of the gas-works has to be transferred, are not gas consumers, and all the persons interested in the works as gas consumers are not interested in the borough fund (as the Corporation supply gas without the limits of the borough of Birmingham), that the tenant of the gas-works would be bound to hand over the surplus profits to the borough fund, and that the parties interested in the borough fund, like the parties paying the dock dues at Liverpool, would have a right to object to any part of the gas revenue being applied to tenants' profits.

But, on the other hand, the parties interested in the borough fund would get the benefit of the allowance for tenants' profits, if an allowance is made as the rateable value of the gas-works, and the amount of rates payable thereon would thereby be reduced, and it is important to observe that the Corporation, by section 33, are exempted from the provisions of the Gas-Works Clauses Act, and other Acts relating to gas-works, providing for the application of the profits and of the prices of gas.

In rating properties like docks, railways, and gas and water works, it is the practice to allow interest on tenants' capital as well as tenants' profits; but the question of allowing interest does not appear to have been raised in the Mersey Docks case, and therefore that point was not decided by the Court.

As a certain amount of tenants' capital would have to be provided by the Corporation for meters and a cash balance, to pay wages and expenses, and the Corporation could only obtain such capital by borrowing, it is reasonable to assume that interest on tenants' capital ought to be allowed.

Counsel are requested to advise the Poor Law Union Authorities:

1. Whether, under the foregoing circumstances, any allowance for tenants' profits should be made to the Corporation in rating the Birmingham gas-works.
2. Should Counsel be of opinion no allowance ought to be made for tenants' profits, ought any allowance to be made for interest on tenants' capital.

Opinion.

The preamble to the Birmingham Corporation Gas Act, 1875, recites that "it is expedient that all necessary and proper powers for the making of gas, and in relation to the control and management of gas supply within the respective districts of the two Companies, be conferred on the Corporation," and the 36th section contemplates that a profit may be made out of the gas supply by the Corporation for the benefit of the inhabitants, or others liable to contribute to the borough improvement rate or fund.

We think that the Corporation are traders in the supply of gas as much as an ordinary gas company authorized by Act of Parliament would be; and that, in valuing their gas-works for the purposes of assessment to the poor-rate, the Corporation are entitled to the same deductions as any such ordinary gas company would be entitled to claim. Therefore that the Corporation are entitled to claim deductions in respect of—

1. Tenants' profits.
2. Interest on tenants' capital.

The subsequent application of the profits makes no difference. The hypothetical tenant must be assumed, which was not the case in the *Mersey Docks v. Liverpool*, for there the actual figures existed, that is to say—

1. The amount received from the dock rates or dues.
2. The cost of collecting the rates or dues.

We do not think that it makes any difference, the fact that all the persons interested in the borough fund are not gas consumers, and that all the persons interested in the gas-works as gas consumers are not interested in the borough fund; for that fund, in our opinion, is entitled (so to speak) to be credited with whatever amount of net profit is derived from the supply of gas by the Corporation within and without the borough.

(Signed) R. E. WEBSTER.
W. CUNNINGHAM GLEN.

Temple, March 5, 1881.

THE WATER SUPPLY OF CARDIFF.

For some months past the necessity of increasing the water supply of Cardiff has been pressing itself upon the attention of the Town Council, who some time since engaged the services of Mr. J. Taylor, M. Inst. C.E., of London, to report upon the subject, as also to advise the Council generally as to what steps should be taken. The scope of his suggestions was limited to the area and the means available for increasing the water supply, which passed into the hands of the Corporation under the provisions of the Cardiff Water-Works Act of 1878. Among the sources of supply specified in this Act were the Llanishen Brook and the River Ely, and the report furnished by Mr. Taylor, in accordance with his instructions, was limited to recommendations by which a larger quantity of water could be extracted from this river, and delivered into the Cardiff mains, and also to the construction of a second reservoir at Llysane, by which the storage capacity for water would be doubled. At a meeting of the Council in January it was resolved to carry out one portion of a scheme recommended by Mr. Taylor, consisting of the construction of a new reservoir at Ely, the laying down of larger pipes, and increasing the pumping power, at a cost of about £10,000. The chief objection urged against the adoption of this part of the scheme was the fact that the water from the Ely is of inferior quality, is remarkable for its hardness, contains a very large percentage of solid matter, and has been considered by the Medical Officer of Health for the district to be unsuited for dietetic purposes. Another portion of Mr. Taylor's scheme is of a more extensive nature, and would involve an outlay of from £100,000 to £120,000. He proposes to construct another large reservoir at Llysane, capable of storing 180 million or 190 million gallons of water, and by raising the walls 5 feet secure an increased pressure of 20 feet at Cardiff; but this, he says, can only be done by enlarging the mains, and by constructing two new filter-beds, for which 8 acres of land will have to be acquired. Even with this pressure it is doubtful if the water will be carried, at all periods of the year, to the upper floors of the houses at the lower parts of the town, owing to the friction in the pipes materially reducing the pressure. The watershed at Llysane is not regarded by some members of the Council as being the most suitable one from which to draw additional supplies of water, and some surprise has been expressed that the Water Committee have not taken steps to obtain the opinion of Mr. Taylor, Mr. J. F. Bateman, or some equally eminent water engineer, as to whether it would not be practicable, with a smaller outlay, to find an equally good, if not a better source of supply elsewhere. One of the finest watersheds in the county is in the neighbourhood of the Aber Brook; and by constructing a short dam and reservoirs a daily supply of 3 million gallons of water could be sent into Cardiff. This watershed is more than 300 feet above the town, and the advantage of the increased pressure over the 60 feet head at Llysane would be immense. The water also is of much purer quality. The Llysane water contains about 22 parts per 1000 of solid matter; the Aber water only 8 parts per 1000. The cost of constructing the necessary works and conveying the water to Cardiff would not amount to more than half the sum involved in Mr. Taylor's scheme, and a supply could be afforded to places on the route. A scheme has been brought forward, and finds favour with some members of the Council, for obtaining an auxiliary supply from the Aber Brook, at an estimated cost of £80,000 for works; but as the author of the scheme—Mr. G. A. Lundie, M. Inst. C.E.—reckons that something like £1100 per annum would be saved in pumping, and that there would be a certain revenue from the sale of water to places on the line of pipes, these amounts capitalized at 4 per cent. would bring the net cost down to one-half the sum stated above. Under the Cardiff Water-Works Act the inhabitants of Llandaff, on guaranteeing an income to the Cardiff Corporation of £400 a year, can compel the Corporation to supply them with water. To do this under Mr. Taylor's scheme would involve a special outlay of £15,000 in the construction of another reservoir. The income from Llandaff would not recoup the town the cost of supplying the place with water, and should such a demand be made by the inhabitants of Llandaff, it would prove a tax on the ratepayers at Cardiff. The extension of the works at Ely, without any extension at Llysane, will send into the town 4 million gallons of water daily. This will be an abundant supply for the next two years, the present consumption being

about 2½ million gallons. There will not, therefore, be any pressing necessity for immediately carrying out Mr. Taylor's or any other scheme.

At the meeting of the Town Council on Monday, the 14th inst.—the Mayor (Mr. Rees Jones) in the chair—the question of further extending the water supply was under consideration.

Alderman JONES (Chairman of the Water Committee) moved—"That the Water-Works Committee be authorized to carry out the powers vested in the Cardiff Corporation by the Cardiff Water-Works Act, 1878, and the Cardiff Corporation Act, 1879, for the erection and completion of reservoirs, filters, aqueducts, conduits, pipes, and other works, with the exception of the Upper Llanishen reservoir, and the works connected therewith." In doing so, he gave a short history of the connection of the Corporation with the water-works. In 1878, he said, the Water-Works Company went to Parliament for a Bill to enable them to increase their capital by £200,000, and to extend their works at Ely and Llanishen, the time for purchasing the land being limited to four years from the passing of the Act, and the power of completing the works being limited to ten years from that time. In 1879 the Corporation obtained an Act giving them power to purchase the existing water-works, and the costs entailed in the passing of the Company's Act and the Act of 1879 were paid by the Corporation. In September, 1879, the works became the property of the Corporation, and had since been managed by them through their Committee, with the help of Mr. Gooch, the late Water Company's Engineer, who had remained in this position up to the present time. Since 1879 there had been an unusually dry summer, and past winter was one of unexampled frost. The result had been that the water supply, which up to then was fairly sufficient, proved, under the strain of the two causes, temporarily insufficient, and the Committee had had great and increasing difficulties in dealing with the matter. After a considerable time they were authorized to consult Mr. J. Taylor, the Engineer to the Cardiff Water-Works Company, whose experience, as one of the original promoters of the Cardiff Water-Works, and the local knowledge necessarily acquired by him in consequence thereof, must be of great value in connection with the extension of the existing works. Mr. Taylor, in a report dated Sept. 23, 1880, recommended the easiest possible method of supplying the deficiency by the extension of the Ely works, so as to enable the Corporation to pump the 3 million gallons of water per day to which they were entitled by their Act of Parliament. A portion only of the works were being carried out, the Corporation being desirous not to incur any larger outlay at Ely than would guarantee their right to the 3 million gallons daily, and as soon as possible enable the town and district to receive a sufficient supply of water from this, the readiest mode, while other works could be constructed which could supply the town by the cheaper and better mode of gravitation. The works at Ely, if at any time superseded by gravitation, would form a valuable and inexhaustible store or reservoir, to supply any deficiency which might hereafter arise. For months past the Committee had been urged to increase the works, and every time the question had been pressed, something or other had been suggested which, it was said, would be cheaper and better than the scheme proposed by Mr. Taylor. The scheme approved by the Committee was that of the Water Company, and by this time it would have been completed by the Company if it had not been for the action of the Corporation. It was a scheme which, in the opinion of the Company, would certainly have repaid them 7 per cent. upon the necessary outlay. Whatever its merits or demerits, it was not the scheme of the Corporation, but the plan and scheme became the property of the Corporation by purchase in 1879. Although there was only the old Water Company's schemes before the Corporation, there was another—the Aber scheme—which was proposed by Mr. Lundie. Many persons thought this ought to supersede the Committee's scheme. The advantages of the Aber scheme were that the Aber Brook had an abundant supply of water; the brook, although varying, had never been known to be dry; the quality of the water was very soft and pure; and the position marked for a reservoir and filter-beds was much higher than the town. Its disadvantages were its distance from Cardiff; the cost of conveying the water to Cardiff; and the absence of clay for puddling. The ground was upon the coal formation; and there was the necessity for purchasing the underlying coal measures. There were other disadvantages connected with this scheme, among which was this—that the proposed works could not be connected with those at Llysane and Cardiff. The advantages of the Llanishen new reservoir were that it had sufficient water to supply, with the works at Ely, double the number of inhabitants at present in Cardiff; the quality of the water was good and soft, and the position of the reservoir would allow of any part of the town being supplied; it was within 4 miles of Cardiff, there were no engineering difficulties, and this would render the construction cheap and easy; there was a good natural subsoil for the reservoirs, while the land was cheap, there being no minerals. The only disadvantage, as compared with the Aber scheme, was its height above the town; but Mr. Taylor has provided for this in his Llanishen upper reservoir, which could supply Llandaff and the north of Cardiff. This was a fair résumé of the whole matter, and one without prejudice.

Mr. A. THOMAS moved as an amendment—"That, inasmuch as the report of Mr. John Taylor, C.E., deals with one source of supply only, and as it is essential, in order to come to a conclusion as to the locality best adapted as a site for additional water supply, that every source yielding an abundant supply should receive consideration, the words mentioned or implied in the motion of Alderman Jones be deferred until a report on every available source of water supply within a reasonable distance of Cardiff be laid before the Council, and that the Borough Engineer be requested to report thereon forthwith; the area already dealt with in Mr. Taylor's report to be considered as not coming within the scope of such instruction." In doing so he referred to the great cost of the works proposed by the Committee, though the sum to be expended would not, he said, be too large, supposing the essentials of a good water supply—purity, abundance, and pressure—were obtained. In none of these particulars did the Committee's scheme, in his opinion, come up to the mark; while the Aber Brook scheme, he thought, did so in every essential point. He was not, however, wedded to this scheme if a better one could be found.

Mr. JACOBS seconded the amendment.

After some discussion, in the course of which several propositions were made as to obtaining the opinion and assistance of some eminent Water Engineer, to act with the Borough Engineer (Mr. Williams), the following resolution was agreed to:—"That inasmuch as the report of Mr. John Taylor, C.E., deals with one source of supply only, and as it is essential, in order to come to a conclusion as to the locality best adapted as a site for works of additional water supply, that every source yielding an abundant supply should receive consideration, the works mentioned or implied in the motion of Alderman Jones be deferred until a report of every available source of water supply within a reasonable distance of Cardiff be laid before the Council, and that the Borough Engineer be instructed to prepare a report forthwith, and that he be empowered to engage some eminent civil or mining engineer to assist him in his report, such appointment to be made subject to the approval of the Water-Works Committee."

GERMAN CONTINENTAL GAS COMPANY.

TWENTY-SIXTH ANNUAL REPORT OF THE DIRECTORS.

We have received a copy of the Directors' report and the statement of accounts of the past year's working of the German Continental Gas Company, of Dessau, presented at the twenty-sixth annual meeting of the Company, held on the 14th inst. The present report commences by referring to the closing passages of the report for 1879, wherein a hope was expressed that an improvement might be experienced in the business of the Company, as well as in the general trade of the Continent. This hope has been realized during the past year, the gas consumption of the German stations of the Company, which had decreased during the two previous years, having again made some progress, completely reaching the normal rate of increase of past years in the latter six months, although the average of the whole year was still somewhat behind. At the foreign stations, Warsaw, Krakau, and Lemberg, the increase was smaller in the first, and larger in the second half year than in the preceding year, the average being, on the whole, a little lower. The increase in gas consumption was

	German Stations. Per Cent.	Foreign Stations. Per Cent.	Total Per Cent.
In the first half of 1880	1 09 ..	5 68 ..	3 17
" second "	8 38 ..	8 97 ..	8 64
In the complete year, 1880	+4 98 ..	+7 42 ..	+6 08
" " 1879	-2 93 ..	+7 91 ..	+1 67

The extraordinarily severe weather in December had a great influence on the increase of the second half year. In the first period considerable improvement took place in the rate of exchange on Russia, whereas the Dulcigno affair caused a considerable decrease in the second period, only giving place to a slight recovery towards the end of the year. The average realized was 211 as against 206 in 1879, thus showing a small improvement. It is hoped that the measures lately taken by the Ministry of Finance, and the maintenance of peace in the East, will soon result in an increased value for Russian currency. In other respects the past year gives little cause for comment. There is in reality no competition, as regards the Company, with the electric light; and the competition of petroleum has diminished in intensity wherever the general state of business has become more favourable.

The gas-meter works have been much busier, and realized a profit of 23·83 per cent. on the sunk and working capital apportioned to this branch of the Company's operations, as against 14·18 per cent. in the year before, and 7·66 per cent. in 1878. Altogether 728 meters were made, or 360 more than in the previous year, 310 meters were altered to the metre scale and repaired, or 137 more than in the year before. Besides this, there was a very considerable increase in the manufacture of brass fittings, lighting apparatus, regulators, lanterns, &c.

There have been no accidents or interruptions in the working of any of the stations. No compensation has had to be charged to the fire and explosion insurance fund, the balance of which has risen to 101,172-96 marks. The appointment of a second Engineer, vacant through the death of Herr W. Voss, has not been filled up, in consequence of the great exertions of Herr O. Möhr, the Company's Chief Engineer.

By the resolution of the general meeting, held on the 12th of March last year, which was the twenty-fifth anniversary of the formation of the Company, the officers' pension fund was created, thereby completing the general insurance and pension fund for the under-officers and workmen, previously provided by the resolution of July 1, 1874. The sum of 50,000 marks granted by the general meeting forms the working capital of the pension fund, to which all officers in receipt of yearly salaries of less than 3000 marks pay 2 per cent. of their incomes, while the Company contribute double this amount, and also allow interest at the rate of 5 per cent. on the whole capital. The details of the now completed organization for the pension and assistance of the Company's servants are to be found in the report of the progress of the Company during the first 25 years of their incorporation, published at the same time as this report.*

In connection with the celebration of the twenty-fifth anniversary of the Company, the following extraordinary expenditure was made:—

	Marks.
To the pension fund.	50,000·00
To under-officers, workmen, widows, and orphans	23,079·38
Total.	<u>73,079·38</u>

To which are to be added the following yearly expenses of the same class:—

Contribution to the officers' pension fund	Marks. 6911'18
Interest at 5 per cent.	2608'47
Pension to a manager (granted before the pension fund was formed)	1800'00
Accident insurance, and pensions to under-officials and workmen, and their widows and orphans	9544'44
Contributions by the Company to local sick funds . . .	3827'15
Total	23,291'24

Thus the extraordinary and ordinary payments on this account amounted together to 96,370.62 marks.

As mentioned in the last report, a new contract was concluded on Jan. 22 with the town of Ruhrort, on the basis already announced (that is, the town waiving the right of acquiring the works gratis, in consideration of a compensation to the community and a reduction in the price of gas). On the 8/12th of October an extension contract was also concluded with Gladbach, the existing conditions being prolonged to the end of 1903.

The following is an analysis of the gas consumption:—

		Cubic Metres.	Per Cent.
Street lighting		2,769,492	= 13·76
Public buildings		1,869,831	= 9·29
Private consumers		9,065,258	= 45·03
Manufactories		5,967,031	= 29·64
Gas for heating, &c.—			
Gas-engines	193,557		
Cooking-stoves, &c.	266,238		
		459,795	= 2·28
Total		20,131,407	100·00

According to this statement, the following classes of consumption show a decrease from the previous year:—Street lighting by 0·33 per cent., public buildings by 0·08 per cent., and private consumption by 0·52 per cent. The following have increased:—Manufactories by 0·55 per cent., and gas for heating, &c., by 0·38 per cent. In all classes, however, there has been a considerable absolute increase. The largest increase—161,216 cubic metres—is in the railway stations and workshops, partly due to increased traffic, and partly to departure in many cases from the excessive and dangerous economy practised by the railway officials during the previous year. The remaining increase is chiefly made up as follows:—On the iron and steel industry, 74,648 cubic metres; on the cotton industry, 70,108 cubic metres; on mills and steam bakeries, 55,902 cubic metres; on the woollen industry, 47,248 cubic metres;

silk factories, 37,139 cubic mètres, and so on. There were large decreases in the leather trade consumption, of 15,277 cubic mètres; in printing and paper works, of 13,662 cubic mètres; in tobacco mills, of 13,466 cubic mètres, and so forth. The increased consumption of gas for motor engines (there being 116 gas-engines of 240-horse power on the books, as against 102 engines of 209-horse power in the previous year), and for heating, cooking, and general trade purposes, amounted to 99,444 cubic mètres. The increase of this class of consumption has not yet answered the Company's expectations, owing, it is surmised, to the innate conservatism of ladies and cooks, which militates against the introduction of new methods of doing the work of a household; still there is an actual increase of 28 per cent. to be recorded. The Company have endeavoured, and with success, to introduce gas for locomotive engines. The real advantage, in respect of the economical working of gas-making establishments, of the sale of gas for heating, &c., appears in the example of Luckenwalde, where this class of consumption, though only 1.89 per cent. of the total quantity of gas sold for the whole year, was yet 30.27 per cent. of the total consumption in the month of June and July. It is clearly shown by this instance how much more advantageously gas-works may be managed when there is a considerable increase in this class of consumption.

The following are the particulars of the working of the several stations :—

		Production. Cubic Metres.	Number of Lights.
1. Frankfort-on-the-Oder	1879	1,276,397	.. 15,124
Do. do.	1880	1,309,848	.. 15,255
Increase		33,451	Inc. 131

By this increase, only a part of the decrease of 1879 is recovered; but as the improvement belongs to the second half year, it may be hoped to continue during the present year. Of the land previously acquired with a view to building branch works, a portion was resold at a considerable profit.

		Production. Cubic Metres.	Number of Lights.
2. Mülheim-on-the-Ruhr	1879	815,870	11,517
Do. do.	1880	906,940	11,832
Increase		91,070	Inc. 315

A considerable increase has at length followed the extraordinary decreases of the last four years, although the remarkable production of 1875 has not yet been equalled. The increased consumption is due to the railways and the manufactories.

			Production, Cubic Metres.		Number of Lights.
3. Potsdam-Neuendorf	1879		1,545,004	..	17,824
Do. do.	1880		1,557,980	..	18,157
		Increase	12,976	Inc.	333

The increase of production is a matter of loss, the consumption having actually decreased by 7150 cubic metres, the diminution being therefore repeated for the third year. As, however, there was a slight improvement in the second half year, it is hoped the current year will turn out better. When the change to the metric system was made, there was a thorough revision of discounts, causing considerable loss.

		Production, Cubic Mètres.	Number of Lights.
4. Dessau	1879	656,715	10,943
Do.	1880	717,665	11,258
	Increase	60,950	Inc. 315

The extraordinarily rapid progress of the town of Dessau and its manufactures has again caused a very favourable rise in the consumption of gas. By the same causes as stated in the case of Potsdam, the increase of profit was considerably retarded by lowering the price, and by discounts.

		Production. Cubic Metres.	Number of Lights.
5. Luckenwalde	1879	272,150 ..	3,756
Do.	1880	301,922 ..	3,957
Increase		29,772	Inc. 201

The progress of former years has thus been continued at the same rate, although the cloth trade has not yet recovered its normal state of activity.

			Production. Cubic Metres.	Number of Lights.
6. Gladbach-Rheydt.	1879		2,534,925	28,860
Do. do.	1880		2,690,950	30,356
		Increase	156,025	Inc. 1,496

The decrease of consumption mentioned in last year's report continued from the end of 1879 to September last, when such a rapid improvement set in, owing to a revival of the cotton trade, that the above large returns were secured, which are only lower than those of 1876. The contract with the Municipality of Gladbach was to have terminated on Oct. 15, 1882. On the 8/12th of October last year a new contract was entered into for the period from Oct. 15, 1882, to the end of the year 1903. With the exception of a small abatement of price for street lamps, the prices and discounts to private consumers are to remain in force. The Company, however, have to pay to the Municipality, for the use of the subsoil of the streets, a yearly sum rising in defined proportions in a fixed ratio to the local taxes, which have risen enormously in the towns of the Rhine district. The works will, of course, remain the property of the Company at the end of the extended contract period. The highly esteemed chief of the Gladbach establishment, Herr A. Reichardt, who held that position for many years, having been pensioned at his own request, he has been followed in his office by Herr H. Kamlah. Herr Reichardt will be remembered with the greatest esteem by the Company, and by the citizens of Gladbach, Rheydt, and Odenkirchen.

		Production. Cubic Metres.	Number of Lights.
7. Hagen-Herdecke	1879	966,880	11,680
Do. do.	1880	974,770	11,825
Increase		7,890	145

This increase is only a greater loss, the consumption having again decreased as in the previous year, last year's diminution being 15,681 cubic mètres. The increase, though small, noticed during the second half year, gives hopes of a better result for the present year, although the iron and steel trade, especially in the export branch, remains depressed.

		Production, Cubic Metres.	Number of Lights.
8. Warsaw-Praga	1879	7,419,374	57,613
Do.	1880	8,087,391	63,008
Increase		668,017	Inc. 5,395

This expansion surpassed all previous experience. In consequence, however, of the unusually severe winter, the loss of gas which had been so remarkably diminished in 1879, again increased considerably, so that

the actual increase of consumption amounted only to 569,368 cubic metres, or less than the corresponding figures for the preceding year. This is due to depression of trade. The increase in the number of lights is the largest ever recorded, and must be regarded with pleasure as giving evidence that the private consumption is steadily improving. The telescoping of the third gasholder, mentioned in the last report, has been accomplished on the American system, without covering, the cupping being warmed by steam. This arrangement has answered admirably during the past winter, and has caused a great saving of capital. The total gasholder capacity of the Warsaw works is now 28,166 cubic metres; on the 23rd of December the production was 43,364 cubic metres, owing principally to bad weather. During the present year six settings of eight retorts, with gas generator furnaces, will be built in retort-house No. 3. It has been already mentioned that the average value of the paper currency has somewhat risen, being now 211 as against 206 in 1879. This is still less than two-thirds of the normal rate of exchange for cash payments. The present contract with the city of Warsaw expires on Sept. 26, 1883, the City having waived the right of prolonging it for five years, with a reduction of about 5 per cent. in the selling price of gas. An open circular invitation for the purpose of establishing competing works has had no result. The Municipal President, assisted by Herr Aug. Hegener, a German Engineer, contemplates the erection of works by the Municipality, while at the same time treating with the Company for a considerable extension of the contract. The terms offered by the Company are so advantageous to the city of Warsaw, that there is the best reason for hoping they will be accepted. It is, moreover, known to the Proprietors that the Company possess at Warsaw the right of carrying on operations for ever, and are therefore able, with calmness, to anticipate eventual competition, especially as nothing is gained by the public lighting. Since the beginning of this year there has been another increase in the Russian import duty on coal, which, as regards the Company, amounted in 1880 to 31,605·23 marks.

		Production. Cubic Metres.	Number of Lights.
9. Erfurt	1879	1,070,943	15,204
Do.	1880	1,136,489	14,036
Increase		65,546	Inc. 832

The decrease of the past few years, chiefly the result of the competition of petroleum, which is more active here than anywhere else, has therefore at length yielded to a considerable increase, although the production has not yet recovered the proportions of former years. Erfurt especially affords a confirmation of the statement to be found at the beginning of this report, respecting the generally decreasing severity of petroleum competition. The reduction of price, referred to in the last report, also caused much loss here last year.

		Production. Cubic Metres.	Number of Lights.
10. Krakau-Podgoritz	1879	663,199	6,607
Do.	1880	678,741	6,886
Increase		15,542	Inc. 279

This increase more than compensates for the previous year's decrease. Generator furnaces were also introduced here during the year, two settings of eight retorts having been erected. On account of another fall in the value of silver, the rate of realization was lower here and at Lemberg, being 172½, as against 174 in the previous year.

		Production. Cubic Metres.	Number of Lights.
11. Nordhausen	1879	583,315	8,564
Do.	1880	615,988	8,968
Increase		32,673	Inc. 404

In this place also the preceding year's decrease was largely compensated for. The lower prices introduced since July 1, 1879, caused great losses, but, as at Erfurt and Gotha, may have contributed to the increased consumption. Business of all kinds is still unfavourable here; the increase of consumption is almost entirely attributable to the railway stations.

		Production. Cubic Metres.	Number of Lights.
12. Lemberg	1879	943,107	11,265
Do.	1880	997,912	11,655
Increase		54,805	Inc. 390

The increase much surpassed the decrease of the previous year, although there is not here, more than at Krakau, any considerable amelioration in trade to be recorded. The fall in the rate of exchange has been already referred to in the case of Krakau.

		Production. Cubic Metres.	Number of Lights.
13. Gotha	1879	603,061	5,778
Do.	1880	625,504	9,002
Increase		22,443	Inc. 224

This improvement was rather better than the progress recorded in 1879, but did not quite cover the loss caused by the lowering of prices in that year.

		Production. Cubic Metres.	Number of Lights.
14. Ruhrort	1879	434,171	4,298
Do.	1880	528,746	4,621
Increase		94,575	Inc. 323

The falling-off in past years is more than covered by this large increase, which is more in proportion than that recorded for any other of the Company's stations. The lessened prices stipulated in the new contract (*vide* last report, given in JOURNAL for April 6, 1880, p. 523) and still more the improvement in the iron trade, and the lighting up of the extended harbour with gas, have contributed to this favourable result. On the 17/29th of November last, a gas lighting contract was concluded with the neighbouring thriving community of Meiderich, on the new Ruhrort model, which promises to become of value in the future.

		Production. Cubic Metres.	Number of Lights.
15. Eupen	1879	275,475	4,002
Do.	1880	289,141	3,973
Increase		13,666	Dec. 29

This increase is almost entirely on the losing side; the general state of business in Eupen is still altogether unsatisfactory.

		Production. Cubic Metres.	Number of Lights.
16. Herbesthal	1879	89,168	246
Do.	1880	90,253	263
Increase		1,085	Inc. 17

This trifling increase was chiefly owing to a somewhat larger railway consumption.

The following is a statement of the total results of the past year's working:—

	Production. Cubic Metres.	Number of Lights
1. Frankfort-on-the-Oder	1,309,848	15,255
2. Mülheim-on-the-Rohr	906,940	11,832
3. Potsdam Neuendorf	1,557,980	18,157
4. Dessau	717,665	11,258
5. Luckenwalde	301,922	3,957
6. Gladbach-Rheydt	2,690,950	30,356
7. Hagen-Herdecke	974,770	11,825
8. Warsaw-Praga	8,087,391	63,008
9. Erfurt	1,136,489	14,036
10. Krakau-Podgoritz	678,741	6,886
11. Nordhausen	615,988	8,968
12. Lemberg	997,912	11,655
13. Gotha	625,504	9,002
14. Ruhrort	528,746	4,621
15. Eupen	289,141	3,973
16. Herbesthal	90,253	263
Total	1880 21,510,240	225,052
Total	1879 20,149,754	214,281
Increase	1,360,486	Inc. 10,771
	= 6·75 p.c.	= 5·03 p.c.

The increase of production compared with that of the preceding year has thus risen from 0·57 to 6·75 per cent.; while the increase in consumption has risen from 1·67 to 6·08 per cent. The proportionately small increase in the consumption is explained by the loss of gas in distribution having risen from 4·90 to 5·50 per cent.—a result which was anticipated in the last report as a consequence of the unusually cold winter of 1879-80. It has required great exertion and no small outlay to bring down the percentage of loss from 6·74 in the first to 4·44 in the second half of the year, and thus to obtain for the whole year the respectable average of 5·5 per cent., which is only surpassed by the figures for the year 1879.

The increase in the number of lights has more than doubled, as compared with the previous year, and has only been exceeded in the years 1874 and 1875. The German stations only contributed 60 lights, or 1·12 per cent. of the whole, to the increase of 1879; but last year they added 4707 lights, or 43·7 per cent. of the total. For the first time for three years there was again an increase in the average yearly consumption of every burner in use. This increase amounted to 323·5 cubic metres, or 4·7 cubic metres more in the case of street lamps, and to 82·5 cubic metres, or 2·3 cubic metres each more for private lights; the gross average being 92 cubic metres, or 2·4 cubic metres each more than was consumed in the year 1879.

The consumption of coal was as follows:—

	Hectolitres.	Per Cent.
Westphalian	353,683	or 38·63
Upper Silesian	338,144	36·96
Moravian	83,647	9·14
English	70,067	7·65
Lower Silesian	69,311	7·57
Platten coal	422	0·05
Total	915,574	100·00

The deviations from the particulars of the previous year's coal consumption are unimportant. The increase in the quantity carbonized amounted to 60,987 hectolitres. The yield of gas from the coal per hectolitre was 23·5 cubic metres, as against 23·6 cubic metres during the previous year.

The average price of coal delivered into the works was 1·37 marks per hectolitre, or 3 pfennige (0·03s.) less than the preceding year's price; thus again touching the minimum cost of coal as in the year 1868. For the beginning of the current year the Company have succeeded in buying coal on the same advantageous terms as in 1880.

The price of coke again rose considerably as compared with the preceding year, the increase amounting to 12 pf. (0·12s.) per hectolitre, thus reaching 87 pf. (0·87s.) per hectolitre, and more than compensating for the diminution in value experienced in 1878.

In the sale of tar there was also an improvement, and the receipts for ammoniacal liquor were larger than the bare increase of quantity produced would account for. The profit on these heads amounted to 104,351·11 marks, or 11,778·64 marks more than for the previous year.

The cost of purification was diminished during the year to the insignificant total of 3116·54 marks, and may soon altogether disappear, as at present the spent material is disposed of to chemical manufacturers who make use of the sulphur which it contains.

Last year the amounts usually written off for plant, apparatus, and tools were so much increased that in a few years the items standing under these heads will have entirely disappeared, except in the case of a few of the more valuable articles.

Generator firing has again made satisfactory progress, both as regards extension of construction and economy of coke. Of the gas made, 72 per cent. is produced from settings fired by generator furnaces, as against 64 per cent. so heated during the preceding year. The percentage of coke used as fuel has further diminished from 19·59 to 18·06 kilos. per 100 kilos. of coal carbonized. At Dessau the relative consumption of coke in the generators amounted only to 15·94 kilos., including the fuel required for lighting up and letting down the benches. The value of the economy of fuel which has already been attained, and is still increasing, may be appreciated when it is remembered that in 1880 no more coke was used as fuel than in 1874, although the production of gas for the past year was 25·6 per cent. in excess of that recorded six years since.

The capital expenditure at all the Company's stations was increased by the net amount of 304,805·97 marks during the year. This exceeded the outlay of the previous year by 20,080·22 marks, chiefly in consequence of the erection of a gasholder at Warsaw and the extension of mains at Ruhrort. There are no important extensions in prospect this year; only the generator system will be extended.

The length of mains laid at the end of the year 1880 was 541,132 metres, or 19,519 metres more than at the termination of the previous year.

The gross profit of the undertaking has increased by 161,740·98 marks, in spite of abatements in price, on the acceptance of contracts, or on the adoption of the metric system in seven towns, amounting to no less than 68,380 marks; and notwithstanding the unusually large amounts written off the apparatus and tools accounts. The improvement in the Russian exchanges (being so small, and outweighed by a fall in the Austrian exchange) has not affected the profits to any considerable extent. The extra profit is, therefore, to be mainly ascribed to an extended consumption, to technical and economical progress, and to the more advantageous realization of the secondary products, with the somewhat lower cost of coal. The net divisible profit could not, of course, increase in the same ratio, the amortization instalment (68,618·04 marks for 1879), which had in the previous year been covered by the premiums on the last issue of shares, having now to be taken from the business returns, and 73,079·86 marks having been expended on the pension fund on the twenty-fifth anniversary of the Company. Nevertheless, the balance of the net

profits has increased by 13,607·45 marks as compared with 1879, which would enable a dividend of nearly 13½ per cent. to be declared. In accordance with the recommendation of the statutory Audit Committee, the Directors have, however, decided to declare a dividend after the rate of 13 per cent. per annum, as for the last three years; and to carry 71,187·63 marks to the reserve fund. It is hoped that the result of the current year's working will enable the Directors to increase the reserve by a much greater amount, which would enable them, as mentioned in the last report, to carry out future extensions to a greater extent from the amounts written off, from the reserve fund, and from the amortization instalments. The increase of consumption amounted in January last to 142,605 cubic metres, or more than five times as much as the recorded increase in January, 1880. Prospects are generally favourable if only, as is hoped, peace can be maintained in Europe.

Complying with instructions given last year, the Directors have published a report on the progress of the Company during the first 25 years of its incorporation. This will be of special interest, not only to the numerous old Shareholders, but also to the new Proprietors, as it sets forth the reasons of the Company's past prosperity, and thereby affords some guidance to a conclusion as to its future existence.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

(Continued from p. 445.)

After the introductory proceedings at the recent half-yearly meeting of this Association, as reported last week,
Mr. W. W. MONK (Bournemouth) read the following description of his patented

DIP-SEAL REGULATOR AND SUPERHEATED STEAM RE-VOLATILIZING APPARATUS.

As I believe the apparatus I am now about to speak of is interesting, practical, and simple, for ordinary retort-house working, I have pleasure in bringing it before you.

The imperfections of the ordinary hydraulic main, and their effects on the manufacture of gas, have for some time occupied the attention of some of our greatest engineers and chemists, and, of late years, not a few evils are attributed to it. The chief objection is that the pressure caused by the dip or seal promotes the formation of carbon in the retorts, and the gases, as they bubble through the tar, are deteriorated in quality, and there is a diminished yield per ton. To remove these evils has been the object of all the new patent dip and anti-dip arrangements, some of which show a considerable amount of careful thought and study;

but they nearly all fall very far short of the gas manufacturer's requirements, chiefly in still allowing pulsatory action in the retort, while my plan entirely removes this serious objection, especially when an exhaustor is used in combination with it.

To supply an hydraulic main that will overcome the great defects that have been laid against the older types, has been my aim in the invention of my patent dip-seal regulator and superheated steam re-volatilizing apparatus, which, being new, may require a little description so that it may be understood. In order to make it plain, I have had a drawing prepared, to which I beg to call your attention.

The dip-seal regulator at the side of the retort-bench is an iron box, moving up and down upon guides; and can be raised or lowered, by means of a screw and bevel-gear arrangement, from below. Between the box and the hydraulic main, a syphon is fixed, one leg in the box, the other leg in the hydraulic main, so that by raising the box the level of the water will be higher than that in the hydraulic main, and therefore the water will flow from the box, and seal all the dip-pipes, while by lowering the box below the level of the liquid in the hydraulic main, the contrary takes place. You will see, by this arrangement for sealing and unsealing, that it is simple, efficient, and reliable, being based upon sound, practical principles.

When working without steam, it would be advisable to so arrange the overflow from the hydraulic main as to draw off all tar from the bottom of the main, and thus have liquor or tar only for working into the syphon and unsealing box. It is also advisable to have a separate length of hydraulic main for each bed of retorts. When working with steam, it is unnecessary to use the unsealing box.

The annular dip re-volatilizing hydraulic main is, as you will notice, different in shape from what is generally used. The reason will be obvious on examination, the hydraulic being brought forward so as to allow of the ascension-pipes being carried right up through the main, to about 1 ft. 6 in. above the top of the main. The dip is a pipe placed outside the top of the ascension-pipe, forming with it an annular dip, which goes down to within a few inches of the bottom of the hydraulic main. On the top of the dip-pipe, and between it and the ascension-pipe, is a ring of iron tube similar to a ring-burner of a gas-stove. This ring has a number of small holes in its under side, from which small jets of steam rush down the annular space into the hydraulic main, the steam being supplied from a boiler, and through a superheated coil, which is a spiral coil of copper pipe inserted in the flue of the retort-bench. With this apparatus you can work either with or without steam; and the man in charge can see at a glance, by the indicator attached to the actuating rod of the syphon-box, whether the pipes are sealed or not, or what dip he is working with. When working without a seal by this system, there is no pulsation of the gas inside the retort; the steam flowing with the gas keeps the current steady, thereby preventing any evil effects from this cause.

Again, the apparatus goes farther than only relieving the back pressure; the action of the steam raises the temperature of the gases in the hydraulic main—which is very necessary too, as by the best process of gas manufacture it is impossible to prevent a considerable quantity of rich hydrocarbons being left in the tar. The application of steam in the dip-pipe rarefies the gases and vapours of the illuminating hydrocarbons more than by the ordinary process, so that the sooty, tarry particles fall more freely, from their greater specific gravity, without being able to carry along with them the lighter hydrocarbons; and the high temperature of the steam raising the temperature of the tar, prevents it abstracting the naphtha and vapours of similar substances from the gas, and re-volatilizing the naphthaline, preventing it from crystallizing at ordinary temperatures in consequence of the presence in the gas of a more considerable quantity of the lighter hydrocarbon vapours.

There is also little probability of trouble from choked ascension-pipes, which would soon be known only as a thing of the past, as every time the retorts are drawn the steam passing down the ascension-pipes effectually clears the interiors thereof.

In working this system, care is, and should be taken that the heavy oils and compounds which form tar, having an affinity for illuminants at low temperatures, are separated in the condenser at not less than 100° Fahr.; or they would be carried down with the tar to a considerable extent, and be taken away with it as it flows into the tar-well.

I have not had time to go minutely into the minor advantages obtainable by this apparatus, in consequence of having to work other retorts on the ordinary plan in conjunction with it, the lighting season being too far advanced when I commenced to use it. Neither have I any tabulated form comparing the working results with the ordinary process; but I would suggest that any manager making an addition to his works, where it could be worked separately, would do well to give it a trial for a certain period against the ordinary process, when I am certain great advantage would be found in adopting it, especially that of eliminating the sulphur compounds in addition to getting an increased make.

Discussion.

The PRESIDENT inquired whether Mr. Monk had been able to test the make of gas per ton of coal carbonized by his process; also, whether there was any difference in the consistency of the tar in the hydraulic, and if he did not require more condensing power.

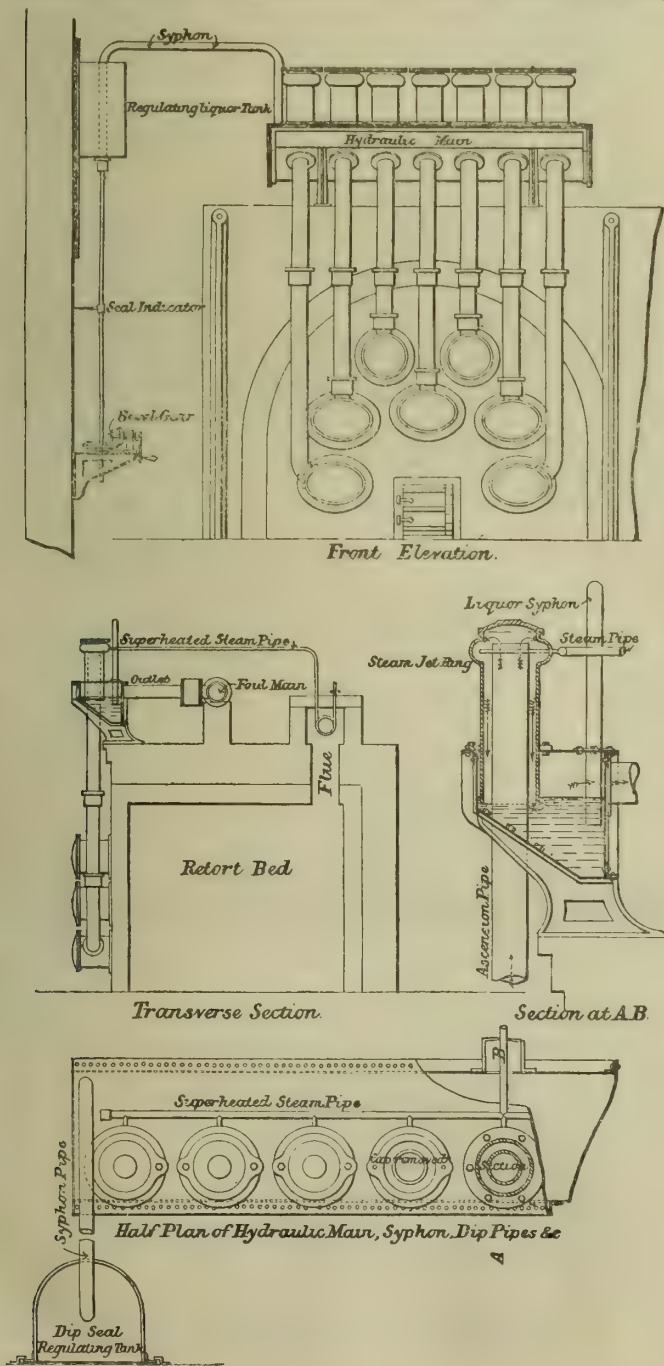
Mr. E. FARRAND (Ryde) inquired whether there was any advantage in using superheated steam, and, if so, what. He further wished to know at what point the tar was removed from the gas.

Mr. J. G. LIVESAY (Ventnor) asked if Mr. Monk had taken the temperature of the gas in the hydraulic.

Mr. DURKIN said he should like to know if Mr. Monk had found any difficulty with the fluids in the hydraulic; and whether any particular kind of meter was used in his district.

Mr. T. STONE (Weymouth) asked whether Mr. Monk had made up his account of gas made and sold per ton for the past half year.

Mr. MONK said he had worked the process for a week by itself, and had obtained 11,500 cubic feet of gas per ton of coal. But he had only fitted one bench of retorts with his apparatus, and therefore during the winter it had been worked in conjunction with the ordinary process. He used a mixture of Pelaw Main and Silkestone coal, without cannel (in fact, only 42 tons of cannel were used at the works during the whole of last half year); and the illuminating power of his gas was 15½ candles. His object in using superheated steam was to get it quite dry, and also hotter than saturated steam, as unless this was the case he could not take up the naphtha vapours. The temperature of the gas and steam at the top of the hydraulic was 300° Fahr. He had no trouble in the hydraulic, but the tar had occasionally been thick in the condenser during the past winter, and he had to use steam, which proved an effective remedy. He had not had any choked ascension-pipes. [He then handed round the last half-yearly report of the Bournemouth Gas Company, from which it appears that the make of gas per ton of coal carbonized was 10,750 feet; gas accounted for, 10,060 feet; loss 6½ per cent.] He removed the tar at about the middle of his condensing apparatus, which was of ample size for his requirements, and of the horizontal form. He did not allow the tar to remain in contact with the gas at a lower temperature than 100° Fahr. He used a separate hydraulic to each setting, and a ¾-inch seal. He wished to put the matter



fairly before the meeting, and would say that the tar produced by his process was not so good, and there was a large quantity of weak liquor; so he recommended that his plan should be worked, not by itself, but in conjunction with the ordinary process. He could get his liquor up to 12-oz. strength by using two scrubbers. The same purifying apparatus answered for his system as was used for the ordinary process.

The President said that the meeting was much indebted to Mr. Monk for the manner in which his invention had been placed before them, and for the admirable way in which it had been illustrated.

Mr. W. S. M'GREGOR (Ringwood) next read the following paper on

THE EDUCATION OF GAS CONSUMERS.

The subject which I have the honour of bringing before the Association is one of daily increasing importance, and one that, until recently, has been done scant justice to by the majority of gas companies. In expressing this opinion, I am not overlooking the fact that the subject has been rendered familiar to us by the energetic action and painstaking efforts of many companies and corporate bodies, and that the requirements of the case have been fully provided for by the scientific research and persistent labour of many of the members of our profession. Still, if we consider the vast amount of loss that annually takes place through the imperfect and wasteful methods adopted in consuming gas, it is evident that we ought to try and prevent this abuse from continuing any longer.

Complaints are repeatedly made which, on investigation, are found to be chargeable to either the burners or the fittings, but it is a difficult and well-nigh impossible task to convince consumers, more especially when they have provided themselves with it, may be, new fittings and burners, not taking into consideration that these may not be suited for their purpose. Consumers are, as a rule, painfully ignorant of the conditions under which perfect combustion can be secured; therefore it is much to be regretted that we do not possess the necessary power to see that they are supplied with proper fittings, and that these are fixed in a satisfactory way. Without this provision, consumers are practically at the mercy of local fitters, who may or may not be men of experience, and this only tends to complicate matters; because there is no common interest between consumers and fitters, whereas with a gas company the case is different, as their interests and the consumers' are identical. Not only because the latter would receive an improved supply, and consequently there would be fewer complaints, but also on the score of economy, are consumers equally interested with manufacturers of gas; and, looking at this matter from a sanitary point of view, it may be said that they ought to take a deep interest in it, for it is well known that gas, improperly burned, not only vitiates the atmosphere, but makes our dwelling-houses unhealthy. There can be no question but that it would prove advantageous to all concerned, if we supplied all necessary apparatus, although it would most likely raise the cry of monopoly and interference with private rights. Still, all things considered, it would gain us the support and confidence of our customers, and any prejudice they may now have would disappear through the saving effected by these means.

Success in any commercial enterprise depends, in a great measure, not only in having a good article for disposal, but also in making it known as widely as possible amongst those most likely to require it. Gas companies have not done this, although I fail to see a sufficient reason why they should not; on the contrary, if we are to have as many rivals in the field as seems probable, we must do it, and not rest satisfied until we have seen our staple article delivered at the point of consumption. Objections may be urged that this would entail upon us a considerable amount of extra labour, as it undoubtedly would; but I believe none of us would object to some time being spent in this manner, could we but be spared the annoyance and trouble of frequent complaints, which in ninety-nine cases out of a hundred simply mean bad internal fittings, or our old antiquated enemy, the iron burner.

Even in the matter of burners, a good deal may be said, for burners ought to be good burners, not only in the ordinary sense of the word, but they should be otherwise adapted to the quality of gas supplied, otherwise they are worse than useless, however good and well-finished articles they may be. Bearing this in mind, it is obvious that the maximum amount of light will only be obtained when the burner is suited to the quality, and is passing the quantity of gas for which it was constructed, any fluctuations under or over the proper amount causing a proportionate decrease in the illuminating power; thus conclusively showing the advantages to be gained by burning the gas at a regular pressure, as low as is consistent with a proper supply.

Many attempts have been made to render the burner a regulating agent, and not without some measure of success, but there can be no doubt that the best results will be obtained by using a governor to control the supply, and it is astonishing, considering the perfection these instruments have attained in the last few years, how few of them are in consumers' houses. With so many excellent burners now before the public, it would be invidious to draw a hard and fast line, and say which was best; but it will be generally admitted that the batswing, or some of the numerous modifications of it, is best suited for our purpose. The Argand burners are better adapted for burning a low standard of gas; but as it is not desirable, for ordinary purposes, that a burner should be too complicated, the flat-flame is the best for practical use. I have lately fitted up for some of my consumers several of Mr. Sugg's "Christiania" burners and "London" Argands with most gratifying results.

Many consumers commit the error of having good burners fixed inside globes having very small openings at the bottom, thus causing a flickering, noisy, and disagreeable light. Globes, of whatever material they may be made, should have wide openings at top and bottom, to enable the air to pass freely without impinging on the edges of the flame. Manufacturers of these articles are fully alive to this, and the most expensive kinds can now be purchased made in this way. It is not very pleasing to reflect that, even with all these manifest improvements, consumers, generally speaking, have reaped comparatively little benefit. This is not as it ought to be, and is worthy our earnest consideration.

Another subject should have more attention than it usually receives—viz., the complaints that are often made about incorrect registration of meters; for it is a well-known fact that this is a fruitful source of dispute, and often the cause of much trouble and hostility shown towards gas companies. If possible, we should try and enable the consumer to understand the principle of the meters in daily use, their construction, and the range of error allowed by Act of Parliament as to registration; and not leave them to believe, as many do, that they are not trustworthy, and can be made to register to suit the company. Many companies print on the back of their gas bills instructions how to read the indices of meters, and this is a step in the right direction. But is it enough? I think not. We must give every facility for information; and, if not so successful as we could wish, at least we shall have the consciousness of having done our duty.

Consumers have had the benefit, in a few places, of a good deal of instruction on the use of gas cooking and heating stoves, and many companies now let these out on hire. Cannot they go a step farther, and let everything on hire a consumer requires, inside piping excepted? The

JOURNAL OF GAS LIGHTING has repeatedly advocated this system, and it is satisfactory to know that wherever it has been tried it has given excellent results. The high price of gas in some small towns would, no doubt, retard the introduction of stoves, but it need not have a discouraging effect on other things as essential to the welfare of a company. In small works, where the manager is the moving spirit of the concern, he could give the consumers judicious advice as to meters, fittings, &c., and in larger works could not the meter inspectors be deputed to discharge the same duty? The exhibitions of gas apparatus have undoubtedly done a great amount of good in drawing the attention of the public to the many uses to which gas can be applied; but, being only temporary, their influence is apt to decline, and they do not suit all cases; besides, there are other means quite as effectual, such as popular lectures, the distribution of pamphlets or leaflets, or, what is probably the best method, keeping a selected stock in any convenient place, that the consumers can see at any time.

I trust it will soon become a recognized duty that all companies and corporate bodies supplying gas will take a cordial and sympathetic interest in seeing their consumers fully instructed in all that appertains to the economical consumption of gas, for it is beyond doubt that the results would compensate for any time, trouble, or expense incurred in so doing.

In conclusion, I am fully aware that I have not said anything new, but I trust the remarks I have made, however crude, on this important subject, will elicit your opinions, and induce others better qualified to solve its knotty points.

Discussion.

The President said he should be pleased to hear the observations of members on this subject, as the paper contained points which must recommend themselves to the attention of all gas managers present.

Mr. HARDICK said he had tried to educate his consumers by distributing amongst them books and pamphlets on gas matters; but he found they required a reduction in the gas bill without trouble to themselves, rather than to learn anything about gas. He found that a great deal of trouble and dissatisfaction arose from the sale of service regulators, which were fixed indiscriminately, without regard to the fact that sometimes there was no excess of pressure. Some consumers had fixed these instruments, not having a sufficient pressure, by reason of their service-pipes being too small in the first place; and one consumer, considering that he obtained some advantage by the use of one regulator, had put on two, in the belief that the supposed saving would be increased. Some people, too, were very suspicious about meters, and he instanced the case of a gentleman who, having tried first a dry and then a wet meter, without any reduction in his quarterly gas bill, sent to London, privately, and purchased a meter; and as his gas bill still remained the same, he concluded that he (Mr. Hardick) influenced the meters in some way. Gas consumers would not read books, but he thought that a concise pamphlet, setting forth the principal facts in connection with the consumption of gas, might be useful.

Mr. W. FAULKNER (Romsey) stated that he found it much more satisfactory to deal with people who understood the indications of their meters.

The President said he had given the subject under consideration a great deal of attention. He had introduced regulators to a large extent, and wherever he found bad burners he, without charge to the consumers, took them out and put in good ones suited to the individual circumstances of pressure, &c. In his experience the money so spent brought an excellent return. He also found trouble about the meters. On one occasion he brought a consumer into the testing-room at the works, and showed him how to test the meter for himself, by comparing it with the test meter. The consumer tried it, and the meter proved to be correct; but then he refused to pay the gas bill, unless it could be shown to his satisfaction that the test meter was accurate. He (Mr. Garnett) then commenced to show him how to calculate the size of the drum of the test meter; but the consumer stopped him in the middle of this explanation, and paid the amount in dispute. Another difficulty he encountered was that when the price of gas was reduced, people were more extravagant with the gas, the result being that the amount of their bills came to about the same as before the reduction in price, and they said that the gas had been doctored.

The business of the meeting was then brought to a close.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

[Abstract of Proceedings, from the report in the *American Gaslight Journal*.]

The Eleventh Annual Meeting of this Association was held at Boston, on the 16th, 17th, and 18th ult.—Mr. W. A. STEDMAN presiding.

After the usual preliminary proceedings,

The President read his address, which commenced by congratulating the members on meeting together again after a year of fairly-successful business. In the course of his subsequent remarks he said: A problem was given us by a member at our last meeting—viz., how to be able to sell gas at about a dollar per 1000 feet, and pay dividends. I hope our discussions and papers will show that we have made good progress towards its solution. The longest stride in this direction would be made by materially increasing the yield of gas per ton of coal. In point of saving—that is, in reducing the cost of gas in the holder—an increased yield of 1000 feet per ton does not show the ultimate advantage; indeed, it can be demonstrated that such increased yield might result in a loss, if it were attended by an increased consumption of coke and a slight diminution of candle power. In point of gaining, however, such increase gives very satisfactory showing. For example, suppose coal to cost 5 dols. per ton, and gas to be sold at 2 dols. per 1000 feet; in point of saving, if we had made 10,000 feet per ton, the gas has cost for coal alone 50 cents per 1000; at a yield of 11,000 feet, the cost is 45.55 cents per 1000; and at 12,000 feet the cost is 41.66 cents per 1000—a saving which could possibly be realized as well by the greater economy attendant on the smaller yield. But when the increased receipts from each ton of coal are considered, it will be seen that the gain in the two cases would be 2 and 4 dols. respectively—amounts which would far exceed possible results in the economy of fuel and utilization of residuals.

The important factor in the dollar problem, both to the engineer and the stockholder, is the question of dividends. If the dividend gets one-half of the dollar—and it would seem that capital should be so adjusted to business as not to exact more than 50 cents per 1000 feet on the yearly sales—there would be left us the simpler, and, judging by the figures of our statistics for 1878, the quite simplified problem of making gas at 50 cents per 1000 feet, paying expenses, and keeping our plant and mains in condition, and even of sometimes improving their condition and extent. Now we need to look sharply after all the economies of manufacture, and while trying to get the most 17-candle gas with the least enriching expense, we want to utilize the residuals in the closest and most effective manner.

Thanks to the earnest souls who have led the way in the investigation of better methods of firing, we have complete demonstration of possibilities in the economic application of heating. There appears to be on both sides of the water an acceptance of the Siemens theory—of a primary

partial combustion and a subsequent complete oxidation of the products obtained by the first process, by means of a supplementary supply of heated air. This method is scientific, logical, and, in its application to our work, as well as in many other manufactures, proves itself eminently practical. It eliminates many elements of uncertainty which the old method of direct combustion involved.

In the last number of the *American Gaslight Journal* was figured the plan now in use at the South Metropolitan Gas-Works in London,* and this plan seems to have points in advance of anything yet promulgated in compactness, simplicity, and economy of results. The introduction of steam at the grate-bars, and the subjection of the intense and destructive heat generated at this point, by causing such heat to expend a portion of its energy in the decomposition of steam, and thereby diverting the energy from its usual work of decomposition of the bricks lining the coke chamber, the reduction of the slag and clinker nuisance to a minimum, the utilization of the products of the decomposed steam at a point where their combustion only is beneficial—these are great and easily appreciated advantages. If Mr. Livesey gains the further step which he proposes to take, and utilizes his waste heat in raising to the highest possible point his supplementary air supply, it would appear that very little would remain to be done to reach the ultimate of economy in the application of heat to the distillation of coal.

Now that we are in a hopeful mood in relation to our possible economies of manufacture, we will regard the ultimate of economy within our reach, and look at the coke question thus: One ton of coal will produce 40 standard bushels of coke. Of this amount 12½ per cent. suffices to carbonize, and we have 35 bushels of coke, at, say, 7 cents per bushel, to the credit side of gas in the holder. Now, if our enthusiastic friend, who has twice favoured the American Association with addresses on coal tar and its products,† shall be able to make the world see the rosy colours which he extracts, the result must be to our advantage in disposing of our product, which, in spite of the gorgeous hues we know it contains, remains in our estimation a nasty black nuisance. Let us hope that its value will increase, and that at least we may be able to realize 5 cents per gallon in the not distant future. Then the 12 gallons which we may be able to gather will leave 1 gallon for each 1000 feet, and will carry another 5 cents to the right side of the account. Of course, we all know that our ammoniacal liquor is soon to become valuable. Let us suppose that from this source 4 cents can be credited. Then—

12,000 feet of gas, with coal at 5 dols. per ton, gives the cost of	Cents.
1000 feet	41·60
25 bushels of coke, at 7 cents = 2·45 dols. ÷ 12 = 20·41 cents.	
Tar 5 cents, ammonia 4 cents	9·00
	29·41
Coals, less residuals	12·25
Add for labour and salaries at works	10 cents.
Purifying	1 "
Retorts and tools	2 "
Repairs of plant	5 "
Repairs of mains and meters	2 "
Management	6 "
Rent and taxes	3 "
	29·00
Total cost of gas delivered to consumers	41·25

Leaving a margin of 8½ cents for leeway and leakage. The problem is solved—on paper.

The small cost of labour and salaries at works—viz., 10 cents per 1000 feet—is to be obtained by the general introduction of mechanical stoking, in connection with the Siemens furnaces. By the same furnaces and improvements in settings it is to be hoped that a lower sum even than 2 cents will represent the cost of retorts per 1000 feet. The repairs of plant item is a varying quantity, but the proportionate figure will be diminished as the productive capacity of the plant is more completely utilized. The repairs of mains, rent, taxes, and management items will be lessened as to cost per 1000 feet, in consequence of the great increase of sales resulting from the low price of gas.

At the last August meeting of the Manchester District Institution of Gas Engineers, which was held at the Halifax Gas-Works, the President, in the course of his address, gave an analysis of the cost of gas at his works during the previous year. He stated the yearly consumption to have been 277 million feet. Calling a penny 2 cents in our currency, .

Coal and cannel cost per 1000 feet	Cents.
Residuals	23·20
	20·18
Coals, less residuals	3·02
Salaries and wages	12·20 cents.
Purifying material	0·60 "
Maintenance of retorts	2·96 "
General workmen, repairs, &c.	4·28 "
Miscellaneous expenses	3·70 "
Rates and taxes	5·92 "
	29·66 cents.
Less meter-rents	3·44 "
	26·22
Cost of gas at consumers' meters	29·24
Received per 1000 feet sold	74·90
Profit	45·66

You will notice a different division of the expenses from the hopeful and hypothetical case previously mentioned. And of course our hypothesis does not come near his actual results. The differences can readily be compared and the points of approximation and irreconcilability can be easily seen.

In relation to durability of retorts, there seems to be a wide range in the different works. Six months is mentioned as the average life in some places, while in others several years are passed in using the same bench. While writing this, a copy of results in working the same benches several years lies at hand, and tempts the use of some of its figures. The longest firing was 970 days, and the greatest product per retort was 6,986,000 feet, or 41,916,000 feet per bench. Supposing the retort and setting to have cost originally 300 dols., the result would show a cost of about ½ cent per 1000 feet of gas to renew the bench. With the new method of firing, with the greater steadiness of heat maintained, and the immunity from cold blasts, in connection with the closer blocking of the retorts in their places, which is not only possible but desirable, there need be only intelligent care directed to proportion the charges to the heat carried, to enable retorts to be worked through a useful life to a reputable old age. In large works the adapting of the charges to the heats is much more easily managed than where an idle retort bears so large a ratio to the whole number. It is certain that when retorts are worked full, with high heats, and not undercharged, they give their best results in quantity, quality, and freedom

from stoppages and annoyances. On the other hand, where charges are necessarily variable, unless the heats are very intelligently managed the retort soon becomes damaged, and carbon and pitch and soot and tribulation ensue. The preponderance of testimony in relation to anti-dip valves is rather to the effect that their influence is against the health of the retort. The deduction is so obvious that I need not make it. Ambitious engineers who tip the water in the gauge the wrong way, in their eagerness after big yields, can readily see the point.

The main points in stand-pipe stoppages were well discussed at the Chicago meeting* without definite settlement. There are plausibilities on both sides of the question. We can remember—at least we older ones—that the low heats with iron retorts did not give us entire exemption. But we know that high heats and hard burning have greatly increased our troubles. Cooling the stand-pipes has proved an effectual remedy with many; but no remedy will prove complete if charges are forced too hard. Mr. Lewis Thompson, in a little book he published 20 years ago, pointed out the limitation in the direction of squeezing the coal. "Whenever," said he, "with the ordinary process, you extract such a portion of the naphthas or light oils from the tar as to leave the balance without sufficient fluidity to be easily run off, your difficulties in managing it will be greater than the advantage of an increased yield."

It is quite among the common experiences to have a pitchy tar to deal with, and still to wonder where are the light oils that should have kept it lubricated up to an ability to do its own locomotion in connection with the persuasive allurements of gravity. The pitch we have, the naphthas and light oils—where are they? The gas does not get them, because neither the quantity nor the quality justifies the assumption of their gaseous conversion. They have gone, while in vapour, beyond the main, and condensed farther on. The radiant heat from the bench and the high temperature of the gases and vapours in the main have prevented condensation, and the liquids which might have assimilated the thirsty lampblack have gone. Then, when things on the main present a threatening aspect, and you expect soon to shut down and open your hand-holes to pull out the pitch, why not pump up some of the thin tar from the condenser, and have it run slowly into the main from such a position that it will thoroughly mix with the contents thereof? This has often been done with gratifying results when the patient was not too far gone.

When we leave the retort-house we leave the most fruitful subjects of discussion. Beyond the domain of the stoker, things act a little more as if amenable to some natural laws, always excepting that outlaw, bumner, guerrilla, or whatever bad name it may get—naphthaline. There is some interest in the results of trials in purification with a new applicant for favour called iron sponge. You will doubtless have some figures in regard to its value from the members who have already given it a trial.

To generalize at the close of my remarks, let it be understood that the problem recalled to your minds is not to be dismissed with the conundrum answer, "I give it up." It is presented in all seriousness as a problem to be solved. It is one of the problems of our lives, if we continue as gas engineers. It is going to be solved presently. Shall we each contribute our quota of hard thought and hard work to the question, that our sum of knowledge may accumulate from the individual mites?

The rivals for public favour in artificial illumination are restless and pushing. They work hard to win the position we occupy. Shall we fortify ourselves by making our product the cheapest, as it is the best, for all purposes of lighting? Shall we push our consumption into the domain of heating and cooking, by offering the boon of gaseous fuel at prices which will compete with and displace solid fuel?

To do our best, we must work and think. Decide carefully on the best thing offered to advance your business, and when you have decided, have that thing as soon as you can compass it. Throw out any apparatus or method that obstructs or hinders your progress to the highest success. You cannot afford to retain what you know hinders the best results. It pays to get the best, and when this is improved upon, discard it and get the improvement. Only be sure it is an improvement before you exchange "the old love for the new."

And be social, communicative, and compare notes assiduously, not only here, but anywhere you meet. Visit each other's works, and there make observations. Then when you come to the yearly meeting, you will be full of question and instructive reply. Whatever is presented here, discuss it to shreds. We accomplish the confirmation of our judgments and have our fallacies exploded by the friction of intellect. The sympathy evoked in a common cause, the friendship springing from the sound basis of mutual respect and esteem, the very consciousness of being one of the solid and intelligent body that represents the interests of New England in a business so closely identified with household comfort and convenience—these are considerations which are worth the time and effort of attendance at our *réunions*. But no member can come to a session and listen and take part with a desire to benefit himself in his knowledge of his profession without feeling munificently repaid. One man does not evolve all knowledge from his own brain. What he gathers is by far the larger part of his attainments, be he never so original or profound.

On the motion of Mr. STINESS, the thanks of the Association were tendered to the President for the very able and instructive address which he had delivered.

ON THE WHOLESOMENESS OF DRINKING WATER.

By Mr. REUBEN HAINES.

[Abstract of a Lecture delivered before the Franklin Institute, Philadelphia, U.S.A., Dec. 9, 1880.]

(Concluded from p. 361.)

Wells are the chief source of drinking water in country and suburban districts, and in towns having no public water supply. Artesian wells of great depth are sometimes used for city supply, but these are found unsatisfactory, because they do not meet the demands of an increasing population, and at the same time generally furnish a very hard water. Deep wells, or those over 100 feet in depth, but not artesian, are seldom used for private domestic purposes, yet these are strongly advocated by high sanitary authorities, as furnishing the best supply for domestic use where a driven tube-well cannot be sunk. The chief object is to go below, and to exclude carefully the water in the upper water-bearing strata, which will be very liable to become impure. The wells generally used are less than 50 feet deep, and very frequently both these wells and the vaults and sinks for sewage are generally placed tolerably near the house, and also near each other. Often in small lots, and sometimes in larger ones, the cesspools or privies and wells are not more than 10 feet apart. Ash and garbage heaps, in a state of foetid decomposition, are frequently placed quite close to the well. All this has been found actually true in various parts of England, and in Massachusetts. As might be expected, numerous cases of typhoid fever were the immediate cause of the investigations that were made. Not only in Massachusetts is such culpable negligence to be found, but also in many other parts of this country, and as near home as the immediate neighbourhood of Philadelphia.

Dr. Joseph G. Pinkham, in his very able and thorough official report,

* Reproduced from the JOURNAL of Jan. 4.

† See ante, p. 142.

* See JOURNAL, Vol. XXXVI., p. 816.

in 1876, on the sanitary condition of Lynn, Mass., himself a resident of that town, makes the following remarks:—"The most erroneous ideas in regard to the liability of wells to contamination prevail among the people. Those who are familiar with the principles of under-drainage by means of porous earthen tiles know that, when they are placed in the earth, the water will find its way, for quite a long distance on either side, to them and through their pores; yet they are only small vacant spaces in the earth, while a well is a large and deep one, attracting moisture from a much greater distance. But notwithstanding these well-known facts, persons of high intelligence on most points feel perfectly secure, in regard to their wells, with a cesspool or privy within a few feet of them." In regard to other sanitary conditions, Dr. Pinkham remarks: "Less than one-tenth part of the families, shops, &c., supplied with the city water have drains connecting with the sewers." He estimates that drainage water to the amount of 420 million gallons is annually absorbed by the soil of the town, and then he asks the reader to form his own opinion as to the probability of this foul drainage soaking into the thousands of wells situated in this same thickly-settled part of the town. There is but one possible answer to the question. It is but right to add that what was true of this town in 1876 may be very much improved now, but of this I have seen no positive statement.

We know very well that any hole or ditch acts as a drain to the earth surrounding it. A well, as ordinarily constructed, is precisely such a hole for drainage; any contaminating liquid, or any solid matter capable of being dissolved and washed into the soil by the rain, any such material as human sewage placed or allowed to flow on the surface of the ground near the well, will be exceedingly liable to pass directly into the well water—in other words, it will help feed the well, and a considerable amount of sewage escaping filtration will eventually be daily consumed by the people of the house in their drinking water.

This is certainly not a pleasant subject to contemplate, but it will do us no possible good to shut our eyes to a state of things which actually exists, and which is every day liable to cause disease and death in our families. The more loose the soil in which the well is dug—that is to say, the more sandy and gravelly it is—the more liable the well is to contamination. It has been stated by some writers that a well drains a mass of soil in the shape of an inverted cone whose apex is the bottom of the well, and whose base is an area of surface having a diameter equal to three times the depth of the well. That is, a well of 20 feet deep will drain an area 60 feet in diameter, and any liquid within 30 feet of the well will be liable to pass directly into it. This statement is necessarily a very rough estimate, since the area of surface drained will vary exceedingly according to the character of the soil. There is clear and positive evidence to show that in sandy and gravelly soils the extent of drainage area is far greater, even when the surface of the ground is level, and the stratification of soil is quite horizontal. In New England the Massachusetts State Board of Health reports give a number of instances where pollution of wells occurred from cesspools situated in sandy level soil to the distance of more than 100 feet from the wells. The water was found by chemical analysis to be polluted with sewage, and cases of typhoid fever occurred from the use of such water for drinking.

If contamination takes place in level soil to the distance of 100 feet, it will undoubtedly be liable to occur at much greater distances when the soil and rock are inclined towards the well. Mr. Child, Officer of Health for Oxfordshire, England, gives in one of his reports an instance of the fouling of wells by petroleum or benzine which passed through the soil, from a broken barrel buried in the ground, to a number of wells, all of which were from 250 to 300 yards distant. The surface of the ground had a descent of about 60 feet between the two points towards the wells. About 82 people living in 15 houses were unable to use these wells for ten days, and cattle refused to drink from one of them. In commenting on this remarkable case, we should recollect the extraordinary penetrating power of petroleum oils. We can scarcely believe that sewage can be carried through nearly the sixth of a mile of soil as the petroleum was in this case. Nevertheless it furnishes a very good text for a sermon on the possibilities of sewage contamination.

Sand and gravel at first undoubtedly exert a certain amount of filtering power. But this is soon exhausted by the soil becoming saturated with filth, and in course of time a direct channel may be opened to the well through which the sewage may sometimes pass unobstructed even in the solid condition. From these facts we can positively say that a sandy and gravelly subsoil is one of the most dangerous of all situations for a shallow well in a thickly settled neighbourhood, or where the cesspools and privies are not placed at the distance of several hundred feet from the well. A "tube" well, or "driven" well, will be little, if any, better whatever, unless the tube is sunk to a depth approaching 100 feet, except in a few cases. In addition to this we have already seen that such soils very often contain large amounts of organic matter, naturally present, and that this amount may be of itself so large as to produce malarial fever from drinking the water. These considerations are of especial importance in regard to the well waters of southern and central New Jersey, and in regard to the possibilities of obtaining a really and permanently pure water supply, public or private, at the seaside resorts of that State, which must be considered by the sanitarian to be decidedly a doubtful matter, until careful chemical investigation can prove the contrary to be true.

It has lately been discovered in Massachusetts that some kinds of rock are no real hindrance to the direct percolation of cesspool sewage through them. In one case the well was sunk down into the solid rock for some distance, and the walls of the well were with the utmost care laid in mortar and coated with hydraulic cement from the surface of the ground down to the rock. Yet with all this care contamination took place from a cesspool on the opposite side of the house and 50 feet distant from the well. The sewage was shown to have passed down through the rock at right angles to the dip or inclination of the rock, which was about 45°. The rock was sandstone, and percolation took place between the joints or fractures in the strata. On the removal of the cesspool to a distant part of the premises the water became decidedly better.

From the brief study we have made of this subject in this lecture we may sum up the following conclusions to which we should carefully give practical attention.

On no account should we ever allow a cesspool, vault or surface privy within a radius from a well equal to twice its depth. No drain pipe, whether of iron or terra cotta, should ever be allowed within this distance on account of the danger of leakage. The best laid drains have been frequently found to leak in the most unexpected places, and where especial care had been taken to prevent it. In the case of houses on small lots of ground in a town, wells ought never to be used at all for drinking. The board of health of such towns should have full legal power to close up all such wells, and remove the pumps, even if no positive disease has ever arisen from their use, or even if no complaint has been entered by a person residing in the immediate neighbourhood. The board of health should also have power to prohibit any new wells being dug on premises of less than a certain fixed size.

Where a system of sewerage exists, cesspools should be totally prohibited under penalty of law, unless such cesspools are built absolutely watertight, and kept so, and are thoroughly ventilated by tall pipes or chimney-

stacks, and the contents are frequently and regularly removed. A certificate of compliance with these conditions, given by regular official sanitary inspectors, should be required at regular stated periods, say once a year, of every person having such cesspools on his premises. No new cesspools should be allowed under penalty of law, unless by a certificate granted by a regular official sanitary inspector. When a system of sewerage does not exist in a town, the same law should be made to apply wherever the houses are not very scattered. In rural districts the law would be inapplicable.

All wells located near sewers or under street pavements, or exposed to contamination from street gutters, should be immediately closed and the pumps removed. Such wells are extremely dangerous, and a direct menace to the public health. In cases where a right of way to such a well is granted to several property-holders by deed of title, the board of health should have legal power to overcome resistance to its action, so as to prevent all further use of the well, under penalty of law. A case of this kind has lately become known within the limits of Philadelphia, which I was requested to investigate. In all cases of refusal of property-holders to comply with such requisitions of the board of health, the latter should have power to proceed as in ordinary cases of public nuisances.

A modification of the law should be made so as to include within its prohibition all such wells as are likely, in the opinion of a regularly constituted sanitary authority, to become polluted in the near future as well as those which are now actually in a polluted condition.

[In his concluding remarks the lecturer spoke of the minute living animals found in river water, and exhibited by means of a lantern several photographs of animal and vegetable life found in the water supplied to London in 1851 and 1854, which were years when cholera was violently epidemic.]

These photographs are taken from plates in Dr. Hassall's work on "The Adulteration of Food." I wish to express, however, my strong dissent from the opinions of Dr. Hassall as to the injurious character of these animals and diatoms themselves. I believe that no clear and positive evidence has ever been brought forward to prove with any degree of certainty that these forms of life themselves have been the cause of disease. They could not have caused cholera in London, for many of them—nearly all, perhaps—are stated to be found in the Schuylkill River water at the present time, and yet Philadelphia was, at least in 1872, exceptionally free from cholera at a time when it was epidemic in other parts of the country. No disease has ever been proved attributable to these living forms in the Schuylkill River. The chief point to be considered is, what may be associated with these animalculæ, and upon which they may feed, or in some way be the indication of its presence. Some of them undoubtedly live only in comparatively good water. Some of them require a polluted water, and one which contains sewage in not too great amount will often be crowded with some forms, as was the case with some of the London water, which in 1851, and for some years after, was taken from the river at the London bridges, where contamination with sewage was very great. These animalculæ, therefore, may be an indication of organic filth in the water, and this filth may be excreted from the intestines of diseased people. The animalculæ themselves are probably no more injurious to a human being than raw oysters. In all probability they can be digested with equal rapidity, and there is, as far as we know, no possible way for them to get into the blood in a living state.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

I am beginning to wonder whether the Philosophical Society of Glasgow have become so enamoured of the electric light as to lose sight of the public duty which they have to perform—namely, of publishing the awards of the Committees on the various articles shown at the exhibition of gas apparatus in October last. Patience is a virtue; but there is a period when the absence of this quality may be quite easily justified. There is a growing feeling of discontent that the publication of the awards has been so long delayed. Already it has broken out in significant grumbling in various quarters; and while those who grumble may be ignorant of the great labour which the preparation of the necessary reports involves, surely a word of explanation is necessary to allay the feeling of discontent. A more satisfactory method of doing this would, of course, be to publish the awards immediately.

At a meeting of the Gas Commissioners of Broughty Ferry on Monday, the Gas Committee recommended the Commissioners to consider the propriety of adopting oxide of iron along with lime for the purification of the gas. By such an arrangement it is calculated there will be a saving, and the accumulation of waste lime will be prevented. It was remitted to the Convener and the visitors, with powers to purchase oxide of iron, and to report if any additional accommodation would be required at the works for its use. In Scotland an idea largely prevails that oxide of iron does not so effectually purify gas as the liberal use of Irish lime; but in towns such as Broughty Ferry, where there is evidently some difficulty in getting rid of the sulphate of lime, it is necessary to do something to lessen the evil. A judicious arrangement of the purifiers with oxide of iron and lime is said to do the work most efficiently, and in the contiguous town of Dundee, if I mistake not, oxide of iron is largely used. There they have a simple plan of rendering the oxide fit for further use again when it has become foul.

In view of the discussion which has recently taken place in the columns of the JOURNAL, it may not be uninteresting to the readers to have a list of the places which have adopted the Sale of Gas Act, and have inspectors' stamps. The list which I herewith append is up to March 5, 1881:—1, retained; 2, Sheffield; 3, Aberdeen; 4, Lancaster; 5, Bristol; 6, Ashton-under-Lyne; 7, Wakefield; 8, London; 9, Carlisle; 10, Middlesbrough; 11, Edinburgh; 12, Exeter; 13, Liverpool; 14, Louth; 15, Oldham; 16, Leeds; 17, Stalybridge; 18, Cork; 19, Bolton; 20, Dublin; 21, Perth; 22, Portsmouth; 23, Birmingham; 24, Manchester; 25, Salford; 26, Newport (Mon.); 27, Perth; 28, Metropolitan Board of Works (W. district); 29, Do. (E. district); 30, Do. (S. district); 31, Dundee; 32, Lanark; 33, Ayr; 34, Lynn; 35, Greenock; 36, Rochester; 37, Bath; 38, Gloucester (county); 39, Metropolitan Board of Works (Central district); 40, Preston; 41, Hull; 42, Scarborough; 43, Wigan; 44, Yarmouth; 45, Kingston-on-Thames; 46, Blackburn; 47, Winchester; 48, Brighton; 49, York; 50, Lincoln; 51, Worcester; 52, Reading; 53, Bradford; 54, Glasgow; 55, Northampton; 56, Shrewsbury; 57, Newcastle-on-Tyne; 58, Leith; 59, Derby.

The storms of the past two months have done great damage all over Scotland. The farms, especially in districts watered by the more important rivers, will suffer severely from the destruction of seed in the ground, and through the retardation of the labour necessary to complete sowing operations. But if there has been loss to one class, there is a promise of gain to another. Through the denudation of a field on the banks of the Dee, in Aberdeenshire, several veins of lead ore have been laid bare, of a nature similar to those worked in the mines belonging to the Marquis of Huntly at the foot of Gairn, in the same district. The ore is said to have the appearance of being very rich in quality, although

whether it exists in sufficient quantity to repay working, cannot yet be determined. Colonel Farquharson, of Invercauld, is proprietor of the ground where this "find" has been made.

Lord Rutherford Clark has to-day pronounced an interlocutor in the action by Lord President Inglis, of the Court of Session, against the Shotts Iron Company. His lordship, it will be remembered, sought to interdict the defendants from calcining ironstone ore in the neighbourhood of his estate of Glencorse, on the ground that the sulphurous fumes resulting from the calcination had proved injurious to the trees upon the estate. The evidence brought forward in the action extended over ten days, and was principally of a chemical nature; and, taking both sides, it may be stated that the most eminent chemists of the day gave their opinions for or against the contentions of the pursuer. The point sought to be established was that the sulphurous acid taking an additional atom of oxygen from the air became converted into sulphuric acid, and that in its free state this acid was deposited on the trees, and speedily proved destructive to their existence. The means by which the quantity of free sulphuric acid was determined was by the rain test—that is to say, bottles were put down at various parts of the estate, and rain water was collected in these, and then analyzed to ascertain the quantity of sulphate of soda. By this means the quantity of free sulphuric acid in the air was determined. The highest calculation was 25 parts of sulphuric acid to a million of air. On a consideration of all the evidence, the Lord Ordinary, while admitting that it is of a very conflicting character, has come to the conclusion that the pursuer must prevail, and he has accordingly interdicted the Shotts Iron Company from calcining ironstone ore at any point within one mile of the pursuer's lands. The case will now be carried to a Court of Review, and it remains to be seen whether the judgment of the Lord Ordinary will be confirmed.

The Elie Local Authority have resolved to withdraw their opposition to the formation of a water supply district. The litigation at present pending before the Sheriff will now therefore cease, and the requisite measures will doubtless be adopted for carrying out the resolution.

At a meeting of the Lockerbie Police Commission on Monday, it was reported that the cost of introducing water from Foulraw Burn would be about £9500. To provide for this sum, and £1100 of debt incurred in connection with the present water supply, the Committee stated that an assessment of 8½d. would be required for 35 years. The Committee received instructions to ascertain whether the money could be borrowed for 4½ per cent., to have the proposed supply analyzed, &c.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The leading event which has transpired in Glasgow this week that can at the same time be said to be even more than of passing interest to persons connected with gas affairs, is undoubtedly the visit of Mr. Swan, of Newcastle, to fulfil a long-standing promise made with a prominent member of the Philosophical Society of Glasgow, who was formerly resident on Tyneside, to appear before the members of that body for the purpose of exhibiting and describing his incandescent electric lamp. Although Mr. Swan is not a professional lecturer, yet he has now, I think, made at least six public appearances for a similar purpose. Some four or five months ago he was prevailed upon to come forth from his retirement, in order to give his first account of his invention in any public way, before the Literary and Philosophical Society of Newcastle. He was subsequently induced to re-state the position which he had achieved, before a meeting of the Society of Telegraph Engineers in London; and he has since then done the same thing before learned societies in Liverpool, Middlesbrough, and Leeds. So far as his visit to this city was concerned, it was certainly a great success in the way of exciting interest amongst advocates of scientific progress in general, and electric lighting in particular, as also amongst corporation gas commissioners, gas company directors, and persons holding gas shares as a legitimate investment. Sir William Thomson, who had just been spending a fortnight or so amongst the scientific societies of London, and had been one of a party of guests entertained last Monday evening by Mr. W. Spottiswoode, the President of the Royal Society—on which occasion the residence of the distinguished host was illuminated by the Swan lamp—travelled all the way from the Metropolis on the day of the lecture, in order to be present at the Philosophical Society's meeting, and give Mr. Swan such encouragement and countenance as were in his power. The place of meeting was, as I expected, crowded to overflowing on Wednesday night, and arrangements were made for the repetition of the exhibition on the following evening, when the meeting-room was even more crowded, if that were possible. Many of the enthusiasts who were present seemed at once to come to the conclusion, if they had not already become confirmed in the opinion, that the days of coal gas as a general illuminating agent were, in a sense, numbered, and that the great invention of gas lighting was soon to be relegated to the category of things which had become antiquated. But Dr. Wallace, the President of the Society, when speaking in the course of the discussion following Mr. Swan's paper, did not hesitate to say that even though the electric light should, in course of time, be extensively turned to account for illuminating purposes, there would still be a large demand for gas to be used in cooking and heating stoves and in driving gas-engines, as well as for lighting where the so-called "light of the future" could not be readily or profitably turned to account. A good deal was also said in the course of the discussion about the products of combustion in gas-lighted apartments acting very detrimentally in the way of contaminating the atmosphere of the same; but Mr. D. M. Nelson strongly urged that the condition of the atmosphere was very much in the hands of the gas consumers themselves, inasmuch as it depended greatly upon the mode in which the gas was burned. If proper burners were used, and the pressure of the gas were attended to with a due amount of care, there would not, he thought, be much room for complaint on this score. Along with the scientific enthusiasts, there were also present at the meeting some scientific sceptics, persons who thought that, on the score of economy, coal gas had still an important future in store for itself, even as an illuminant. The data laid down to them as to relative cost, &c., were not sufficient to convince them that the electric light might be expected forthwith to snuff out gaslight. But altogether apart from the debatable matter involved in the question and in the statements made in the course of the discussion, the paper was an exceedingly interesting one, and the demonstration with the lamps exhibited was an event that will long be remembered.

I understand that Mr. David Terrace has now been formally installed in office as the resident Manager at the Dawsholm station of the Glasgow Corporation Gas Commissioners.

Mr. Hugh M^W. Campbell, who has for three years acted as the assistant to Mr. Carlow at Port-Glasgow, has just been appointed Gas Manager and Collector at Port William. There was a large number of applicants for the appointment, the list of whom was reduced to eight, from amongst whom Mr. Campbell, who is quite a young man, was eventually selected as the successful candidate. Before taking office at Port-Glasgow, Mr. Campbell was about six years in the employment of

the Glasgow Corporation Gas Commissioners. Much regret is being expressed at Mr. Carlow and Mr. Campbell—chief and assistant—being drafted away from Port-Glasgow almost at the same time.

The correspondence is still being continued in reference to the summary dismissal of Mr. Brown, the much-respected Manager of the Dalry Gas-Works; but beyond mentioning the fact, I do not care to enlarge any further on the matter just now.

Extreme depression has characterized the Glasgow pig iron market this week, and a feeling of hopelessness becomes apparent now that the season is so far advanced, and that buying on the part of America and the Continent is practically nil. An occasional flash of life is imparted when some large "bears" come forward to cover, but for lack of trade support it quickly dies out. Some makers have reduced their prices, but business is still almost a blank. Business closed yesterday at noon with sellers at 48s. 3d. cash and 48s. 4½d. one month, and buyers offering 1d. per ton less.

The coal trade is tolerably brisk in one or two departments, but the demand for house coal is falling off rapidly.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, March 19, 1881.

Tar, no change—40s. to 42s. per ton.
Ammonia liquor (sp. gr. 1.03), 24s. to 25s. per ton.
" sulphate (white), £20 5s. to £20 10s. per ton.
" muriate (white), worth about £36 per ton.
" " (good grey), £30 per ton.
" " (brown), £26 per ton.
Muriatic acid, £1 5s. to £1 10s. per ton.
Sulphuric acid (brown vitriol), about £3 per ton.
Tar products, as last quoted. Anthracene, 3s. 6d. per lb. Benzol, 6s. per gallon. Solvent naphtha, 1s. per gallon.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The supplies of all classes of fuel in the market are in excess of requirements, and prices continue to tend downwards. There is no pressing demand for any description of round coal, and at some of the pits stocks are already beginning to accumulate. The quoted prices at the pit mouth are about 10s. to 10s. 6d. per ton for best Wigan Arley coals, 8s. to 8s. 6d. for good Pemberton four-feet, and 6s. 6d. to 7s. for common Wigan mines; but these prices are not in all cases being obtained, and they cannot be regarded as at all settled quotations. Engine classes of fuel are not so scarce in the market as they were, owing to the increased quantity of slack which has been produced during the last week or two, and prices are not so stiff as they were. Burgy at the pit mouth is quoted at 5s. to 6s. 6d., and slack at from 3s. 6d. to 4s. 6d. per ton, according to quality.

The coke ovens in this district are now in operation again; but, as I anticipated, advanced prices are being asked of about 10d. to 1s. 8d. per ton as compared with those ruling prior to the strike. Best cokes at the ovens are quoted at 12s. to 15s., and small cokes at 9s. to 11s. per ton.

In the iron trade there is still little or nothing doing. For pig iron there is no demand whatever, and any quoted prices are simply nominal. The average prices which local makers of pig would be willing to accept are about 45s. for forge and 46s. for foundry iron, less 2½ per cent., delivered into the Manchester district. For finished there is only a very limited inquiry, and prices are weaker, bars delivered into the Manchester district averaging about £5 17s. 6d. per ton. Founders are very quiet, and I hear of contracts for casting pipes being taken at extremely low figures.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Less activity has been experienced in the coal trade of this district during the last few days, and in respect of all kinds there is an abundant supply. Prices are as yet unaltered from the bases of transactions of the last two months, but a reduction all round is looked for by consumers in the district, and there is every probability that it will be made at no great distant date. The sudden check in the demand is traceable to two causes—namely, the decreased requirements of manufacturers and smelters, and the departure of the winter season. The Cannock Chase proprietors have still a fair amount of business on hand, and are firm in their quotations for best deep qualities, which are 11s. and 12s. per ton loaded in trucks, and 10s. in boats; shallow qualities are returned at 8s. and 9s., though sales are effected at as low as 7s. 6d. Slack stands at 5s. Furnace coal is now realizing from 7s. 6d. to 10s. per ton, and forge qualities average 7s. Stocks at most of the collieries are increasing, and consumers in the district are withholding orders as much as possible. Cokes are selling slowly, and there is an abundant supply in the market.

The local iron trade in both raw and finished departments is somewhat depressed. It is especially so in the unfinished trade, and several smelters in various parts of the district are preparing to blow out some of their furnaces. The markets of the past week were but thinly attended, and the business was of a very limited character. Reductions from recent rates were made in most descriptions of iron. Exception, however, may be noted in the case of best marked bars, which were held steady on the basis of £7 10s. Unmarked bars changed hands at prices varying from £6 to £6 5s., being a reduction from those of the previous week. Common bars were quoted at £5 10s., which also is a reduction of 5s. per ton from those of the week preceding. Sheets were more steady, but changed hands at £7 5s. for common singles. Nail rods were quoted at £6 2s. 6d. There was but a limited business done in hoops and plates, and girder and bridge iron was scarcely inquired for. Tube and strip sold more freely. The latter, together with sheets of good quality, were exceptions, there being a fair look-out for sheets for export and for galvanizing purposes. Pig iron was also considerably weaker, and rates quoted were from 1s. 6d. to 2s. 6d., and in a few cases as much as 5s. per ton below those of recent date. Best pigs were a slow sale at £3 5s. The system of underselling is complained of. Several of the local trades are well supplied with orders, chiefly the galvanizing, edge tool making, and tube manufacturing branches. The manufacturers in the latter department are fairly busy throughout the district on extensive contracts, one for the South African market comprising as much as 20,000 tons.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The tone of the iron trade throughout Yorkshire is quiet. New inquiries are few, but some of the works have fair orders on hand for old specifications. The output of pig iron is fully sustained, and although stocks are high, it is looked upon as a favourable sign that prices hold fairly up. The mills and forges vary a good deal so far as regards work; orders for light goods being most in request. The foundries are badly off, especially with regard to castings for building purposes. There is a fair demand for Bessemer steel rails and tires, and for gas-meters and apparatus of various kinds.

The pits in the West Yorkshire district are not over well employed, whilst prices remain low and competition is keen. The house coal trade is only quiet, and there is but an indifferent business doing in steam coal and manufacturing fuel.

The South Yorkshire district is in a much quieter state than it was a short time ago, the pits, with few exceptions, being again at work. The coal trade is, however, in a very quiet state, whilst prices are lower than they were before the strike. Although the business doing in gas coal is pretty active, the consumption is not so large as it was during the recent stormy weather. Most of what is raised is supplied on account of contracts entered into early in the year. With regard to the general sale of steam coal, it may be stated that prices are somewhat lower than they were before the pits ceased working.

The London coal trade, so far as regards house and gas fuel, is not over good. Last month the Great Northern Railway, which conveys most of the coal raised from the district, only carried a moderate tonnage; nine of the leading Silkestone pits only supplying a little more than 14,000 tons. Most of the thick-seam pits sent about an average tonnage where they were allowed to work. The quantity of house coal sent to the Eastern Counties exhibits a falling-off as compared with what was supplied a short time ago. It is stated that the new price lists issued during the week by firms whose collieries have been stopped are lower than they were before the strike, thus showing the difficulties and sacrifices owners have to make in order to bring back their trade.

The steam coal trade is remarkably quiet for this season of the year, and a limited tonnage is being sent to Hull and Grimsby from South Yorkshire, and to Goole from the West Riding pits. The exports are still very low, but with the continuation of fine weather merchants are looking forward to the opening of the lower Baltic ports. This branch of trade is now carried on at very slight profits, and during the week the prices at Hull have considerably declined, owing to the pits getting to work again. Hard coal for locomotive purposes is in fair request, and a good tonnage is taken by several of the leading Railway Companies.

A quietness pervades the business doing in manufactured fuel, owing in a great measure to the slack state of trade in Bradford and other West Riding districts, as well as to the settlement of the dispute in Lancashire. Prices are much lower than they were, whilst supplies are abundant.

There is a capital demand for South Yorkshire coke for smelting purposes, and prices are well sustained. The output is not so large as it was, therefore stocks are low. There is a large quantity sent daily to the North Lincolnshire iron-smelting district, but the change in the tonnage rates recently made by the Manchester, Sheffield, and Lincolnshire Railway Company is causing serious loss to the holders of contracts, which have in many cases to be supplied carriage paid. If the new list be enforced, it will also seriously affect makers of iron, as in some instances the increased rates will add 6d. per ton to the cost of producing pig iron.

With the exception of the Old and New Oaks, Strafford Main, and one or two other pits, the whole of the collieries in South Yorkshire are again at work on the old rate of wages.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The weather having been comparatively fine throughout the past fortnight, the shipments of gas coals coastwise have been above an average. The Baltic has begun to reopen, and there are heavier exports thither, especially to St. Petersburg and the larger gas-works in Russia. The coalowners are beginning to ship, in the fulfilment of contracts, to the Mediterranean. In fact, with this week the activity which characterized the shipment of gas coals coastwise in mid-winter will be abated, and more attention will be paid to the exports abroad, which will be very considerable in April and May, especially to the Baltic. There is no alteration in the price of any kinds of gas coals. In fact, all the leading gas-works at home and abroad are out of the market, as they completed their contracts a month ago, and do not need to buy. The general rates for coals and coke of all descriptions are unaltered. The prices do not improve, neither do they get worse. The business done is largely a matter of bargain. Every colliery makes its own price. Under the circumstances there is a considerable range of prices. There will be a run on classes of coal, steam and gas especially, so soon as the Baltic is reopened, but this will only continue for a while, as stocks are made up.

Shipping business has been duller coastwise, but more active for abroad. Steamers will be gradually drawn out of coasting and put into the Baltic trade. Coasting rates, if anything, are a little lower all round, for steamers and sailing vessels alike.

The iron trade of the Cleveland and Tyneside districts does not show any improvement. The Cleveland ironfounders, though taking low prices before, have found it advisable to make further reductions in quotations. The shipments of fire-clay goods are now active to most parts of the world. Best brands keep their position upon the quotations, and in some instances there is an improvement. But all sorts of fire-bricks below a certain standard are subjected to keen competition, and the makers cannot establish very much of an advance upon last year's low rates. The cement business is somewhat dull. The lead and copper trades are not very firm. The wood trade gives some symptoms of revival; but there is not any advance in prices.

REDUCTIONS IN PRICE.—The Kingston-on-Thames Gas Company announce that, from and after the 25th inst., the price of their gas will be reduced from 3s. 9d. to 3s. 6d. per 1000 cubic feet.—The Rye Gas Company have announced their intention of reducing the price of gas from 4s. 3d. to 3s. 9d. per 1000 feet.

STOCKTON AND MIDDLESBROUGH CORPORATIONS WATER SUPPLY.—The usual monthly meeting of the Stockton and Middlesbrough Water Board was held on Monday last week. The accounts for the half year ending Feb. 14 showed the revenue to be £25,695 15s. 9d., as against £20,301 for the corresponding period of 1879-80; or an average increase during the past 4½ years of £5443 17s. 10d. The water pumped last half year showed an average quantity per week of 54,321,000 gallons, or an increase upon 1880 of 6,978,000 gallons. The profits for the six months were £152 more than the preceding half year. A draft report was submitted to the Board, stating that to avoid a large expenditure in carrying out the scheme of 1876, an effort had been made to discover a suitable site for a reservoir; and as the compulsory powers of the Board would expire in August next, it would be necessary, before that date, to give the statutory notices to treat with the owners of the land. The report was adopted.

LEWES GAS COMPANY.—The half-yearly general meeting of this Company was held on Monday, the 14th inst.—Mr. E. Morris in the chair. The Secretary (Mr. E. Hillman) read the Directors' report, which stated that the balance of the revenue account amounted to £1305 8s. 1d., and recommended that £4 19s. 11d. be taken from the profit and loss account, making together £1310 8s., thus permitting the payment of a dividend for the past half year at the rate of 5 per cent. upon the capital of the Company. The accounts showed that on capital account the expenditure had been £1513 4s., making a total expenditure of £30,555 1s. 7d. The total capital called up was £31,130, which left a balance of £574 18s. 5d. On the

revenue account the receipts for the half year had been £4089 8s. 6d., and the expenditure £2784 0s. 5d., which left a balance of £1305 8s. 1d. to be carried to the profit and loss account. The report was adopted, and the dividend recommended by the Directors was declared. A vote of thanks was then passed to the Chairman, and the proceedings terminated.

STOKE-ON-TRENT CORPORATION GAS SUPPLY.—At the monthly meeting of the Stoke Town Council, last Thursday, Alderman Turner stated that the gas accounts were in such a condition as to enable him to speak with confidence as to operations for the year ending Sept. 30 last. During this period 92,800,500 feet of gas had been consumed, and after paying interest on the borrowed money and all working expenses in connection with the concern, the profits for the twelve months amounted to £4702, as compared with £3717 during the previous year. He could not say whether the whole of the money would be divided between Stoke and Fenton, as the Joint Gas Committee might possibly decide upon forming a sinking fund; but if it were divided the portion falling to the lot of Stoke would be considerably more than £3000. Mr. Kirkham asked whether a better quality of gas could not be made. The report of the Gas Manager (Mr. J. M'Millan) as to the quality of the gas was, however, read, showing the quality of the gas to be up to the standard as to illuminating power and purity.

EXAMINATIONS IN GAS MANUFACTURE.—From the report to the Governors of the City and Guilds of London Institute for the Advancement of Technical Education, presented at the meeting on the 14th inst., we gather some further particulars as to the results of the examinations in "gas manufacture" held last May. It appears, from an analysis of the results, that there were 32 candidates for examination, 24 of whom passed—viz., 2 first, and 3 second in the honours grade; 4 first, and 6 second in the advanced grade; and 2 first, and 7 second in the elementary grade. The failures were 1, 2, and 5, in the various grades, respectively. Of the 32 candidates, all but one depended on private study; the solitary exception not passing. There were seven prizes awarded—viz., 1st and 3rd in honours grade; 1st, 2nd, and 3rd in advanced grade; and 2nd and 3rd in elementary grade. In the course of his report, the Examiner in this section (Mr. A. A. Croll) said: "Not only is the number increased, but evidently the examination is enlisting the sympathy and inducing many of those actively engaged in the management of gas-works to enter into the competition. Altogether it is much in advance of any previous year."

SALES OF GAS SHARES.—On Tuesday last Messrs. Balshaw and Hancock sold by auction, at Altrincham, 58 original fully-paid £10 shares in the Altrincham Gas Company and 58 new £10 shares in the same Company on which £2 per share has been paid. In each case the first five lots comprised 10 shares each, and the sixth lot 8 shares. Each original share is entitled to a dividend of 10 per cent. on £7 10s. paid, and 7 per cent. on the remaining £2 10s., or an average of 9½ per cent. They realized the following prices:—1st and 5th lots, £20 2s. 6d. per share; 2nd, 3rd, and 6th lots, £20; and fourth lot, £20 5s. The new shares, entitled to 7 per cent. dividend, realized £4, £3 15s., £3 12s. 6d., £3 17s., £3 18s. 6d., and £3 19s. 6d. per share for each lot respectively. The bidding throughout the sale was very spirited.—On Wednesday, the 9th inst., Mr. T. J. Harrison sold by auction, at Folkestone, 55 fully paid original shares in the Folkestone Gas Company, the average price realized being £20 per share. On the same occasion some new shares, issued under the Company's Act of 1876, and entitled to 7 per cent. dividend, were submitted for competition, and realized prices ranging from £14 to £14 5s. per share; also some new shares on which £5 had been paid, which were sold for £8 7s. 6d. and £8 10s. per share.

SOUTHEAD GAS COMPANY.—The annual meeting of this Company was held last Wednesday, when the Directors reported that a fair increase in the receipts for gas during the past year took place, while the amount realized by the sale of residual products also showed a satisfactory advance. The expenditure on capital account to the end of last year (£15,150) exceeded the receipts by £145; the receipts being £9000 of original and £1000 of improvement stock, bearing interest at 10 and 5 per cent. respectively; and £5000 of new (7 per cent.) shares. Besides these the Company have unused power to the extent of £5000 of shares, and a like amount of loans. The twelve months' receipts on revenue account were £4282; the principal items being £3612 for gas, and £564 for residuales. Against this, manufacturing charges were £2026; distribution, £380; public lighting, £102; rents, rates, and taxes, £85; management, £313; and allowances and discounts, £237. The balance of revenue account (£1138) carried to profit and loss account allowed the Directors to recommend a dividend, free of income-tax, on the improvement stock of 5 per cent. per annum, on the original stock of 8 per cent. per annum, and on the new ordinary shares of 6 per cent. per annum. This will absorb £1070, and they will carry forward a balance of £124 11s. 6d. to the next account.

THE EXTENSIONS AT THE BURNLEY CORPORATION GAS-WORKS.—As an instance of variation in the amounts required for work in connection with gas undertakings, we publish the following list of tenders received for two gasholder-tanks, &c., recently advertised in our pages:—

R. B. Matthews, Marple	£4885 5 5
Holmes and King, Wigan	5156 13 8
Frank Dawson, Bury	5249 0 0
William Rigby, Worksope	5362 12 3
Thane and Wilson, Maryport	5376 14 0
M. W. Walmsley, Crumpsall	5385 11 9
Beckett and Bentley, Bacup	5475 14 0
E. and G. Smith, Burnley	5685 1 6
Robert Pitt, Liverpool	5693 12 10
W. B. Cameron, Bradford	5713 10 6
Thos. Cross and Catlow, Burnley	5798 7 6
William Clegg, Accrington	7150 0 0
Thos. Heates and Hodson, Burnley	8799 0 0
Thos. Oat and Son, Burnley	9000 0 0

The tenders were opened on Monday last week, when a Sub-Committee of the Gas Committee was arranged to make inquiries. These proving satisfactory, the following day the first-named tender—that of Mr. R. B. Matthews, of Marple—was accepted.

FOULGER'S PATENT SEALED JOINTS.—We understand that The Gaslight and Coke Company have, during the past twelve months, been testing these ingenious joints, which were described in the JOURNAL a short time since, and have finally decided to adopt them throughout their entire system—first, on inlet connections of meters, both as caps and linings, and also as barrel unions; secondly, on all bye-passes; and, thirdly, as caps for cutting off services. The special feature of these joints is, it will be remembered, the seal, by means of which the inspector can see at a glance whether a bye-pass has been opened, or the connections of a meter or the cap on the end of service removed, as either operation must destroy the seal having the company's name engraved thereon. The union seal is held in a recess on the back of the cap, and surrounds the lining, which is fluted to ensure breaking the seals if the cap be turned over so slightly. The "capping" or "cutting-off" seal may be done in either of two ways—first, by previously screwing on, in the front of the ordinary wrought-iron cap, a countersunk cap; or, secondly, by inserting a fluted plug in the end

of the open pipe, over which a cap is screwed. The *modus operandi* of fixing is extremely simple. Shreds of sealing-wax (specially made) are rendered pliable by warming, and inserted in the countersunk cap (of course in any position), and being again warmed are stamped with the patent die. Messrs. Parkinson and Co. are at present engaged on the necessarily large order of The Gaslight and Coke Company.

THE NEWPORT (MON.) WATER COMPANY AND THE TOWN COUNCIL.—At a special meeting of the Newport (Mon.) Town Council last Tuesday, the Mayor referred to the result of the opposition to the Water Company's application to the Board of Trade for a Provisional Order for an extension of their works and an increase of capital. He reminded the Council of the objections raised on the part of the Corporation at the recent official inquiry into the matter, conducted by Major Marindin, and said he was glad to inform them that the Inspector had reported in favour of their objections. The Council had objected to the proposition to nearly double the capital by raising an additional £97,000, and the Inspector had submitted in his report that the share capital should be £55,000 and the loan capital £10,000, thus practically reducing the proposition of the promoters by one-third. The Corporation had also objected to the proposed maximum dividend at the rate of 8 per cent. as being too high, and Major Marindin had reported in favour of the maximum being fixed at 7 per cent., as they recommended. They had also gained their point with respect to the filtration of the water (as to the occasional turbidity of which the Mayor had himself testified), inasmuch as the Inspector had suggested the insertion of a clause in the Provisional Order, providing for the construction of new filter-beds if, after proper inquiry, it should be considered necessary to do so. Thus the Corporation had succeeded in effecting their object in regard to three important points; but with regard to the alteration they had suggested with respect to the proposed extra charge of 10 per cent. for the water supply above the datum level, the evidence had been so strong that Major Marindin did not deem it advisable that there should be any alteration; nor did he agree to any alteration in the terms of the supply for manufacturing purposes, which did not appear to him to be excessive, nor to any other powers being given to the Corporation with a view to purchasing the water-works, beyond what they possessed under existing Acts of Parliament.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 1059.—SUGG, W. T., and PIERSON, R., Westminster, "Improvements in the construction of gas lamps or lanterns." March 11, 1881.
- 1074.—BÉNIER, E., and LAMART, A., Beaumetz, France, "Improvements in gas-engines." March 12, 1881.
- 1081.—WISH, W. L., Westminster, "Improvements in apparatus for making

- gas for lighting, heating, and other purposes, and for burning it, and in the manufacture of such gas." A communication. March 12, 1881.
- 1084.—FENBY, J. B., Sutton Coldfield, Warwick, "Improvements in self-governing gas-burners." March 14, 1881.
- 1089.—CLERK, D., Glasgow, "Improvements in motors worked by combustible gas or vapour." March 14, 1881.
- 1130.—JENKIN, H. C. F., and JAMESON, A. C., Edinburgh, "Improvements in caloric motor engines using gas as fuel." March 16, 1881.
- 1148.—BOLTON, F. J., Grosvenor Gardens, and WANKLYN, J. A., Westminster Chambers, London, "Improvements in the manufacture of coal gas for illuminating purposes." March 16, 1881.
- 1149.—POWELL, L. E., Notting Hill, London, and BOYS, C. V., Wing Oakham, Rutland, "Improvements in water-pipes." March 16, 1881.
- 1155.—PAYNE, S. J., Charlton, Kent, "Improvements in the manufacture of fire-bricks, retorts, crucibles, and other fire-ware goods intended for resisting intense heat." March 16, 1881.
- 1160.—JENKIN, H. C. F., and JAMESON, A. C., Edinburgh, "Improvements in caloric motor engines to be worked by a simultaneous combustion of gas and fuel, or temporarily of either." March 17, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3814.—FLETCHER, T., Warrington, Lancs., "Improvements in gas ovens for cooking purposes." Sept. 20, 1880.
- 3869.—PURSELL, J. R., Merton, Surrey, "Improvements in the construction, arrangement, and method of action of gas engines." Sept. 24, 1880.
- 4344.—GANSTER, G. P., Reading, U.S.A., "Improvements in means or apparatus for automatically lighting and extinguishing street lamps and analogous lamps." Oct. 25, 1880.
- 4444.—LAKE, H. H., Southampton Buildings, London, "Improvements in electric gas lighting apparatus." A communication. Oct. 30, 1880.
- 4626.—LAKE, W. R., Southampton Buildings, London, "Improvements in apparatus for lighting and extinguishing gas by means of electricity." A communication. Nov. 10, 1880.
- 5122.—COWAN, W., Edinburgh, "Improvements in gas-governors." Dec. 8, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.
- 700.—SIEMENS, C. W., "Improvements in regenerative gas furnaces or kilns and gas producers." Feb. 20, 1878.
 - 732.—WESTON, G., "An improved apparatus applicable to gas governors." Feb. 22, 1878.
 - 865.—MILLAR, R., "A new or improved meter applicable for measuring water or other liquids, part or parts thereof being applicable to piston meters generally." May 4, 1878.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending March 16, 1881.

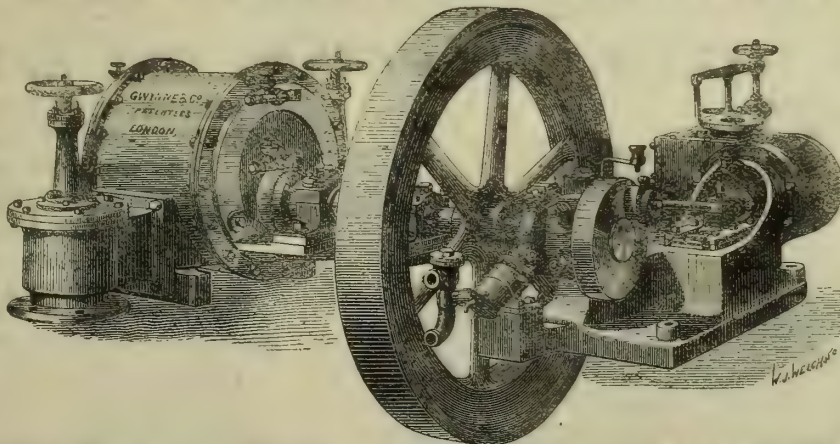
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.5	16.6	17.1	7.8	6.4	7.0	0.2	0.0	0.1	None.	In excess.
	Camden Town	17.5	16.6	17.1	14.7	11.0	11.9	0.0	0.0	0.0	"	"
	Dalston	17.2	16.5	17.0	15.7	10.6	12.9	0.2	0.0	0.0	"	"
	Bow	17.5	16.3	17.1	12.6	10.5	11.2	0.8	0.3	0.6	"	"
	Chelsea	17.0	16.5	16.7	18.1	14.8	16.6	0.2	0.0	0.1	"	"
	Kingsland Road	17.1	16.3	16.8	15.5	13.0	14.4	0.2	0.1	0.2	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas) . . .	21.7	20.8	21.2	11.0	6.6	8.5	1.6	0.8	1.3	"	"
	Peckham	17.0	16.7	16.8	12.3	10.8	12.0	0.4	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.5	16.5	17.0	17.3	11.0	14.1	0.1	0.0	0.1	"	"
	St. George-in-the-East . . .	17.4	17.1	17.2	16.3	9.3	11.4	0.3	0.1	0.2	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, by the Advertiser, a Situation as GAS-FITTER. Understands Main and Service Laying, Meter-Fixing, and Taking Indices; or Management of small Works. Sixteen years' reference from present employers.
Address F. G. M., 431, King's Road, CHELSEA, S.W.

TO Gas Engineers and Managers, adopting Retort Settings with Regenerator Furnaces, Assistance given in their Designing and Construction.
Address No. 731, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RE-ENGAGEMENT wanted as Manager or SECRETARY and MANAGER of Gas-Works, or ASSISTANT in large Works, by one who has for the last 12 years been Manager of Gas-Works in a large provincial city. Aged 34; married; abstainer. Can leave present situation at brief notice. Highest recommendations.
Address No. 727, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-fitter, who, in addition to his mechanical abilities, has had the management of a small Gas-Works. A competent man of good character would meet with a good engagement.
Address No. 733, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a small Gas-Works (making about 1 million cubic feet per year) in North Wales. He must understand the Making of Gas, Laying of Mains and Services, Fixing Meters, and Taking Indices thereof. Salary £60 per year, with house, coals, and gas.
Applications (in own handwriting) stating age and family, with copy of testimonials, to be sent, on or before the 31st inst., to Mr. R. W. PITCHER, Accountant and Estate Agent, 35, South John Street, LIVERPOOL.

WANTED, two intelligent, practical, sober, trustworthy Men as FOREMEN in the RETORT-HOUSE, where from 300 to 400 retorts are used. They must be well able to control the Stokers under their charge, and be thoroughly competent to take charge of the carbonizing department. The wages will be not less than £2 5s. per week. No one need apply who cannot bring first-class testimonials, and who has not filled a similar situation. Preference will be given to men from any large provincial town.
Application, by letter only, addressed No. 732, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS MANAGERS.

THE Cowes Gaslight and Coke Company require a Competent MANAGER for their Works at West Cowes, in the Isle of Wight. He must be thoroughly acquainted with the Manufacture and Distribution of Gas, Extension and General Repairs of Plant. Make under 15 millions. A residence with good garden, coals, gas, &c., found on the premises. The person appointed would have to commence his duties on the 24th of May next.
Application, stating salary required and enclosing copies of testimonials, to be sent on or before March 31st, to T. HALLIDAY, Secretary, 59, High Street, WEST COWES.

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gasholder. Must be thoroughly sound.
Price and particulars to be addressed to Mr. EDWARD BAKER, Engineer, Reading Gas-Works.

GAS-WORKS.

ON SALE—A Complete Gas-Works, supplying 450 lights; can be seen working.
Apply to MERCER, BROTHER, AND Co., Rishton Mill, near BLACKBURN.

DARTFORD GAS COMPANY.

SALE BY TENDER OF £3000 OF NEW ORDINARY SHARES, BEING A PORTION OF THE ADDITIONAL CAPITAL AUTHORIZED TO BE RAISED BY RESOLUTION PASSED AT AN EXTRAORDINARY GENERAL MEETING OF PROPRIETORS HELD ON THE 31ST OF AUGUST, 1880, IN PURSUANCE OF THE POWERS OF THE DARTFORD GAS ACT, 1880.

THE Dartford Gas Company, under the powers of the Dartford Gas Act, 1880, GIVE NOTICE that they will be prepared to receive TENDERS for £3000 additional new ordinary SHARES (£10 nominal value each), entitled to a maximum dividend of £7 per cent. per annum, in lots of £100 each nominal value.

A reserved price will be fixed upon the Shares.
The full nominal amount of the Shares, together with any premium thereon, must be paid to the Company within one week after notice of the tender being accepted. The premium paid upon the Shares will be applied as provided by the Dartford Gas Act, 1880, and will not be entitled to dividend.

Tenders will be received at the Company's Offices in Spital Street, Dartford, up to and including the 9th day of April next, and forms of tender may be obtained there, or will be sent by post on application.

By order,

J. C. HAYWARD, Secretary.

Dartford, March 11, 1881.

FOR SALE—A Telescopic Gasholder, 75 ft. diameter, two Lifts, 24 ft. each, with cast-iron Tank and Pipes complete to suit. Only been in use a few years; removed for extensions. Plans sent to intending purchasers.
Apply to ASHMORE AND WHILE, Hope Iron-Works, STOCKTON-ON-TEES.

TELESCOPIC Gasholder for Sale, 100 ft. by 53 ft., with excellent Guide Framing; only been in use 12 years. Now being removed from a large Provincial Gas-Works to make room for extensions, for which there is no other space. If properly re-erected, will be equal to new, and the cost much less.
Particulars on application to SAMUEL CUTLER AND SONS, Millwall, LONDON, E.

TAR AND AMMONIA PLANT FOR SALE.

A Complete Set of Tar and Ammonia Plant, capable of working up to 1½ tons of Sulphate per diem.
Apply to T. V. CLARKE, Trundley Lane, Deptford, who will contract to re-erect same in the country or abroad; also Plant for Manufacture of Sulphuric Acid in limited quantities.

ILKESTON LOCAL BOARD.—GAS DEPARTMENT.

THE following Old Plant, recently replaced by larger, is for DISPOSAL:—
4 Purifiers, 7 ft. 6 in. by 5 ft. 6 in., with Centre-Valve and Connections.
27-in. Change Valves.
16-in. Parkinson's Governor.
12 pieces of Hydraulic Main, 13 in. by 12 in.
46 Ascension and H Pipes.
21 Mouthpieces, Lids, Screws, and Cross Bars.
20 Backstaves, 8 ft. 6 in. long.
Prices and particulars may be had of F. C. HUMPHREYS, Manager.

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Angular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned, R. MORLAND, Engineer.

THE Gravesend and Milton Gas Company have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of Westminster.

For further particulars apply to the undersigned.

S. Sowood, Manager.

GAS PLANT FOR SALE.

THE Gas Committee of the Bolton Corporation invite TENDERS for the Purchase of all or any of the following APPARATUS.

Set of four Purifiers, each 12 ft. square by 5 ft. deep, and having five tiers of wooden sieves in each chamber. There is a dry-surfaced Centre-Valve, with Connections, 12-in. diameter throughout. The whole is in excellent condition, having been erected four years ago by Messrs. R. Dempster and Sons.

Set of four Purifiers, each 9 ft. square by 5 ft. deep, with five Tiers Sieves. To this set is an Hydraulic Centre-Valve. All Connections are 12 in. diameter.

One Musgrave's Exhauster capable of passing 50,000 cubic feet per hour. This is strongly built and in tolerably good repair.

About 10,000 yards of 2-in. bore cast-iron turned and bored Gas-Mains, coated and in good condition.

For further particulars apply to Mr. Fraser, Engineer, Gas Offices, Bolton.

Tenders to be sent to the undersigned, and early offers are desired, as the apparatus has to be removed for extensions to be immediately proceeded with.

By order,

R. G. HINNELL, Town Clerk.

Town Hall, Bolton, March 8, 1881.

TENDERS for the Erection of an Ammonia Plant for a Works, in the Midland Counties, to work about 60 tons per annum of Sulphate.

Full particulars to be sent, not later than the 31st inst., to Messrs. F. BENNETT AND SON, 12, Little Queen Street, WESTMINSTER.

THE Isle of Thanet Gas Company invite

TENDERS, to be delivered on or before Thursday, March 31, 1881, for the Supply of 7000 tons of the Best GAS COAL.

Particulars and times of delivery may be had on application to

THOS. C. FULLER, Secretary.

Gas-Works, Margate, March 18, 1881.

COKE.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company are prepared to receive TENDERS for the Purchase of about 7000 Chaldrons of COKE to be delivered during Twelve months commencing the 1st of May next.

Particulars and form of contract can be had on application at the Office of the Company, 56, High Street, Rochester.

Tenders, sealed and marked "Tender for Coke," to be delivered at the Office as above before Noon of Thursday, March 31 inst.

March 3, 1881.

W. SYMS, Secretary.

AMMONIACAL LIQUOR.

THE Directors of the Bristol United Gaslight Company invite TENDERS for the Purchase of the AMMONIACAL LIQUOR made at all or either of their three stations, situate respectively at Avon Street, Canons' Marsh, and Stapleton Road, in the Borough of Bristol, for a term of Five or Seven years, commencing July 1, 1882.

The annual quantity of Liquor produced at present at the three stations is about 2½ million gallons.

Conditions of contract and other particulars may be obtained of the Secretary, at the Office of the Company, Canons' Marsh, Bristol.

Tenders to be delivered on or before Tuesday, May 3 next, addressed to the Chairman of the Company, and marked "Tender for Ammoniacal Liquor."

The Directors do not bind themselves to accept the highest or any tender.

HENRY H. TOWNSEND, Secretary.

Gas Offices, Canons' Marsh, Bristol, Jan. 8, 1881.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE
OSCILLATION, FRICTION, AND POWER.
TO WORK BY BELT OR WITH

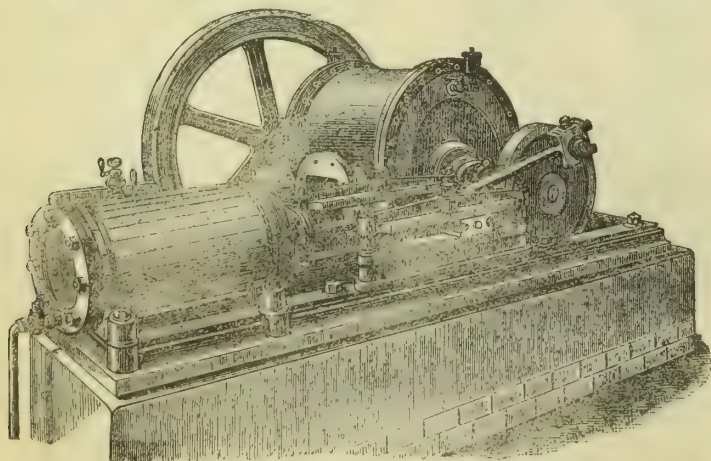
ENGINE COMBINED.

GEORGE WALLER & CO.,
Makers of BEALE'S EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
SELF-ACTING BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.



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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

H. C.—(1.) It would register correctly from the smallest quantity up to the maximum for which it is marked. (2.) No; not for a satisfactory supply.

TAB.—The price of anthracene should, of course, have been quoted at "per unit," and not "per lb."

W. H. M.—We are not aware of any special cause for alarm; but are glad to observe a gradual recovery in prices.

W. H. B. (Salford).—The matter is outside the range of subjects treated of in the JOURNAL.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 29, 1881.

THE BOARD OF TRADE AND THE SLIDING SCALE.

In our issue of the 22nd ult., we called attention to a report which had reached us of intended action on the part of the Board of Trade, limiting the operation of the sliding scale. We understood the proposal to be that in future Provisional Orders granted by the Board a clause would be inserted providing for a revision of the initial price at any time, after an interval to be named in the Order, on the petition of either the consumers or the Company. This proposal was felt to be of grave importance, because, for reasons, among others, which we then gave, it is fatal to the extended application of the principle; fatal, that is, to its extended application in the simple form of which the Legislature has so far approved,

absolutely fatal to it as a method of securing the interest of Gas Companies in favour of cheap gas. We are now, however, glad to be able to state that the department repudiates any intention of hindering the application or the free operation of the sliding scale in regard to established Companies generally. The intention, as we now understand it, is only to apply the revision clause either to Companies newly established, and making their first application for powers, or in cases where, for other reasons, it is especially difficult to determine a fair initial price. The Board of Trade are an important power in regard to gas legislation, and it is satisfactory, especially to those Companies whose dividends are now regulated by the sliding scale, to know that they have no intention of attacking the principle so recently adopted, but only to prevent its occasional abuse. At the same time, while we rejoice to know that the "intentions" of the Board are "strictly honourable," we still deem it our duty to caution Companies against a too confiding disposition. Precedents once established often have wider application than was originally contemplated, and this clause, admitted into Provisional Orders, will inevitably have great attractions in the eyes of Local Authorities, some of whom may be able to persuade Parliamentary Committees to regard it with equal favour. In the very nature of things the sliding scale must be jealously regarded by consumers, so long as its effect is to increase dividends; hence it is the more necessary to guard against indirect attacks. The citadel itself is not so strong that its outworks can be safely disregarded. We therefore again urge all Companies to whom this proposal may be made to refuse it, and to seek rather to have no sliding scale at all than to take its shadow only, coupled with the vexations and ill-feeling which would attend the investigations necessary, from time to time, to determine the proper price to be charged.

If the Board of Trade are not at present possessed of powers sufficient to enable them to obtain proper advice and guidance as to the cost of gas-making in the particular cases suggested, there surely cannot be any great difficulty in the way of their obtaining such powers. Gas Companies certainly have no reason to wish the Board to be other than well informed in these matters.

Although not so intended, this proposal must be accepted as a warning. That it was suggested, whether unreasonably or not is of little consequence to our present argument, by the prompt and considerable increase of dividends which has been found possible where the sliding scale has been obtained, there can be no doubt. Parliamentary Committees, as well as the Board of Trade, must be guided very largely, in fixing either a maximum or initial price for gas, by the evidence of Companies appearing before them, and our observation tells us that in the past such evidence has been treated with all the respect which in the great majority of instances it deserved. At the same time, under the old legislation, if too high a price was asked for and obtained, the Shareholders were no gainers thereby, and the effect most apparent from the so-called success was the harmless and indeed pleasing picture of Directors posing as benefactors to the consumers, while they surrendered that which was of no value to them, and need never have been granted. Now, it need not be said that the case is altered materially. The authorities have the same right to expect a fair statement of facts from Companies before them, but they have an entirely new reason for resentment if the statement is not a fair one, and increased profits immediately accrue to the Shareholders in consequence. We repeat what has been said before, that the sliding scale in prospect discourages good, if it does not actually put a premium upon bad management. This tendency is one which, while it may be beneficial in isolated cases, is certainly injurious in its effect as a whole, and interest is on the side of honesty in suggesting that it should not be encouraged.

There is another aspect of this question which we think worthy of attention. Apart from the envious feelings excited by the large dividends now paid by some Gas Companies, it is doubtful whether the actual value of these undertakings would not be greater if the surplus profits over ordinary maximum dividends were invested till they formed a really handsome reserve fund, instead of being as now divided at once among the Shareholders. At the present time, for instance, because of the new electric light alarms, many people are timidly sacrificing their gas property. We do not say that a large reserve fund would make such deplorable scares impossible, but we are emphatically of opinion that such a reserve, available to meet any future contingency, would have a greater effect in steadying public confidence than the knowledge that ever so large a dividend had been paid in the past.

THE SOUTH METROPOLITAN BILL BEFORE THE COURT OF REFEREES.*

THE proceedings in the Court of Referees, on the question of the claim by the Metropolitan Board of Works to *locus standi* against the Bill of the South Metropolitan Gas Company are more than usually interesting. They really indicate the close of one period in the contemporary history of the practice of Parliament in the matter of Private Bill legislation, and the commencement of another era, destined probably to be characterized by a complete reversal of the present order of procedure in at least one important respect. It is generally known that within the past few years it has been a principle with the House of Commons to disallow the *locus standi* of Local Authorities to oppose Gas and Water Companies' Bills, when such Bills were intended solely to obtain power for raising additional capital. It is unnecessary now to inquire how it has happened that the Lower House has been led to adopt a principle confessedly at variance with the rule of the House of Lords, and also with that of the Board of Trade, who may be considered, as regards private gas and water legislation, in the light of an assistant to Parliament. Opinions naturally differ with respect to the equity of the House of Commons' practice. The persons who benefit by it are likely to praise it; just as those who conceive themselves debarred from a hearing in consequence of it, are naturally loud in its condemnation. On the whole, the balance of opinion must be against it, for we are told that a proposal is in contemplation to submit this question of *locus standi* to the House, with a view to a re-arrangement of the existing Order. Such being the case, we are not now called upon to express an opinion either way; we shall reserve all comment on the principle involved, until something definite is known regarding the new proposals to be shortly laid before the House.

The influence of the impending changes is observable in the transactions of the Court of Referees with respect to the South Metropolitan Bill. This is now only a money and land Bill. By the present rule the Metropolitan Board of Works could not be heard on the first question, while the Greenwich District Board, who are more immediately concerned, intend to oppose the Bill on the land clauses. But, in recognition of the special constitution and character of the Metropolitan Board, the Company, through their Counsel, Mr. W. H. Michael, Q.C., did not object to the Board appearing in opposition to the Bill itself. The Company's chief solicitude in resisting the *locus standi* of the Board was to prevent the latter from going before the Committee with *carte blanche* permission, as sought in their petition, to open up every possible question in connection with the gas supply of South London. Especially did the Company wish to have the Board restrained from going into the question of the standard price of gas, which was particularly mentioned in the petition. In short, the Board wanted general *locus standi* to raise anything and everything against the Company in committee; while the Company desired them to be confined to the measure actually brought forward.

It is evident that the Referees might have allowed the *locus* of the Metropolitan Board upon their petition. The pending action of the House on the subject of opposition to money Bills would not have affected the question, because on this point the Company were willing to give way. The Referees, however, were doubtful as to how much the new Standing Order—if any should be introduced during the present session—will affect the points in dispute, outside the simple money question, but growing out of it. They were naturally anxious to avoid, as much as possible, all attempts at what might be made to look like impatience of the action of the House; and so the case, with the consent of the parties, was postponed until a new Order is brought in, or the existing rule is decided to be maintained. Of course, if the Bill has to be proceeded with before the decision of the House can be known, the Court will have to adjudicate on the matter on the established lines.

This adjournment will not injure either party—certainly not the Gas Company. Fruitless as it would be to speculate upon the extent to which the representative rights of Local Authorities may be increased by any impending change in the Standing Orders, it may be fairly assumed that those rights will be defined, and that, as in the present instance, it will be found desirable to draw a line for the guidance of petitioners in stating the range of effects which may be held to arise from any possible grant of additional capital powers to a trading Company. Whatever may be said for or against the present rule, it has had, rightly or wrongly, a powerful effect in discouraging costly and unnecessary parliamentary

contests. Unless the framers of the new Order think very differently from most ratepayers, the powers of Local Authorities to institute parliamentary opposition to Private Bills should be extended only with extreme caution. But if the widest discretion in this respect be given to Local Authorities, it does not follow that, in the present case, the Referees will be bound to allow the unlimited *locus standi* demanded by the Metropolitan Board. The case presents peculiarities which cannot be referred to any rigid regulation; the discretion of the Referees will still be a power to be called in action before the Bill emerges from their Court, and it may be taken for granted that the Metropolitan Board will have to fight for their position step by step. If they obtain all they ask, their success will probably be beyond their expectations; and we believe they will have every advantage to which they are justly entitled, if they should at last be driven to accept the offer that has been freely made to them on behalf of the Company.

THE REPORT AND ACCOUNTS OF THE COMMERCIAL GAS COMPANY.

THE half-yearly ordinary general meeting of the Commercial Gas Company will be held on Friday next, when the Directors will recommend the payment of dividends at the rate of eleven and a half per cent. on the old stock, and of eight and a half per cent. per annum upon the new stock. There will be a sum of £6758 added to the insurance fund, and the respectable balance of £8559 will remain to be carried forward. The dividends recommended for the past half year are a quarter per cent. higher than those paid for the previous half year, or for the corresponding period of last year. The profit realized during the period now to be considered exceeds that of the corresponding half of 1879 by over £8000. The Company, like the other Metropolitan Companies, are doing well under the sliding scale. The quantity of gas sold amounted to over 21 million cubic feet more than during the half year ending Dec. 31, 1879, while the consumption of coal has not risen in anything like the same proportion. We notice that the Directors have invested £40,438 of their cash in Exchequer Bills, which is very sound policy. The Company will probably find themselves able to still further reduce the price of gas on an early date. Since the last meeting Mr. Robert Jones has retired from the position of Chief Engineer, and the completion of the arrangements for commuting his retiring allowance will come before the Shareholders at the ensuing meeting. It is announced that the number of Directors, reduced to seven by the retirement of one of their number, will not be again increased. Consequent upon the death of Mr. Henry Webb, who was connected with the Company from its formation, there is a vacancy for an Auditor of the Company, which will rest with the Proprietors to fill up. There is little of importance, in addition to the matters already mentioned, to call for comment in the report and accounts, which will doubtless be considered satisfactory by the Shareholders.

COMPETITION REQUIRED AT PONTYPOOL.

THERE appear to be numbers of people in Pontypool who have small respect for Acts of Parliament. It is announced that the Pontypool Local Board, feeling dissatisfied with the prices charged by the local Gas and Water Company for the supply of gas to the public lamps, as well as to private consumers, have determined to ask the Directors of the Abersychan Gas Company to receive a deputation to discuss the question of the latter Company coming out of their own district for the purpose of supplying gas in Pontypool. The districts of the two Companies adjoin each other, and are defined by Acts of Parliament obtained by both Companies in 1873. This circumstance is ignored by the discontented Local Board, who seem to imagine that they have only to ask the Abersychan Company to come over and help them, in order to find a simple and speedy end to all their trouble. Opinions may differ as to the power of a local authority to contract with a stranger Company for a supply of gas, while a statutory Company in their own district are ready and willing to undertake the business. There can, however, be no dispute regarding the policy of the outsiders so invited to go outside their proper sphere; in doing so they would, if already incorporated with defined statutory powers, at once assume the disabilities of unauthorized adventurers; and would exist in the foreign territory solely on sufferance by the Local Authority. Even if the service of the public lamps should in any assumed case be sufficiently profitable to pay a dividend on the cost of laying the mains and services, the buried property would be really lost to its owners, for it could not even be inspected, to say nothing of the possibility of its ultimate removal, if desired, without consent of the Highway Authorities. And who would

be inclined to build upon the continuance of the favour of an elected public body? We can safely predict in the present case that, the power of a special Act for gas supply apart, the application of the Pontypool Local Board to the Abersychan Gas Company will be lost labour. At the same time, it must be conceded that the Local Board have some reason for their dissatisfaction with the existing state of things. They, and the public generally, are charged rather highly for gas by the local Company, and a request for a reduction has been met with a refusal, for the expressed reason that the Company are expending a large sum on their water-works, and therefore cannot afford to sell gas any cheaper. This is, of course, one of the disadvantages of mixing up traffic in fire and water. In reference to this explanation by the Company, one of the speakers at the recent meeting of the Board, when the matter was discussed, is reported to have enlarged upon the injustice of paying for the water-works through the gas-rates; and the speaker held so strongly to the principle of "every tub standing on its own bottom," that for the time we almost fancied there was some mistake, and that we were reading a reported debate on the application of the profits of a gas undertaking owned by the Board. However, it was not so; the proceedings of a trading Company were under review, and, while confessing that the Company were not altogether right, we sadly remembered that what is evidently considered a heinous practice in Pontypool is deemed the essence of equity in many larger towns.

PROFESSOR PERRY ON THE FUTURE OF ELECTRICITY.

A VERY comprehensive lecture on "The Future Development of Electrical Appliances" was delivered by Professor John Perry before the Society of Arts, on Thursday last. The lecture, as implied by the title, was somewhat of a mixture of prophecy and history. Rightly it should perhaps have been more prophetic and less historical, to have more fully justified its title. It is, however, a commonly observed truth that prophesying unless one knows is rather risky work; in addition to which it would have been rather unkind of Mr. Perry to have made his audience listen to nothing but a series of predictions concerning what may happen, perhaps when most of those present had been in their graves for an uncertain period. We do not after all feel much excitement about the manner in which our posterity are to go about their business, or cook their provisions, or even light their dwellings after dark. We like better to know what is going on around and amongst us. Mr. Perry was therefore wise in filling the bulk of his time with narrative and experiments, which, of course, may or may not be connected with the future of electricity. That so much of the electrical work of the day appears, from Mr. Perry's showing, to be done by Mr. Ayrton and himself, is intelligible. A man speaks best of that which he knows best; and the lecturer naturally knows his own better than any other man's work. Mr. Perry states, like the rest of his brother lecturing electricians, that the days of gas lighting are numbered. His omission to give some indication of the number is pardonable; prophets are never good at dates. We are used to this kind of treatment, but hitherto we have preserved a crumb of comfort in the belief that as a source of power even for developing electrical energy, gas might preserve a limited utility. This consolation is now taken away. Professor Perry considers that the electrical distribution of power generated from large stationary steam-engines will supersede the ingenious gas-engine. According to Mr. Perry, we have, in fact, only one excuse for continued existence, and that is the almost boundless development of gas for heating purposes. Unfortunately, some other electricians tell us that their subtle fluid, energy, or whatever it is, will be used for heating purposes, as well as for giving light and power. We ought to feel practically superseded already, if we are to believe the many good-natured friends of the Perry, Edison, and Lane Fox stamp, who never lose an opportunity of blazoning abroad the coming extinction of gas. True, one and another kind friend apportion to gas some tiny field wherein it may expect to receive patronage. They are all very good in thus showing no ill-will; but while acknowledging their charity, we will abstain from thanking them until the occasion arises. Gas does not now, and never will continue to exist on sufferance, but by right. If electricians or others can take away that right, they will, of course, do so. Meanwhile, we have heard rather too much prophecy in the matter. Let electricians work; the friends of gas will neither be terrified by their predictions, nor envious of their success. All human effort finds its due reward, and we shall be content to wait and watch the progress of events.

Water and Sanitary Affairs.

THE absence of any word or sign from the Government in reference to the Metropolitan Water Question while the East London Bill is passing through Parliament, excepting Mr. Dodson's communication to the Select Committee, would seem to imply a want of readiness to deal with the subject. So large and complicated a question demands attention early in the session, and every week that passes seriously affects the prospects of any measure which the Home Secretary may have in hand for effecting a transfer of the London Water Supply. It is not unlikely that the year will pass without anything decisive being accomplished. The idea of purchase being effected in 1881 seems altogether improbable. The utmost that can be reasonably expected is the creation of some new authority, with power to treat and to investigate. The notion is fostered that the Water Companies may be somehow crystallized in their present financial position, so that the price to be paid shall not be subject to any increment through lapse of time. This can only be correct to the extent that new capital may be prevented from making direct addition to the market value of the undertakings, except that such capital must be replaced in the purchasing transaction. But the increasing productiveness of capital already invested must inevitably be represented by an enhanced value in the undertaking. The opponents of the Water Companies seem to be intent on elaborating some new and special doctrines in political economy, in order to make out a popular price as the value of what the Companies possess. We cannot suppose that Parliament will be positively and glaringly unjust in this matter; but there is an obvious difficulty in a Government consenting to terms which it scouted when contemplated by the previous Administration. Nothing could well have been more unfair than many of the arguments employed against the terms secured by Sir R. Cross; but the party then in opposition availed themselves so freely of the opportunity to make an attack, that it is difficult for them to render justice now that they are in power.

Opposition to the Bill of the Eastbourne Water-Works Company has been offered at a meeting of the ratepayers in that town, and a resolution to oppose the Bill has received a majority of votes at a meeting of the Local Board, but as the votes in the latter instance did not constitute a majority of the entire Board the motion has no legal force. The agitation seems intended to cheapen the present supply, but the ostensible objection to the Bill is that it proposes to supply water to Hailsham, and other places outside Eastbourne. If the Eastbourne people can so take advantage of the present juncture as to squeeze out of the Company better terms than they now enjoy, they may congratulate themselves on their cleverness. But the Duke of Devonshire, to whom Eastbourne is indebted for its prosperity as a watering-place, is the real power with whom the inhabitants have to deal. His Grace is practically the Company, and it is hardly wise to quarrel with so powerful and essential a patron. It may also be assumed that the Duke would not willingly promote a plan which would at all impair the water supply of Eastbourne. The town appears to have an overflowing supply of water at its command, though it may be true that in some cases there is a slight deficiency of pressure, so that the supply—which is nominally constant—sometimes fails in particular localities. If there is any such lack of pressure, it calls for a remedy. The Eastbourne Company doubtless could, if they thought fit, send a copious volume of water into Hailsham, though it seems like going a long way from home. On the other hand, no great weight can be attached to the idea that Hailsham might intercept the Eastbourne supply, if wells were sunk to a great depth to gain an independent supply for the former town. As concerns the real motive of the present agitation, we might suggest that the Eastbourne ratepayers, or those of them who are most busy in local matters, are probably influenced by a desire to see the water-works become the property of the Local Board. An extension to Hailsham and other places would make such a transfer a costly and difficult process. It seems to be the policy of the Company to enlarge their district, and to draw proportionately upon the extensive supplies which the geological formation of the country places within their reach. If any of the Eastbourne consumers are at present inadequately supplied, the defect must be purely artificial. As a matter of fact, it is stated that while Eastbourne consumes a million gallons of water per day, there is four times this quantity in the Company's wells.

About two months ago we remarked that the history of the Ipswich sewerage works was perhaps not altogether singular,

but could scarcely be called satisfactory. We are now disposed to think that the history of these works is becoming one of the oddest affairs that has happened in the sanitary career of English boroughs. The Corporation are borrowing money and spending it, ostensibly for the purpose of sewerage the town; but from a discussion which has just taken place at a meeting of the Town Council, it would seem that the Corporation are only on the very threshold of their undertaking. A report presented at this meeting by the Public Health Committee states: "The main intercepting sewer is now nearly complete, and will shortly be available for the reception of the sewage of the town." Of course this is something, but we read in the next place: "Your Committee therefore recommend that the Council instruct the Sewerage Committee to obtain plans, specifications, and estimates for constructing arterial sewers throughout the town, that will enable relief to be given as soon as possible to those parts of the town in which sewers are greatly needed." A further paragraph gives a little more light. Thus: "Your Committee remind the Council that considerable annual expense will be saved when the owners and occupiers of property are enabled to connect the drainage of their premises with the sewers, instead of as now delivering it into dead wells." In the discussion which followed, Alderman Mason asked "whether there was not a plan in existence for the complete sewerage of the town." To this question the Town Clerk replied that there was a plan, but not in detail. It was "a sort of contour plan." Alderman R. C. Ransome observed that "if they spent £30,000 or £40,000 in connecting the whole town with the sewer, and any difficulty should arise with regard to the outfall, they would have made a great mistake." One of the Council was astute enough to observe that "to refuse now to carry out the arterial drainage necessary to convey the sewage to the main sewer, would be to some extent to stultify themselves." So it would appear that a large intercepting sewer, costing a great deal more than was expected, has been laid down, without any proper plan being prepared for the general drainage of the borough. It is said that "many arterial sewers are already constructed, and have been connected with the main sewer, with satisfactory results," but the same gentleman who says this goes on to remark that "what is now wanted is a network of drains to connect streets, courts, and alleys with the sewer." Finally, it was resolved that the Sewerage Committee should "consider the question," but they were not to obtain any "plans, specifications, and estimates," for these "would involve considerable expense." We think we begin to understand now how it was that the execution of the great intercepting sewer was found to be so much more difficult than was expected. However the Local Government Board can sanction the borrowing of money for such freaks we cannot imagine. We noticed on a recent occasion that the Corporation had to raise some of the streets in order to keep the sewers from coming above the road. We shall be interested in watching the progress of affairs at Ipswich.

Professor F. De Chaumont's lecture on "Sanitary Assurance" treats of a subject which will doubtless become increasingly popular. Something is clearly wanted in order to secure the healthfulness of our habitations. The Englishman's house has long been his castle; but while he might bar his door against the King, the occupier and all his establishment have been at the mercy of an insidious foe who has crept up from beneath, and often attacked with fatal effect the inhabitants of the dwelling. The Local Authorities care for the town in a general way, but leave the houses to take care of themselves. It was once thought that the Town Council or the Local Board, if supplied with a certain amount of money, could banish from their borough or district all the zymotic tribe of diseases, and secure a healthy atmosphere for everybody. But the fact is becoming clearer every day, that if towns are to be healthy every man must look after his own dwelling. Every house needs to be inspected, probably with the result that certain works have to be executed, so as to guard against pollution in the air and the water supply. The fatal negligence which attaches to this important subject is shown by the fact that while the Government have been introducing measures for promoting the public health, nearly all the buildings occupied by the Government officials have been in a seriously insanitary condition. Sir R. Cross, while concerned about the dwellings of the working classes, was himself so plagued with headaches from the unwholesome air of the Home Office, that he well-nigh arrived at the conclusion that he would "take lodgings in the neighbourhood, and charge the Treasury

"with the cost." But what lodgings? Who is to know whether a house is in a sound sanitary condition or not? In regard to a particular building, who can tell where the drains are, or whither they go, or whether there may not be some old disused drains about the premises, which serve as runs for rats and receptacles for filth? At the Home Office the officials "could find no plan of the drains." Ten holes were made in Whitehall Place before the junction with the main drains could be discovered, and then a quantity of sewage deposit was found, two feet in depth. In the opinion of the ex-Home Secretary, the matter is one which "must be thoroughly investigated, and remedied at all hazards and cost," only it was "impossible to say what the cost would be." The Sanitary Assurance Association undertakes to deal with the question of private dwellings in respect to its members, on terms which are moderate, so far as the professional fees are concerned. We may hope that the practice of having houses "certified" as fit to live in, will some day become so general that those persons who have any regard for their health and that of their families will be able to avoid an abode which is defective in respect to its sanitary state. Until sanitation is secured in the house, disease of the zymotic type will not be conquered, let the general drainage and water supply be what they may.

THE ANNUAL REPORT OF THE INSPECTOR UNDER THE ALKALI ACTS.

DR. ANGUS SMITH's sixteenth annual report to the Local Government Board, of his proceedings as Inspector under the Alkali Acts during the year 1879, has just been published in the form of a small Blue-book, filled with somewhat disconnected and discursive matter. Gas-works, especially when supplemented with works for the treatment of ammoniacal liquor, will shortly furnish increased occupation to this gentleman and his assistants, and consequently we may be held justified in curiously perusing this latest account of his transactions, with a view of learning something of his past doings. The report before us is somewhat peculiar in the character of its leading matter, and in its whole arrangement. Principally, the Chief Inspector's own communication is made up of abstracts from his papers on the "Measurement of Daylight," and on the "Distribution of Ammonia," taken from the reported Proceedings of the Royal Society, and of the Literary and Philosophical Society of Manchester; and of extracts from reports by Professor Dewar and others. We are not much interested in Dr. Smith's disquisitions on the purification of smoke and fumes from alkali and metallurgical works; but scattered through the report there are some remarks of his which call for notice in these columns. As already mentioned, the matter of the report is discursive, and our remarks in connection with it will consequently be slightly disconnected.

Firstly, it may be of interest to follow the Inspector in his account of the method adopted by him for photometrically estimating the amount of sunlight received in any district; or, as he puts it alternatively, the transparency of the air of a locality. In this place Dr. Smith, of course, restricts the application of his method to the measurement of daylight, as affected by the smoke of towns and manufactories; but it is evident that what is competent to such a purpose may perhaps be also adapted to the estimation of the power of any light. Indeed, Dr. Smith himself states that the ultimate capabilities of the process require to be developed by time. The fundamental fact, applied in this method of chemical photometry, is that when iodide of potassium in solution is treated with nitric acid, so small in quantity as not to cause change of colour in dull diffused light, a change is produced upon bringing the same mixture into clear light. Iodine is set free, and the solution becomes yellow. This, so far, constitutes simply a qualitative test for light; but it is easily made quantitative. The amount of iodine freed can be titrated with great exactness by the use of hyposulphite. In the words of the report: "In these two facts lies the whole process—the first is the new part, the second makes the first quantitative, and its use is, of course, part of the novelty." It is well known that strong acid liberates iodine; weak acid does so in time, but the process is hastened by light. Heat, even to 212° Fahr., does not act so well as light; but heat materially assists the action of light. The action caused by the continued light and heat rays of an electric light with a parabolic reflector was very rapid. It is true that the solution of iodide of potassium, as at present made, is liable to changes, an old solution being more sensitive than a new one. And with the addition of a nitric acid solution, having an acidity equal to 1 per cent. of sulphuric anhydride, to a solution of 1 grain of iodide of potassium in 100 grains of water, the action even of sunlight was slow. It is, however, admitted that the right proportions of the acid solution—the office of which is to render the iodine solution sensitive—have to be determined for different degrees of light and perhaps temperature. In addition to these requirements the best method of exposing the solution to light has to be found. It is scarcely necessary to add that before the process here indicated by Dr. Smith can be adapted to the measurement of comparatively feeble artificial lights, it will have to be so much modified as to really constitute the successful apparatus a new and independent invention.

The Inspector goes on to speak of the almost unsuspected abundance of ammonia in the air, and also deposited, presumably in an aqueous solution, on every solid substance exposed to the air inside and outside dwelling-houses. It is an undoubted fact that ammonia

is thus universally to be detected; but the deductions to be drawn from the observations which prove its presence in various places are by no means simple. If a stone picked up in a town is washed, the water will be found to contain ammonia. If a chair or table in a room is washed, ammonia will also be found in the washing. "If you wash your hands you will find the same; and your paper, your pen, your table-cloth, and clothes, all show ammonia." Whence comes this wonderfully diffused gas? It comes from the continuous decay and decomposition of all organic matter. If washed off from a mirror, and the glass is then breathed upon, no sooner will the mist have cleared off from its surface than ammonia may be gathered from it afresh. The smoke of coal fires is, as may be imagined, a fruitful source of ammonia, and Dr. Smith is evidently vexed in spirit at the enormous and apparently unpreventable waste of this valuable fertilizer, in the volumes of coal smoke poured forth every day from house and factory chimneys.

The fact that the Inspector has made the diffusion of ammonia and of other chemical impurities in the atmosphere a special study, is not without a possible bearing, however slight, upon the manner in which he may interpret his powers of inspection of ammonia works under the new legislation, which is even now taking final shape. At least, it may be anticipated that no factious prosecutions, based on curious methods of air analysis, will be likely to find favour with him. We know, from frequent experience, that if traces of ammonia can be detected in the air of a place wherein a sulphate of ammonia factory is established, it is only necessary that a certain kind of feeling should also exist between the local authority and the proprietors of the factory, in order to make it quite clear to the authority that they should institute legal proceedings for nuisance in respect of the operation carried on at those works. This sort of thing is pointedly discouraged by Dr. Smith in the present report, for he says that although little skill is required to determine the presence of ammonia, such determination must be used with consideration, and the conclusions must not be drawn by an ignorant person. At the same time, the Inspector lays the greatest stress upon the value, in proper hands, of means for the simple estimation of all the noxious substances in the air, without the trouble of making laborious chemical experiments, or using elaborate apparatus. He says that without the full knowledge given by the examination of air, he sees no reason to have any faith in the progress of sanitary economy. In referring to this fundamental need, it is remarked with great force, and in terms which would-be sanitary purists would do well to remember, that demands are constantly made for sanitary legislation, while, so far as Dr. Smith himself can see, the man who knows fully how to legislate in this matter does not exist, and the right method of estimating the health of the nation is not even known, certainly not practised. At Social Science Congresses, and similar gatherings of enthusiastic amateurs who want to apply stringent governmental methods to the furtherance of the health of towns, the appointment of a Minister of Health is advocated as a commonly favoured means to this end. In the present report we find the chief authority on atmospheric sanitation counselling, before all things, caution and patience for the progress of science, and stating as his deliberate opinion that such a minister, "established too soon, would drive (*sic*) imperfect methods which would require to be replaced by others."

Among other subjects contained in the report may be found passages relating to the methods adopted by the Inspectors of drawing and testing gases from factory chimneys; of measuring the speed of chimney draught; and various cognate matters which need not be detailed here. The book, as a whole, contains many interesting facts and tables, and we shall watch with much interest for the changes that will appear in future annual issues of the same kind, when the Inspector's work and responsibilities, already great, have been increased and extended, by fresh legislation, to include fields of industry in which we are even more directly interested.

Notes.

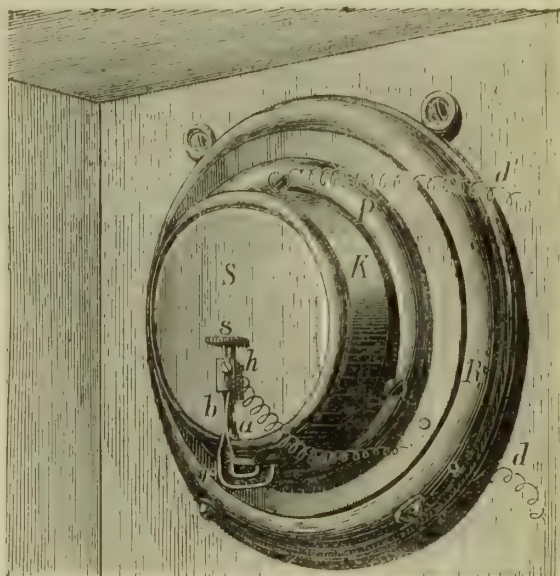
ILLUMINATION BY LUMINOUS PAINT.

The manufacture of luminous paint, used for lighting rooms and objects when artificial lights of any kind are unsuitable, is progressing satisfactorily. According to the *Journal of the Society of Arts*, the manufacturers have lately succeeded in considerably reducing the cost of production, and also in increasing its range of utility. Quite recently it has been applied as a whitewash for ceilings, and Mr. W. Spottiswoode, the President of the Royal Society, has had the ceilings of some rooms in his house treated in this way with good effect. The rooms appear as if lighted with bright moonlight, although far more diffused than this would be, the bright patches where the moon's rays would actually fall being, of course, absent. There is said to be sufficient light in rooms lighted in this manner to see the time by an ordinary watch. Another novel application of this curious material is in the manufacture of temporary lanterns. These are formed of oblong tin cases, coated with luminous paint on the outside. The lanterns are kept exposed to light during the day, and when required at night they may either be used as they are, or by pouring hot water into them the luminosity is excited to a high degree, and the brilliancy remains as long as there is any heat in the water. If only a little water is placed in the tin, the extra luminosity may be momentarily excited by shaking it up so as to warm all sides of the tin. As the light dies down, another shake will bring it up again. It has been observed that after exposure to sunlight, burning magnesium wire, or any other powerful luminant, the great brilliancy shown by the material in darkness

soon dies away, to be succeeded by its normal glimmer. Hot water brings out precisely the same kind of brilliancy as powerful light, but of a more enduring character.

WEBER'S EXPLOSIVE GAS TELL-TALE.

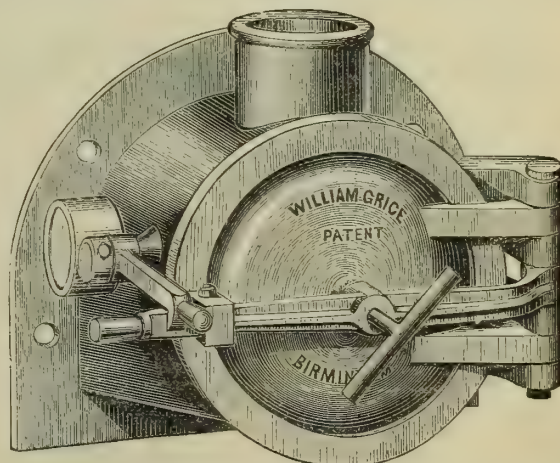
We are now able to illustrate the explosive gas tell-tale, invented by Herr R. Weber, of Leipsic, of which a descriptive "Note" has already appeared (see *ante*, p. 175). The instrument is shown as fixed on the wall of an apartment, near the ceiling, in the best position to give instant warning of the escape of illuminating gas in the room. As previously described, the apparatus consists of a bracket-back, R, of any suitable material, to which is fitted the metallic drum, K, set on the vulcanite base, P. This drum is closed in front by the porous diaphragm, S. The small bent pipe, r, which establishes communication with the interior of the drum, is partly filled with quicksilver, and is prolonged at b into a glass tube, which carries on its upper end the metallic cap, h, through which passes a needle, capable of being raised and lowered by the screw, s. The



wires, d, d, connect the outside of the instrument with an electric alarm; while the cap, h, and the needle carried by it, are connected in the same way by the wire, a. When the air surrounding the instrument is in its normal state, there is perfect equilibrium between the pressure within and without the drum; consequently the mercury in the tube, r (which is virtually a pressure-gauge), is at the same level in both limbs, and at its normal distance from the end of the needle before mentioned. When gas is present in the atmosphere, it at once passes, by a well-known law, into the drum through the diaphragm, and consequently raises the pressure within. This pressure causes the mercury to rise in the outer limb of the tube, r, which is drawn out in order to give the liquid a quicker flow, and as soon as the quicksilver reaches the needle the electric current is completed, and the alarm is set in action.

A NEW SELF-SEALING RETORT MOUTHPIECE LID.

The retort mouthpiece and fittings shown in the annexed illustration are the inventions of Mr. W. Grice, and were first brought before the public at the Glasgow exhibition last autumn. Since then several alterations have been made in the apparatus, and it is from the latest form of the simple mouthpiece and lid that our figure is taken. The mouthpiece may, it is said, be made to suit any size and shape of retort. The lid is hinged on one side of the mouthpiece, the hinge being made very deep and strong, with a view to securing as steady a movement of the swinging lid as possible. The lid is provided on its inner face with a V-ridge, which fits in a corresponding groove on the face of the mouthpiece when the crossbar screw is tightened up. A metallic joint is secured by the contact of the sides of the V-ridge



with the sides of the groove, thus giving what is claimed as a double, instead of the single contact obtainable when the edge

of the lid is applied either to the plane face of the mouth-piece, or to the bottom of a groove. This apparently slight distinction is said to be of considerable importance in the ordinary course of working. The crossbar is, of course, hinged with the lid, and when brought into action for screwing up, it engages at the free end with a catch, which is balanced as shown. The balance-weight causes the catch, or lug, to fly up out of the way when the crossbar is disengaged, so that one side of the mouthpiece is always free from projections of any kind while it is opened for drawing and charging. The arrangement is, we believe, now on trial in several large gas-works. Another form of Mr. Grice's invention includes the provision of a valve in the ascension-pipe.

A NEW ELECTRIC LAMP.

Another electric lamp has lately been introduced by Mr. H. Joel, of London, which is said to hold a position midway between the large arc-lights and the incandescent lamps of Swan, Edison, and others. It is produced by the heating, in consequence of the passage of a magneto-electric current, of a pencil of carbon pressing against a copper terminal. This was also the principle of the Werdermann light. The carbon pencil lasts for seven or fourteen hours, as arranged, and the method of changing it is said to be very simple. The pencil points itself in a peculiar manner while in action. The end of the intensely-heated carbon turns outward, and forms a mushroom top, the edges of which burn away steadily as fast as they are formed by the constant pressure of the pencil against the copper, as already stated. Although the Joel lamp may be placed in a vacuum globe, there is no necessity for a vacuum in which to develop its illuminating power. The light is said to be of good colour, very steady, and equal in power to about seven gas-burners of the best type. It is also claimed that the lamp is easily and cheaply made, and cannot get out of order. The horse power required for each lamp is not stated.

Communicated Article.

ON A NEW UNIT FOR THE EXPRESSION OF THE PURIFYING CAPACITY OF GAS-WORKS.

By Mr. H. LEICESTER GREVILLE, F.I.C., F.C.S.,
Chemist to the Commercial Gas Company.

Questions of gas purification, in all their various details, have been becoming of increasing importance of late years, by reason of the greater restrictions placed upon gas companies in the matter of the purity of the gas they supply. In consequence of these continually increasing restrictions, it becomes necessary to devote attention not only to the chemistry of the question, but also to its more essentially physical aspects; and in the present article I hope to show that these are very intimately connected with the various chemical reactions that take place during the process of purification.

It is, I believe, more or less fully recognized at the present time, that, for efficient purification, it is not only necessary to employ a suitably active material, but it is equally necessary to have a proper relation between the volume of gas to be purified and the amount of material to effect such purification. Although this detail is generally understood by those who have the construction and management of gas-works, the rule as to ratio of purifying plant to quantity of gas made is to a great extent erroneous. It is the custom to allow so much area of purifying surface for so much gas made; but this method of estimation omits one important element from the question—viz., *bulk of material*. The omission of this important detail has been commented upon elsewhere by Mr. A. Vernon Harcourt,* who has pointed out that the mass as well as the area of the purifying material must be considered, and that the amount of action which takes place will depend on the time of contact between the gas and the material. This being the case, a really accurate definition of purifying capacity should include make of gas, area of purifiers, and bulk of material.

As an example of the inadequate character of the definition at present in use, I need only call attention to the fact that, with the orthodox ratio between area and make, it is possible, without infringing the rule, to employ 6 inches of purifying material, or 6 feet; to use one purifier of the proper area, or to employ a dozen. The degrees of attainable purification, however, under the various conditions named, would be widely divergent. Starting with a definite chemical activity in the material employed, the absolute degree of purification effected will, up to the extreme limit of purity, depend upon the length of time during which the gas is in contact with the purifying material. It is for this reason that I propose the expression "contact time" as a unit for the definition of purifying capacity. Contact time means the *actual time during which the gas is in contact with the purifying material*.

As an example of my meaning, let us, for instance, suppose the make of gas in the 24 hours to be $2\frac{1}{2}$ million cubic feet, and the purifiers 35 feet square, with 3 feet in depth of purifying material. Dividing the day's make ($2\frac{1}{2}$ million feet) by the number of minutes in the 24 hours (1440), we get a make of 1736 cubic feet per minute. The purifier being 35 feet square, gives an area of 1225 square feet, which multiplied by 3 gives 3675 cubic feet of purifying material. Now, if gas is passing at the rate of 1736 cubic feet per minute through 3675 cubic feet of purifying material, the time of contact for the quantity of gas mentioned is $3675 \div 1736 = 2.1$ minutes.

* Discussion on the paper, on the "Purification of Gas," by Mr. H. E. Jones, read before the Institution of Civil Engineers, on the 9th of March, 1880.

A formula for the calculation of contact time may be given as follows:—

$$\frac{A \times B}{C \div 1440} = \text{Contact time in minutes,}$$

where A = area of purifying vessel,

B = depth of material,

C = make in the 24 hours.

It is probably well known that if a given limited amount of purification is being effected, an increased efficiency may be obtained either by the employment of purifiers of larger area; by a diminution in the total amount of gas passing through the material; or by increasing the amount of such material, either by layers of increased thickness in the purifier, or by means of an additional purifying vessel. The cause of the increased efficiency in each of these cases is the prolongation of the time of contact between the gas and the material. Assume, in illustration, that with all other conditions being the same as in the example which has been given, the purifiers are 40 feet instead of 35 feet square. The area will then be 1600 square feet, and the amount of material 4800 cubic feet, and $4800 \div 1736$ gives 2.7 minutes as the contact time. As an example of the effect of diminished quantity of gas, let us suppose the make of gas to be one-half that which was assumed in the first example, other conditions remaining the same; then $1,250,000 \div 1440$ gives 868 feet as the make per minute, and $3675 \div 868$ gives 4.2 minutes as the contact time. Lastly, let (*ceteris paribus*) the depth of purifying material be increased to 6 feet. Then $1225 \times 6 = 7350$ cubic feet of purifying material; and $7350 \div 1736$ gives 4.2 minutes as the contact time.

From the last two examples it will be seen that the reduction of the quantity of gas by 50 per cent. has the same effect upon the contact time, as a corresponding increase in the bulk of purifying material. Theoretically speaking, therefore, the same increase of purifying effect might be expected from a definite diminution in the velocity as from a corresponding increase in the mass of purifying material. It will be found, in fact, that the higher the ratio of the bulk of the purifying material to the bulk of the gas, the greater the efficiency in purification, no matter how such ratio is obtained—whether by small makes, by large area of purifiers, or by thickness of material.

As it is found in actual practice—more especially in the domain of sulphur purification—that it is seldom the "sulphur" is reduced to its lowest possible amount, and that a diminished velocity, or increase in the number of purifiers, is attended with a corresponding reduction of impurity, it is obvious that for the usual efficiency of material the contact time is seldom sufficiently long to obtain complete action. This is, of course, a view dealing only with the physical aspects of the question, whereas the chief difficulties in sulphur purification arise from inequality and inefficiency in the purifying material itself.

On the general question of the contact time necessary for the elimination of each particular form of impurity, I believe there is much to be learnt; and the fact that there must be a period of contact which is, under specified conditions, distinct and definite for each particular form of impurity, has scarcely met with the recognition it deserves. From practical experience I can say the time of contact that is necessary for the elimination of sulphuretted hydrogen by oxide of iron, and of carbonic acid by lime, is considerably less than that required for the elimination of sulphur compounds by sulphided lime. This, however, is probably due to the comparative efficiency of the purifying material used for the sulphuretted hydrogen and carbonic acid over that which is available in ordinary practice for bisulphide of carbon.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. W. COWAN'S GAS-GOVERNOR.

SIR,—The number of the JOURNAL for the 8th ult. contains the description of a gas-governor recently patented by Mr. W. Cowan, of Edinburgh, as an important and easily applied improvement upon the governors constructed according to the pattern designed by Clegg in 1815.

I have forwarded to you herewith a little work published in 1867, and if you will refer to pp. 113 to 121 you will find that the need of an improvement such as that in question has already been shown by others besides Mr. Cowan; also that the process by which he has carried out this improvement was described long since, and has for a considerable time past been practically applied. His patent, therefore, cannot be regarded otherwise than as a means of giving publicity to his arrangement; it has no other importance.

Besides, the improvement which has engaged Mr. Cowan's attention is not the only thing required in order to make a Clegg governor regulate the flow of gas at an unvarying pressure. You must, in addition, prevent any alteration taking place in the weight of the moveable holder when it changes its position in the water. In fact, the greater or less immersion of the bell is a matter which certainly should not be neglected, as is shown in the work I have already referred to. In the governor of which you gave an illustration the variation of pressure would be as much as 8.10ths of an inch according to the position of the bell, supposing the latter to have a diameter of 3 ft. 3 in., and to be 8.100ths of an inch thick.

You see, therefore, that apart from other considerations, Mr. Cowan's improved gas-governor does not attain the object which for a long time past has been most successfully accomplished in France.

Paris, March 25, 1881.

H. GIROUD.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION, 1881.
PROGRESS MADE TO SATURDAY, MARCH 26.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Jan. 27	Jan. 28	Feb. 2	March 8	..	..
Alnwick "Gas Bill"	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Barrow-in-Furness Corporation Bill.	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Beverley "Water Bill"	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Bingley "Water and Improvement	Lords	Feb. 4	Feb. 7	Feb. 15	March 22	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 11	March 24	..
Birkenhead Corporation (Gas and	Lords	Jan. 31	Feb. 2	Feb. 7	March 24	..	..
Water) Bill	Commons	Jan. 27	Jan. 28	Feb. 4	March 18	..	..
Bradford Water and Improvement	Lords	Feb. 18	Feb. 18	Feb. 25	..	..	..
Bill	Commons . . . .	..	..	..	..	..	..
Bray Township Bill	Lords	Commons Bill	March 15	..	..	..	..
Brighton and Hove Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 14	March 3	March 14	..
Cambridge University and Town	Lords	Commons Bill	March 11	March 21	March 22	March 25	..
Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
Cheltenham Corporation Water Bill.	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Cleator Moor Local Board Bill . . .	Commons	Jan. 27	Feb. 7	Feb. 14	March 15	..	..
Colne and Marsden Local Board Bill.	Lords	Jan. 28	Jan. 28	Feb. 3	March 15	March 21	..
Dudley "Gas Bill"	Commons . . . .	..	..	..	..	..	..
Dundalk "Water Bill"	Lords	Feb. 2	Feb. 3	Feb. 15	March 22	..	..
Eastbourne Water Bill	Commons	Jan. 28	Jan. 31	..	..	..	..
East London Water "Bill"	Lords	Jan. 27	Jan. 28	Feb. 15	March 18	..	..
Egremont Local Board Bill	Commons	Jan. 28	Jan. 28	Feb. 8	March 7	March 11	..
Fylde "Water Bill"	Lords Bill	..	..	..	..	..	..
Goole and District Gas and Water	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 8	March 18	..	..
Hexham Gas Bill	Lords	Jan. 27	Jan. 28	Feb. 8	March 18	..	..
Holland " (Parts of) and Sutton	Commons	Jan. 28	Jan. 31	March 2	March 18	..	..
Bridge Water Bill	Lords	Jan. 31	Feb. 2	Feb. 7	March 22	..	..
Hyde Gas Bill	Commons	Jan. 28	Jan. 31	Feb. 14	March 25	..	..
Irvine Burgh Bill	Lords	Jan. 28	Jan. 31	Feb. 14	March 25	..	..
Kirkcaldy and Dysart Water Bill .	Commons	Jan. 31	Feb. 2	Feb. 7	..	..	..
London Sea Water Supply Bill . . .	Lords	Jan. 28	Jan. 31	Feb. 7	..	..	..
Lower Thames Valley Main Sewer-	Commons	Jan. 28	Jan. 28	Feb. 7	..	..	..
age Board Bill	Lords	Jan. 28	Jan. 28	Feb. 1	Preamble	not proved.	..
Matlock Water Bill	Commons . . . .	..	..	..	..	..	..
Oban " " " " " " " " " " " " " "	Lords	Jan. 27	Jan. 28	March 2	March 22	..	..
Paisley Water Bill	Commons	Jan. 28	Jan. 28	Feb. 1	March 11	March 22	..
Reading Corporation Bill	Lords Bill	..	..	..	..	..	..
Richmond Gas Bill " " " " " " " "	Commons	Jan. 27	Jan. 28	Feb. 4	March 4	March 21	..
Ryton Local Board (Water) Bill . .	Lords	Jan. 27	Jan. 28	Feb. 4	..	..	..
Sevensoaks "Gas Bill"	Commons	Jan. 27	Jan. 28	Feb. 7	March 15	..	..
Sheffield "Water Bill"	Lords	Jan. 31	Feb. 2	Feb. 7	March 15	March 24	..
South Metropolitan Gas Bill	Commons	Jan. 31	Feb. 2	Feb. 7	March 15	March 21	..
Stalybridge Extension and Improve-	Lords	Jan. 27	Jan. 28	Feb. 21	March 15	March 21	..
ment Bill	Commons	Jan. 27	Jan. 28	March 21	March 1	March 10	..
Stirling Water Bill	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
Westbury-upon-Trym Gas (No. 1)	Commons	Jan. 27	Jan. 28	March 4	..	..	..
Bill	Lords	Jan. 27	Jan. 28	Feb. 4	..	..	..
Westbury-upon-Trym Gas (No. 2)	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Bill	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
Westgate and Birchington Gas Bill.	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Woking "Water and "Gas Bill" . . .	Lords	Jan. 28	Jan. 31	Feb. 7	March 11	March 22	..
" " " " " " " " " " " " " "	Commons	Jan. 28	Jan. 31	Feb. 7	..	..	..

HOUSE OF COMMONS.

MONDAY, MARCH 21.

Requisitions to withdraw their petitions against the following Bills were presented:—Barrow-in-Furness Corporation Bill, from (1) Owners, &c., in chapelry of Rampside, (2) Duke of Devonshire; London Sea Water Supply Bill, from the Great Western and London and North-Western Railway Companies.

DUNDALK WATER BILL.

On the motion for the second reading of this Bill, Mr. CALLAN moved, as an amendment—"That the Bill be read a second time this day six months." In doing so, he remarked that no reasons had been given in support of the Bill. It had been alleged against him that although he was moving the rejection of the Bill, he did not represent the constituency. Several of his constituents were, however, residents in Dundalk, and were among the principal inhabitants, and they included the Chairman and Members of the Town Commissioners, the Harbour Commissioners, Poor Law Guardians, and other official authorities. He had received a letter from the Town Commissioners, stating that at a special meeting held by them a resolution was passed as follows:—"That a private Water Bill now before Parliament, awaiting second reading, being in the

judgment of this Board an attempt to supersede the authority of the Dundalk Town Commissioners as a sanitary body, it is our duty to petition Parliament against the same, and that a petition be adopted and forwarded at once to Mr. Callan, M.P., for presentation." He found in a statement in favour of the Bill that no petition had been presented against it from the Town Commissioners, or by any representatives of the ratepayers; but he had now in his hand the petition from the Town Commissioners, and another petition which was largely and influentially signed by the principal ratepayers of the town. As to the facts of the case, he might state that since 1854 the Town Commissioners had been authorized by Parliament to take steps as a sanitary authority to obtain a water supply, but unfortunately the Act of Parliament was not available in this case, and the necessary machinery was not supplied. Afterwards, in consequence of the great expense of obtaining a private Bill, and for other reasons, the House of Commons, in 1878, passed a general Act providing machinery by which the town commissioners of any town in Ireland, by means of a Provisional Order, might apply to obtain the money they required at 3½ per cent. Under these powers the Town Commissioners of Dundalk, in August last, advertised for plans for supplying the town with water, and offered a prize of 100 guineas, in

addition to the usual fee, for the best scheme. A number of plans were presented, and the Commissioners engaged the services of Mr. Hassard, C.E., of whom it was sufficient to say that to him belonged the honour of having first suggested the supply of water to the city of Dublin as far back as 1854. Having read Mr. Hassard's report, he (Mr. Callan) could only say that he treated with disapproval the scheme now before the House. The Commissioners applied to the Local Government Board, and an inquiry was held with a view to obtaining a Provisional Order. In their petition the Commissioners stated that the promotion of the Bill before the House was "a pure speculation on the part of the Company promoting the same, who had brought it forward not only without the sanction of, but in direct antagonism to and rivalry with your petitioners." The speculative character of the Bill was shown by the clause empowering the Company to sell the undertaking. One of its objects was to force upon the Commissioners the adoption of a scheme which they opposed, and another was to compel them to purchase the undertaking, so that the Company might make a profit out of the transaction. To pass the Bill would simply be reversing the principles of modern legislation. No doubt it might be asked why the Commissioners did not come in the usual form, and pray to be heard in Committee against the Bill; but the fact was that they had no power to apply their funds to such purposes. Personally he was not wedded to any particular scheme, but he wished to have the matter thoroughly weighed and tested, and due consideration given to the modifications suggested by Mr. Hassard. A year's delay proved beneficial in the case of Dublin, inasmuch as it had the effect of securing the best supply, and he had no doubt that if the House rejected the present Bill it would be for the benefit of Dundalk and its neighbourhood.

Mr. W. E. FORSTER said in this particular case he could not help thinking it would be better to have the Bill postponed a year. All he knew about the matter was owing to his position as President of the Local Government Board in Ireland. The Town Commissioners of Dundalk opposed the Bill, and application had been made to the Local Government Board for a Provisional Order. There had not been an opportunity for the consideration of this application, and he certainly thought time ought to be given. Undoubtedly it was the policy of the House to leave sanitary matters as much as possible in the hands of the corporate authorities of the places interested, and it was more likely that a satisfactory final arrangement would be arrived at in Dundalk if the matter were postponed for another year.

Mr. A. M. SULLIVAN said his only anxiety was that the case should be fairly heard by a Committee. He thought the wisest course would be to defer the second reading of the Bill for a short time, because the inquiry had already taken place, and the decision of the Local Government Board in the matter would be known in a few days. If it should turn out that the scheme laid before the Local Government Board by the Commissioners was a very objectionable one, it would be but fair that the proposal now before the House should go to a Select Committee, where its merits would be discussed.

Dr. PLAYFAIR said he had had the advantage of seeing both the promoters and the opponents of the Bill that afternoon, and he found there were certainly some difficulties with regard to it. It was quite true that the Town Commissioners of Dundalk had at present a scheme before the Local Government Board. He would have been very much inclined to have recommended the House to allow the second reading of the Bill, and then to refer it, together with the scheme of the Commissioners, to the same Committee; but the difficulty was that the Commissioners had lost their power of appearing before such Committee. They ought to have petitioned to be heard within ten days of the passing of the first reading, and this they had not done. It might be possible for the Standing Orders Committee to suspend the Standing Orders, and allow the Commissioners to be heard, and he was not prepared to say it would not be a great convenience if the second reading were not taken to-day.

Mr. MELDON pointed out that if the second reading were taken to-day the Bill would be dealt with as if it were unopposed. It had been decided that town commissioners had no power to apply any local rates in opposing a private Bill, and it was well that this should be so. The whole course of legislation for years past had been to vest local authorities with powers of this kind; and this having been the policy of the House, would it tolerate a Company coming forward with a request for powers which were directly opposed to the Public Health Act? A scheme for providing Dundalk with water was before the Local Government Board, and there could be no harm in making a private speculative Company of this kind wait another year before they brought their Bill before the House.

The motion was then put and negatived.

TUESDAY, MARCH 22.

A requisition to withdraw their petition against the Kirkcaldy and Dysart Water Bill was presented from the Countess of Rothes and the Hon. George Waldegrave Leslie.

THURSDAY, MARCH 24.

A petition against the East London Water Bill was presented from the Corporation of the City of London.

FRIDAY, MARCH 25.

A petition against the East London Water Bill was presented from the Metropolitan Board of Works.

COURT OF REFEREES.—MONDAY, MARCH 21.

(Before Mr. PEMBERTON, Chairman; and Messrs. RICKARDS, PARKER, and BONHAM-CARTER.)

SOUTH METROPOLITAN GAS BILL.

The *locus standi* of the Metropolitan Board of Works, as petitioners against the Bill of the South Metropolitan Gas Company, having been objected to, the question to-day came before the Court of Referees, constituted as above.

Mr. MICHAEL, Q.C., appeared for the Company; Mr. BIDDER, Q.C., for the Board.

Mr. RICKARDS: I have been looking at the objection raised, and find it to be to the effect that, as the Bill is a money Bill, according to the practice of Parliament the petitioners have no right to be heard. This, I anticipate, is the question here.

Mr. BIDDER: It is one of the questions.

Mr. RICKARDS: The main question, I suppose.

Mr. MICHAEL: I am not here offering any hostile opposition to the Metropolitan Board of Works, nor do I want to shut them out from being heard. I am willing to afford them *locus standi* to oppose the Bill; but am unwilling to give them *locus* to rip up previous legislation. The Board want to open up the whole question of the standard price of gas, and the conduct of gas company legislation; and as these are matters not touched by the present Bill, I cannot assent to them having *locus* to appear before the Committee upon such points.

Mr. RICKARDS: How would you suggest that the *locus standi* should be limited?

Mr. MICHAEL: It should be limited to the Bill, which merely seeks power to acquire land and to raise further capital. The Greenwich District

Board of Works appear as the Local Authority who are really interested in the matter *quâ* the land; but I am willing to let my friend appear to oppose the acquisition of land, or the raising of capital, if he undertakes not to go beyond the Bill itself—he must not go into the questions of price and quality which might arise in an ordinary gas Bill.

Mr. BIDDER: I understand my friend concedes me general *locus standi* against the Bill; and if, before the Committee, I attempt to go into anything which I am not entitled to, it will be the duty of the Committee to stop me.

Mr. RICKARDS: If you have general *locus standi*, there will be nothing to prevent you from going into the matters contained in your petition.

Mr. BIDDER: I am bound by the rules and practice of the House. I do not say there is not anything within my petition which I should not have a right to go into in opposing the Bill; but it is the function of this Court to decide whether I am entitled to *locus standi*; whether it should be general or limited. When the Court has done this it has discharged its duty.

Mr. RICKARDS: If we give general *locus standi*, it will permit you to be heard upon all the allegations in your petition.

Mr. BIDDER: I do not think so.

Mr. RICKARDS: What is general *locus standi* but that?

Mr. BIDDER: It is against the Bill as a whole. Under general *locus standi*, I am not entitled to go into something which is entirely irrelevant to the Bill. Supposing I am a landowner, whose land is being taken, I should be entitled to *locus standi*; but supposing I put into my petition an allegation that one of the promoters of the Bill had been an immoral person in his youth, could I go into this?

Mr. RICKARDS: That would be irrelevant to the Bill.

Mr. BIDDER: The question must be dealt with when it arises. I never before heard of an attempt in this Court to limit the *locus standi*.

Mr. MICHAEL: It is done every day.

Mr. BIDDER: I think not.

Mr. RICKARDS: I do not see how we can give general *locus standi* against the whole of the Bill, and at the same time specify an interdict as to points into which the petitioners are not to go.

Mr. BIDDER: You are really anticipating the merits of the case, because you cannot now say what will or will not be material.

Mr. RICKARDS: Mr. Michael is willing to admit your opposition to all the contents of the Bill, but he anticipates that if you get general *locus standi* you will carry your opposition further, and introduce points that are outside the Bill.

Mr. BIDDER: My friend is rather imaginative.

Mr. MICHAEL: No; because you expressly state this in your petition.

Mr. BONHAM-CARTER: What are the allegations in the petition?

Mr. MICHAEL: I will show you.

The CHAIRMAN: Is not the doctrine that a petitioner is allowed to go into everything in his petition limited to this, that it is only to matters confined to the Bill? If it is not so, surely it ought to be the case.

Mr. MICHAEL: When we come and raise an objection to a particular part of the petition, it is for you to see whether the objection is well founded. The 7th paragraph of the petition is this: "Your petitioners also humbly submit that if the privilege of raising additional capital beyond the amount limited by the said Act of 1876 be conferred on the Company, it should be accompanied by a reduction in the standard price fixed by that Act." What can be more definite than that they intend before the Committee to raise the question of whether the standard price fixed by the Act of 1876 is a proper one? It has been held a thousand times over that it is not competent to petitioners to go into antecedent legislation. I am willing that they should be allowed to oppose our acquiring further land.

The CHAIRMAN: Will not the Committee who hear the Bill decide upon the point?

Mr. MICHAEL: No; we having come here, it will be alleged that we have been before the Court of Referees; that they have, without any limitation, allowed the petitioners to go before the Committee; and this will be really an acknowledgment of right.

The CHAIRMAN: Perhaps Mr. Bidder will give you an undertaking not to raise the question of price.

Mr. BIDDER: Certainly not.

Mr. RICKARDS: Would the Committee hear the petitioners upon every point raised in the petition?

Mr. MICHAEL: It is impossible to say.

The CHAIRMAN: How soon will this Bill be in committee?

Mr. BIDDER: It will not be ready for some time yet.

Mr. RICKARDS: We may as well state to you what, no doubt, you know already—that it is proposed to make an alteration in the Standing Orders, the effect of which will be to allow petitioners to be heard against Bills for the purpose of raising additional capital, and until this point has been settled by the House we are rather anxious not to decide any more cases which touch the question.

Mr. BIDDER: Under the existing Standing Orders, you have decided over and over again that the Metropolitan Board of Works are entitled to be heard, and therefore the alteration will not affect us.

Mr. MICHAEL: The two main objects of the Bill are to acquire land and to raise money, and I concede that my friend is entitled to go into any matter he pleases upon these questions; but he seeks to go into the question whether the standard price is a proper one. This being, as I submit, foreign to the Bill, you cannot allow a petitioner to appear upon matters which are not within the purview of the Bill.

The CHAIRMAN: The alteration in the Standing Orders, if made, will relieve the Court from going into the question at all. The Bill will then go straight to the Committee upon its merits, without coming here at all.

Mr. MICHAEL: I consider that I should still have the same right to come here.

Mr. RICKARDS: I do not think so.

The CHAIRMAN: Had we not better let this case stand over until we see what is done with the Standing Orders? I do not think there will be any inconvenience caused to either party by such a course being adopted.

Mr. BIDDER: I have no objection. You have heard a great deal from Mr. Michael, but really you do not know in the least what the case is. Now, just let us consider where my friend has tried to land us. He has tried to induce you to exercise a new jurisdiction, because his proposition is this: "Conceded that the Metropolitan Board are entitled to general *locus standi*; I ask you to append to your decision certain further decisions, as to the relevancy or irrelevancy of various paragraphs in the petition." Your jurisdiction, as I submit, is to decide upon the rights of petitioners to be heard upon a Bill. When once it is conceded that I have a right to general *locus standi*, am I to be kept here to discuss the question of whether you will take upon yourself a jurisdiction which the House has not conferred upon you? First I say you have not the jurisdiction; and, secondly, I desire to point out that it would be an excessively inconvenient thing for you to have it, because until you go into the merits of the Bill you cannot say what is relevant and what is not. I will take the very paragraph which my learned friend has read, and which he puts before you as a manifestly irrelevant paragraph, and I will show you that, so far from its being so, the allegation goes directly to the Bill itself, and

that it is a most proper one for the Metropolitan Board of Works to raise. What is the proposal of this Bill? It asks power to raise one million pounds of additional capital—which is to carry the ordinary 10 per cent. dividend—in addition to the capital the Company now have, of two millions. The 7th paragraph of the Board's petition says that if the privilege of raising additional capital be conferred, it should be accompanied by a reduction of the standard price. My friend says that this is irrelevant; but is it? The standard price is 3s. 6d. per 1000 feet as long as the Company pay 10 per cent. dividend; but if they pay another 1 per cent., then the price is to be reduced 4d. If, on the other hand, the dividend falls below 10 per cent., then up goes the price. The proposal is to add one million to the Company's capital, requiring an additional net revenue, and unless the business grows in proportion—which is very unlikely, as they are substituting new works for old ones—they may not earn 9 per cent.

Mr. RICHARDS: The reason for postponing this matter is very strong. We do not know in what terms the new Standing Order, if there is one, may be couched; but it may contain some such limitation as this: That the local authority shall only be entitled to be heard on their petition against the Bill, so far as the allegations are contained in the Bill. Therefore until we know whether there is to be a new Standing Order, and in what terms it will be expressed, I think it will be a mere waste of time to enter upon this case.

Mr. BIDDER: Do you know whether the Standing Order will appear this session?

Mr. RICHARDS: I cannot say.

Mr. BIDDER: The Bill will be proceeded with this session, and ought we to postpone it upon the chance of there being a new Standing Order?

The CHAIRMAN: Either a new Order will be made, or the old one will stand—there must be some decision upon it. I think you had better let this case stand over.

Mr. BIDDER: If you wish it I will do so. It is understood that if the Bill comes on before the Standing Order is passed, then we are to have *locus standi*—that is conceded.

Mr. MICHAEL: No; should the Bill be in the paper, then I presume the Committee will give us an opportunity of coming here first.

The CHAIRMAN: Certainly; we will take care you are not prejudiced.

Mr. MICHAEL: I again repeat that I am willing to grant my friend certain *locus standi* to oppose the Bill.

The CHAIRMAN: I wish you could suggest how to shape such an offer.

Mr. MICHAEL: Leave out the word "general." How can it hurt if you say that the petitioners should be allowed to appear to oppose the acquisition of the land, and the raising of additional capital?

The CHAIRMAN: The order is drawn up, "allowed as to clause so-and-so," or "disallowed."

Mr. BIDDER: I cannot be benefited by the postponement, and I may be prejudiced, because by the existing Order I clearly have *locus standi*, and it is possible that something may be introduced in the new Order which will alter the question.

The CHAIRMAN: I do not think the new Order will restrict you. If there is a possibility of the Bill coming on before the Order is passed, we will hear this petition, unless in the meantime you come to an arrangement.

Mr. MICHAEL: I have made my friend, as I think, a very fair offer.

The discussion then terminated.

HOUSE OF COMMONS COMMITTEE.

TUESDAY, MARCH 8.

(Before Mr. J. G. TALBOT, Chairman; Mr. H. SAMUELSON, Mr. ROSS, and the MARQUIS OF TAUNTON.)

BRADFORD WATER AND IMPROVEMENT BILL.

This Bill—promoted by the Corporation of Bradford for, among other purposes, the acquiring of powers for the construction and maintenance of reservoirs, conduits, and other new water-works, an extension of time for the completion of water-works already authorized, and for the more effectual control of works for the distribution and supply of gas and water—was to-day taken into consideration by a Select Committee of the House of Commons.

Sir EDMUND BECKETT, Q.C., Mr. VAUGHAN RICHARDS, Q.C., and Mr. LITTLER, Q.C., appeared for the promoters. The petitioners against the Bill were represented as follows:—Mr. MICHAEL, Q.C., and Mr. BALFOUR BROWN for the Clayton, Allerton, and Thornton Gas Company; Mr. MICHAEL, Q.C., and Mr. JEUNE for the Pudsey Gas Company and the Pudsey Local Board; Mr. BIDDER, Q.C., for the Leeds and Liverpool Canal Company; Mr. CLERK, Q.C., and Mr. O'HARA, for millowners and others; Mr. VENABLES, Q.C., and Mr. SHIRRESS WILL, for the Shipley Gas Company; and Mr. GRUBBE for the Calverley District Water-Works Company.

Sir E. BECKETT, in opening the case for the promoters, said the Bill was what was commonly called an "omnibus" Bill, embracing a number of objects, some of which were opposed and some unopposed. He would take the most important object first—the power to construct and maintain additional works for the storage and supply of water; and to this part of the Bill there was separate opposition. The Corporation of Bradford had had the duty of supplying water to the town since 1854, when they took over the works of the now defunct Company. The Corporation were at the present time supplying a population of 500,000 people, had already spent £2,000,000, and would shortly have to spend a further sum of £500,000. The immediate object of the present Bill was to substitute a reservoir, or rather a group of reservoirs, for one that was authorized some years ago, called the Brunthwaite reservoir. The reason why the Corporation had decided not to construct this reservoir was that their Engineer (who was not the Engineer who had advised the construction of the reservoir) found, when he came to the works, that the Corporation were saddled with a liability to construct a very long embankment of the enormous height of 140 feet—the highest embankment, he believed, that had ever been authorized. The Engineer found that it was possible to make a reservoir, that would answer all the purposes required, with an embankment only 49 feet high. [The learned Counsel then described the proposed new works, which consist of three reservoirs in the district of Morton, near Bingley. One of these reservoirs is for the storage of water for the use of the Corporation, and the other two are to be compensation reservoirs to supply water to the millowners and others who have a right to it.] Continuing, he (Sir E. Beckett) said the Corporation proposed to make these two compensation reservoirs independent of the one that was to supply water to the town, so that millowners and others might have the complete control of their own supply of water. The opposition to the Bill came from millowners on the stream and from the proprietors of the Leeds and Liverpool Canal. The Leeds and Liverpool Canal proprietors claimed, by their Act of Parliament, power to take the water of the Morton Beck, and they claimed the right to use this water without limit. But he held that their right was not of this unlimited description. By their Act they were entitled to "take water for the supply of their canal from such brooks, streams, or watercourses as were within 1000 yards of the canal." Well, in the first place, none of the streams which the Corporation proposed to interfere with came within 1000 yards of the canal, so that on this ground

alone they were not entitled to compensation. But even if they had the unlimited right they claimed, they would only be in the same position as the millowners on the stream, and it was well known that this right was held to extend to the amount of only one-third of the stream. The contention of the Corporation was that, by the compensation reservoirs which they proposed to construct, both the canal proprietors and the millowners were placed in a better position than they were entitled to. By the proposal of the Corporation 86 per cent. of the water was devoted to compensation purposes, whereas the usual proportion was 83 per cent. This was the real ground of the opposition of the millowners—that they would not get a sufficient quantity of water as compensation. The Corporation asked, further, for an extension of time for the construction of the works, and this part of the Bill and the clauses about capital were not opposed. This was the first part of the Bill that the Committee would have to deal with.

Evidence in support of the water-works portion of the Bill was then taken.

Mr. Angus Holden, examined by Mr. RICHARDS, said he was Mayor of Bradford, now holding that office for the third year. The proposed measure had been considered and discussed by the Council, and was unanimously approved by that body.

Cross-examined by Mr. BIDDER: The scheme had been discussed during the past few months. The Corporation decided to take to this particular watershed in consequence of a matter that arose out of some negotiations that were being carried on between Mr. Busfield Ferrand and the Bingley Improvement Commissioners, but which negotiations fell through. He understood that the Bingley scheme was originally somewhat similar to the Bradford scheme. He did not know that the reason the Bradford Corporation had put forward this scheme was that it was thought to be injurious to the interests of Bradford for the Bingley people to take these streams of water. He could not give the Committee any particular justification for the Corporation asking for compulsory powers, so far as any present shortness in the supply of water was concerned; but he would not say there was not a prospect of a shortness of water in the future.

Mr. Alex. R. Binnie, M. Inst. C.E., the Water Engineer of Bradford, examined by Mr. RICHARDS, described the physical features of the site of the town of Bradford. The town was, he said, in a basin, with rising ground on every side. The Corporation were under obligations to supply water to townships around, lying at a considerable elevation above the sea level. This caused the task of supplying water to be a very difficult one, and the water had to be brought long distances. There was a large consumption of water for manufacturing purposes. The total supply to the town was about 40 gallons per head of the population, of which 40 per cent. was used for trade purposes. The water was brought by two supplies—the high-level and the low-level; the latter alone being the one with which the present Bill proposed to deal. The last Act of the Corporation dealing with the low-level supply was passed in 1875, and by it the construction of three reservoirs was authorized—the Upper Barden, the Cringles, and the Brunthwaite reservoirs. Of these the first was in course of construction; for the second the land had been purchased; the one at Brunthwaite it was proposed to abandon by the present Bill. All these reservoirs were expensive works, all of them involving embankments of 100 feet or more in height. No time was lost after the last Act was passed in pushing forward with the Barden reservoir, which was a very costly work. It was 60 acres in extent, with an embankment 150 feet in height, and already £250,000 had been expended upon the work. With regard to Brunthwaite, he was compelled to advise the Corporation to abandon it, because he had come to the conclusion that the cost of its construction would be so great as to render it entirely unproductive; further than this he believed its safety would have been questionable. When the Bill was before Parliament in 1875 the question was discussed as to whether Bradford was in want of further water, and it was decided that there was such a want. Looking at the future, he anticipated a scarcity of water before long. The consumption of water was annually increasing, and it was nothing but prudent to look in advance, and keep the town four or five years ahead of its actual requirements. The trade of Bradford had not been very brisk of late years, but it was hoped that the depression would pass away, and whenever it did there would be a great increase in the demand for water for trade purposes. The Corporation wished to be in a position to meet this demand, for it was only by their water supply that the trade of the town could be carried on at all. The proposed works comprised the construction of two new reservoirs, the purchase of an existing one, and its alteration and enlargement. No. 1 reservoir would have an embankment 49 feet high and 550 feet in length, and the capacity of the reservoir would be 8,750,000 cubic feet, or 5½ million gallons. This reservoir would be for the supply of the town. The whole of the scheme was in substitution of the Brunthwaite reservoir, and the capacity of the new works was much less than the capacity of the works proposed to be abandoned. The compensation the new works would give to the millowners and others on the stream was more than one-half the amount proposed to be taken for the use of the town, or 36 per cent. of the total water taken. The millowners would have complete control over the compensation water; the Corporation constructing and maintaining the works, and paying a man for attending to the reservoirs, the man himself being under the orders of the millowners. The same scheme of compensation had been adopted in previous Acts obtained by the Corporation, and had been found to work satisfactorily both for the Corporation and the millowners. It was stated that the area taken for the town's reservoir—the higher part of the area of supply—was "wetter" than the portion allotted to the compensation reservoir. It was true that there were more springs in the higher area, but the calculation he had made was based upon the rainfall, which was the real test of the amount of water supply for a given area. The calculation had been made in a manner very favourable to the millowners, as he had taken an average of exceptionally dry years. The average rainfall of the district was 33 inches, but he had taken as the basis of his calculation 26 inches, the average of two or three very dry years. From the 26 inches there was a further deduction of 12 inches for evaporation, leaving 14 inches as the amount that ultimately reached the reservoir. There were certain reasons that had induced him to decide upon this district as a source of water supply in preference to the Brunthwaite scheme. Knowing the difficulties that would attend the construction of the Brunthwaite reservoir, he had had his eye on the Morton district for three years. At first, the Corporation entered into a contract to lease certain springs from Mr. Busfield Ferrand for 999 years; but, after negotiations with the Bingley Commissioners, who had a scheme of their own to obtain water from this district, the Corporation gave up the lease to the Bingley people, on consideration that they withdrew their scheme for obtaining a supply from Morton. In reference to the contention of the Leeds and Liverpool Canal Company that they required the whole of the water of the beck for the purpose of supplying their canal, he had noticed that in times of rain large quantities of water flowed away to waste into the River Aire. He believed that there was a length of 17 miles of the canal at this point without a lock, and the Morton Beck was only one of many streams that supplied the canal. He held that the canal would receive ample compensation from the works that the Corporation would construct, inasmuch as, in place of the fluctuating flow of the beck, they

would have a certainty, in the shape of a large storage of water that they could use in dry weather as they found they required it. He then quoted figures to show that the supply of water from the springs in the district was very fluctuating, and that the fluctuations were entirely due to the fluctuations in the rainfall. In taking this area the Corporation were not depriving any other community, because no other place had a natural right to the water of the district except Bingley, with whom the Corporation had already arranged.

Cross-examined by Mr. BIDDER: He was aware that the Canal Company did an extensive traffic, but he did not know whether the trade was or was not a declining one. He did not know that in dry weather the Canal Company were hard put to it to keep up a supply of water; his own experience was that they had no great difficulty, as he often saw water running to waste. No doubt, if the supply of water to the canal did run short, the Company's traffic would be interfered with. He believed that, with the compensation works, the Company would be better off than they were at present. The Corporation proposed to give them 36 per cent. of the water, and his opinion was that at the present time they did not get anything near one-third of the whole. The people below the canal-weir were entitled to some portion of the water, and the Corporation proposed to compensate these people. He did not consider that the district apportioned to the Corporation reservoir was wetter than the portion allotted to the compensation reservoirs. There were more springs in the Corporation area, but the springs were only fed by the rainfall, and he had no reason to think that the springs were fed by any rainfall outside the area in question. He certainly considered that in a few years they were likely to be running short of water. He believed that the Barden reservoir when completed would have a capacity of 500 million gallons. It was estimated in 1875 to cost £100,000; before its completion it would have cost nearly £250,000. Its capacity had certainly been increased 25 per cent., but this would not involve much additional cost. The Corporation were intending to complete the Cringles reservoir, which would afford capacity for 400 million gallons more. The Brunthwaite reservoir he advised the Corporation to abandon; its cost was estimated at £100,000, but it would have largely exceeded this sum. In addition to these, they had also power to construct the Thoroton Moor reservoir on the high-level system. This would have a capacity of 180 million gallons. They had also power to construct the Stairs reservoir, with a capacity of 50 or 60 million gallons. The present proposal was for a reservoir with a capacity of 54 million gallons, on the low level, but this was in substitution of the Brunthwaite reservoir, which was to be abandoned. The idea of the Corporation in constructing these reservoirs was to increase the extent of their storage capacity. They had already found that in dry seasons the amount of their storage capacity was insufficient, and with a view of providing for the future, and the increased demand that there was certain to be for water for trade purposes, they desired to make such preparations as they considered ample.

By Mr. CLERK: The Barden and Cringles reservoir would, when completed, hold 900 million gallons, but he did not calculate that they would increase the daily supply by more than 7 million gallons. The intention of the Corporation was not so much to increase the daily supply as to increase their storage capacity, in order that they might be in a position to meet an emergency caused by a time of drought. At present their existing works were not sufficient to enable them to make use of the full amount of water to be derived from the drainage area they had power to deal with, because they had not sufficient storage capacity to tide them over times of drought. The total amount proposed to be expended on the new works was about £100,000. There was a total of £400,000 named as required for water-works purposes by the Bill; but this sum included additional capital required for works previously authorized. The water of the stream was of a pure quality, and was very suitable for the manufacture of paper. If the water was taken by the Corporation, it would, of course, be lost to the Sunnydale Mills; but, as a matter of fact, these mills were standing idle, and had been so for some time.

Re-examined by Mr. RICHARDS: He had seen the deeds conveying the Sunnydale Mills to the Bingley Commissioners.

Mr. CLERK: But that was purely a conditional agreement come to when the Bingley Commissioners undertook to supply the district. Now that they have withdrawn from the undertaking, the agreement will fall through.

Re-examination continued: The time authorized by the Act for the purchase of the land for the site of the Brunthwaite reservoir would expire in June next, so that practically this reservoir was already abandoned. In the same way the time for the purchase of the sites of one or two small reservoirs that were proposed to be constructed in the town had also lapsed. The present income from the water-works was about £83,000 a year, in 1854 it was about £10,000.

WEDNESDAY, MARCH 9.

Mr. RICHARDS handed in copies of placards which were issued by the Corporation, in 1876, 1877, 1878, and 1880, cautioning the public against waste of water in consequence of the fear that the supply would fail.

Mr. Geo. J. Symonds, President of the Meteorological Society, examined by Mr. RICHARDS, said he had studied the subject of rainfall almost exclusively for nearly 20 years, and had been generally acquainted with the district dealt with by the present Bill. He produced returns and maps showing the rainfall for the stations in the district. The averages had been corrected so as to give the true average for a long series of years. For the district now being dealt with, the average fall was 33 inches; the driest year was usually two-thirds of the average, and the wettest year double the average. The springs upon a certain area might be considered as an addition to the rainfall in cases where there was a good deal of higher ground adjacent to the area in question, but in the present case he could not see that there was any such higher ground, and he believed that the springs were merely the outcome of the rainfall of the area itself. It therefore followed that the rainfall was the only proper basis upon which compensation calculations could be founded.

Cross-examined by Mr. CLERK: So far as this district was concerned, the prevailing wind and the wettest wind was the south-west, and at many of the stations in the neighbourhood there was a rainfall as high as 47 inches according to the map, but he was rather doubtful as to the accuracy of this figure. There were certain points of land—a third of a mile to a mile distant from the area in question—that were of a higher level; but he did not consider that the springs were fed from these higher portions, because there were other springs much nearer to the higher points, and the general set of the ground seemed to him to indicate that the flow would not be in the direction of the area dealt with by the Bill.

The CHAIRMAN said he did not quite understand the object of this cross-examination.

Mr. CLERK said that when his case came to be laid before the Committee he should show that the damage to his clients was far greater than the promoters sought to make out, because the amount of the rainfall was put at too low a figure, and because no account was taken of the water from the springs.

Mr. T. Hawksley, examined by Mr. RICHARDS, said he had had more than 30 years' acquaintance with the district in question, and had constructed

several very large reservoirs in the surrounding district. He had gone into the calculations as to the average rainfall, and agreed with Mr. Symonds in estimating the average rainfall at 33 inches. Of this he believed that 14 inches would be available in dry seasons, allowing the usual proportion for evaporation, &c. Of this quantity one-third was a fair amount for compensation in a manufacturing district, or, what was equivalent, one-third of the area of the district in which the water was impounded. In cases where the whole of the water was impounded at once, a stipulated amount of water was given out for compensation, the amount being calculated on the basis of one-third of the available supply. The other mode of providing compensation—the one proposed by the Bill—was to give the mill-owners a proportion of the area, and construct for them a reservoir from which they could draw water as they required it. This plan he thought was by far the better one for the millowners. In the present case the compensation to be afforded was fully equal to one-third, and the mill-owners were able to have the water in a more valuable form, as they could regulate their own supply. He agreed with previous witnesses in the opinion that the rainfall was the proper basis on which the amount of compensation should be calculated. He did not believe that the springs were fed from any other gathering-ground, as the nature of the ground seemed to him to preclude such a possibility.

Cross-examined by Mr. BIDDER: The more general practice in Water Bills had been to give one-third of the water as compensation, and not one-third of the area, but there were cases where compensation had been made by giving one-third of the area. He certainly considered one-third as sufficient compensation to the millowners who could not be said to have previously enjoyed the whole of the water, because more than two-thirds of the water actually ran away in the shape of floods; though, of course, if a millowner had a reservoir in which to store the water there would not be an escape of two-thirds of the water. The variation between the flow in the extreme dry weather and the flow in the time of heaviest flood was as 300 to 1. He had seen the existing reservoir on the Morton Beck, but in his opinion it was merely a tea-cup. Its capacity was about 2,700,000 cubic feet, or 15 million gallons. He had ascertained this on the spot, and also from a gentleman connected with one of the mills. This was utterly inadequate to store the water. The amount of storage that was proposed by the Bill as compensation was equal to 36 million gallons, which added to the 17 millions that the existing reservoir would contain when enlarged made 53 millions. Besides this there would be the overflow from the supply reservoir. No doubt, a man who had storage room had a greater interest in the water of the stream than one who did not have any such accommodation, in proportion to the extent of his storage capacity. The water which was stored in the existing reservoir by the millowners, and let out and used by them, was not afterwards available for the use of the canal, because the only means by which the water was admitted to the canal was by an 18-inch conduit, and there was always a supply of water in the stream, besides what came from the area proposed to be taken, sufficient to fill the conduit. The water from the reservoir might be available in times of drought. To a certain extent the length of the canal served as a storage reservoir, but only to a limited extent, because when the water rose a few inches it overflowed into the locks. Taking 6 inches as a fair average of storage over the 17 miles' reach of the canal, there would be a capacity of 15 million gallons; but there was this further fact, that the canal did not serve as a reservoir in times of wet weather, when the water ran to waste. Besides this there were other numerous feeders to the canal within the 17 miles.

By Mr. CLERK: He knew of many cases where manufactures were carried on with an allowance of one-third of the available rainfall as compensation, but he could not say at the moment that he knew of any instance where the one-third was as small as 4½ inches, as in the present case. He did not know that the present amount of water drawn from the springs by the millowners in the driest weather was a larger quantity than 4½ inches; to the best of his belief the amount could not be larger. He did not know whether the millowners would have a legal title to the overflow water from the supply reservoir, but he had not the slightest doubt but that they would enjoy this water. If, at a subsequent period, the Corporation should come before Parliament and ask for powers to construct works to intercept these overflow waters, he thought the mill-owners would have *locus standi* for opposing the scheme.

Re-examined by Mr. RICHARDS: In the case of all the Bradford Water-Works Acts, with the sole exception of the Silsden reservoir, compensation had been provided in the manner proposed by the present Bill.

Mr. J. Smith, a Surveyor, of Bradford, described the situations and extent of the various mills on the Morton Beck. He said he had had experience in arrangements for compensation, having been on the Committee of Millowners on the River Worth, who opposed the Bradford Bill of 1869 and the Keighley Bill subsequently. By these Bills compensation by area was given, and the millowners speedily found that the arrangement was a beneficial one to themselves. If the compensation now proposed was equal to the compensation given to the millowners on the Worth, it would be a great boon to the millowners.

Mr. Binnie, recalled, said, in reply to Mr. RICHARDS, that by the Act of 1869 the compensation awarded to the Worth millowners was just the same as was now proposed. The area appropriated for supply was 1800 acres, and that for compensation was 1020 acres. The proportion was about the same as in the present case.

Cross-examined by Mr. CLERK: There was a considerable difference as to the size of the compensation reservoirs, but the result was not to give them any greater proportion of the rainfall. They would have more water, no doubt, but the available rainfall in the Worth Valley was 25 inches, against 14 in the Morton district. The storage capacity in the Worth Valley was equal to 150 days' supply, while in the case of Morton the Corporation proposed to allow 160 days' supply.

This concluded the evidence in favour of the water-works portion of the Bill.

THURSDAY, MARCH 10.

Mr. CLERK opened the case on behalf of the millowners on the Morton Beck. He said he thought he should show distinctly that the Bill ought not to be proceeded with. There were two large reservoirs, the Barden and the Cringles, which would before long come into work, and which would afford a capacity of 900 million gallons. Then the Corporation had still powers to construct the Brunthwaite reservoir, and it should be borne in mind that the present Bill did not contain any power to abandon this scheme.

The CHAIRMAN: I understand that the time for the purchase of the land expires in June next.

Mr. RICHARDS said that this was so.

Mr. CLERK said there was still time for the Corporation, if they chose, to give notice for the purchase of the land; and he had no doubt, if the water clauses of the Bill were defeated, the Corporation would, without delay, give all the requisite notices. The Corporation would then have power to make three reservoirs with a total capacity of 1300 million gallons. Mr. Binnie had certainly said that he could not approve of the construction of the Brunthwaite reservoir, because it would cost too much. But the estimate for this reservoir was £100,000, and if they adhered to the plan

of construction laid down in the Bill, the work could be effected for such an amount; while by the present Bill they actually asked for £100,000 for the construction of a small reservoir to hold 5½ million gallons. Then there was the extraordinary statement made by Mr. Binnie that the two reservoirs in course of construction, and which would hold 900 million gallons, were only calculated to yield a million gallons a day. If this was the case, what could be drawn from the reservoir now proposed would be merely a few hundred thousand gallons daily. Under these circumstances, he could only look round for some other reason for the action of the Corporation in coming into the Morton district. It was not because there was a deficiency of water, because there was none; it was simply because it was found that the Bingley Improvement Commissioners were thinking of taking the water of the Morton Beck for themselves, and had actually commenced negotiations for the purchase of some of the property. The Corporation then decided to take the water for themselves, in order that they might have power to appropriate the water from every part of their district, with a view to future wants or requirements, and to prevent any one else from coming into their neighbourhood. The water was of vital importance to his (Mr. Clerk's) clients—the millowners on the stream; and he was prepared to show that the amount of water, as measured by the rainfall, had been largely underestimated by the promoters of the Bill. He found that at places, to the south-west and to the north-east of the particular portion of land scheduled, there was a rainfall of 46 and 47, and 39 and 40 inches. He could not understand how the Corporation selected this particular plot of ground, and said that the rainfall was only 33 inches, whereas the whole of the circumstances pointed to the probability of its being higher instead of lower than in the districts around. But the peculiar value of the water supply of the district lay in the numerous and copious springs it contained. He should show that after a long period of drought one spring alone—the Sweet Well spring—yielded a far larger amount of water than the whole of the compensation water with which the Corporation offered to supply the millowners. He therefore contended that he had proved his case that there was no necessity for the Corporation to come into the district, and that by so coming they would inflict a great injury upon his clients.

Mr. J. W. Merrall and Mr. J. W. Wright, millowners on the Morton Beck, were called to bear out the opening speech of their Counsel, as to the injury that would be inflicted on them and their neighbours if the works proposed by the Bill were carried out.

Mr. D. Ambler, caretaker of the Sunnysdale reservoir, gave the results of daily gauges of the water of the Sunnysdale spring and the other streams since June, 1879.

Mr. J. Paskin, examined by Mr. O'HARA, said that he had advised the millowners with reference to the proposed Bill; and had considered the effect of the works upon the millowners. The drainage area of the beck was only small, and therefore any interference with it would be felt more keenly by the mills upon the stream than if the area were larger and more remote from the stream itself. Another peculiarity of the case was that the water of the stream had been utilized almost to the utmost by the series of small reservoirs that had been constructed in connection with the several mills, the whole of which would give a storage capacity of about 24 million gallons. In his opinion the millowners ought to have water compensation equal to 150-horse power if the streams were impounded, and the allowance of 4½ inches of the rainfall would not give nearly this amount. He considered that the district was not at all one that ought to be come to for water-works purposes, especially for such a large town as Bradford. The usual course of giving compensation was to accord to the millowners one-third of the available rainfall when it was over 27 inches, but when it was below this quantity one-third was found to be insufficient. In the present case he believed that 9 inches was the least that would be sufficient for the mills; in the Halifax district they gave the millowners 10 or 11 inches. He maintained that the amount of compensation ought to be about doubled.

This was the case for the millowners.

Mr. BIDDER said he should now call evidence in support of the case of the Leeds and Liverpool Canal Company.

Mr. John Lee, examined by Mr. BIDDER, said he was Traffic Manager of the Leeds and Liverpool Canal. The canal extended from Liverpool to Leeds, a length of 128 miles, with 14 miles additional of branches. At Leeds it joined the Aire and Calder Navigation Company's canal, and the two formed a direct water communication between the Mersey and the Humber. The summit level of the canal was at Colne, where the Company had a number of reservoirs. The canal at Bingley was a long level reach, 17 miles in length. From there to Leeds there was a large local traffic. There was a fall of five locks and another of two locks to let the canal down towards Leeds. There was no ground for the assertion that the trade of the canal was declining; on the contrary, it was thriving and growing. In 1878, 1,960,099 tons of goods passed over the canal; in 1879, 1,983,532 tons; and in 1880, 2,215,686 tons. In 1879 the traffic was a good deal impeded by frost. Some of the traffic was largely dependent upon the water of the Morton Beck. In the whole of the 17 miles of level reach there was only one other feeder at all equal to the Morton Beck, and they had only a very few other streams about the place.

Mr. Charles White, examined by Mr. BIDDER, said he was Engineer-in-Chief of the Leeds and Liverpool Canal, and was well acquainted with the canal and with the sources of the water supply. The water of the Morton Beck was an important source; there was one other of about equal importance, but all the others were exceedingly small. He considered that any abstraction of water from the Morton Beck supply would be a serious restriction upon the working of the canal, especially in dry weather.

Mr. Charles Gott, examined by Mr. BIDDER, said he was now a Civil Engineer practising at Bradford, and was formerly Borough Surveyor and Water-Works Manager. He was proceeding to give a history of the several schemes of the Bradford Water-Works, when

Sir E. BECKETT interposed, and said that the witness was giving evidence of facts which had come to his knowledge when he was in the service of the Corporation, and he thought it was time for him and his friends to object to such a course. What would be thought of a solicitor who, having obtained information of a confidential character in the service of his client, afterwards sold that knowledge to another? Of course there could be no objection to the witness giving purely independent evidence, apart from what he had acquired while in the service of the Corporation; but he was now giving evidence of matters the knowledge of which he had obtained while he was in the confidential employ of the Corporation.

Mr. BIDDER said that his learned friend was confusing the position of the witness with that of a solicitor who had obtained, confidentially, information from his client, and proposed to use it against his client, and in favour of some one else. But this was not the witness's position at all. The whole of the facts to which he was speaking were contained in the archives of the House of Commons and in Acts of Parliament, and were open to any one who chose to obtain them. It was quite true that Mr. Gott had a special acquaintance with these facts, and he agreed with his learned friend that if Mr. Gott were to give evidence in such a way as to betray the confidence of the Corporation, obtained while he was in their

service, he would be justified in raising the objection; but Mr. Gott did not propose to do anything of the kind.

The CHAIRMAN: I do not think you can say that because a person was once in the service of the Corporation he is disqualified from stating facts that came to his knowledge while in such service. It is not a case of his having confidentially advised the Corporation, and now betrayed their confidence. You can stop him when he comes to any confidential evidence; at present he is merely historical.

Sir E. BECKETT: We cannot say that any particular question is objectionable, but it is part of the scheme of evidence—that is apparent.

The CHAIRMAN: You can stop him, and object when he comes to any question that you think ought not to be answered.

Sir E. BECKETT: I do not think we can divide the questions. Any one can see why Mr. Gott is here. He is here because he is no longer our servant. It is not an accident; it is manifest he is here because he has ceased to be our servant—because we have had a quarrel, in fact; and it is for this reason that he is open to the other side to employ him. Whenever the Corporation have a case, Mr. Gott is sure to be against them.

The CHAIRMAN said the Committee thought the examination might go on.

Witness wished to state that there was no foundation whatever for the statement that he had had a quarrel with the Corporation. He had not left the service of the Corporation on account of any quarrel at all.

Examination continued: By the 1875 scheme, which authorized the construction of the Barden, the Cringles, and the Brunthwaite reservoirs, he estimated that an additional daily supply of 4 million gallons would be afforded to the town, and since then the Barden reservoir had been increased in size. He believed the Brunthwaite reservoir might still be completed at the cost of the original estimate—£100,000. He had never heard a word, before entering the committee-room, of the intention of the Corporation to abandon the Brunthwaite reservoir. So far as he knew, there was no resolution of the Town Council authorizing such abandonment.

FRIDAY, MARCH 11.

Mr. Gott, recalled and further examined, said that after carefully going over the area proposed to be taken, he had come to the conclusion that the springs within the area, and especially the Sweet Well spring, were largely fed by water from beyond the area. He was a member of the Corporation Water-Works Committee, and had never heard of any resolution authorizing the abandonment of the Brunthwaite reservoir.

By the COMMITTEE: He attended a great many meetings of the Committee, and, although it was possible, it was not very likely that such a resolution could have passed the Committee and the Council without his being aware of it.

Mr. BIDDER asked that the minutes of the proceedings of the Water Committee or of the Town Council should be produced.

Mr. LITTLER said they did not bring up all their minute-books from Bradford; but the Town Clerk would be put into the witness-box, and depose to the facts, when the proper time came.

[The witness was not cross-examined.]

Mr. Thomas Fenwick, examined by Mr. BIDDER, said he knew the area of the Bradford Water-Works well. He had examined the scheme now proposed by the Corporation, and the mode in which they asked to deal with the water supply of the district, as well as the mode in which the water of the area was used for the purposes of the canal. The Morton Beck was the most important feeder; in fact, the only important feeder to the canal, with the exception of one at Gargrave, for the whole of the distance of the 17 miles of pool. The springs proposed to be taken by the Bill were the chief feeders of the Morton Beck. He had had the flow of the springs gauged, and he found that from the 242 acres on the eastern side of the area, the flow of water was 839,000 gallons in the 24 hours, and from the 428 acres on the western side the daily flow was only 52,812 gallons. This showed to him that the flow of the Sweet Well was the outcome of an underground store of water that was derived from an area far beyond the one dealt with by the Bill. It also showed to him how fallacious it was to afford compensation by giving one-third of the area instead of one-third of the water, because in this instance it was quite possible to take one-third of the area and 15-16ths of the flow of water. Thus on the eastern side the flow was equal to 40 gallons per second per 1000 acres, against 1½ gallons per second per 1000 acres on the western side. As to the value of the beck to the Canal Company, he could say that at present the canal received a great deal more than one-third of the flow of the stream. For about ten months of the year the canal received practically the whole of the flow, and during the other two months it took the water at the rate of 8 million gallons a day. In fact, it was only during storm periods that the whole of the water did not reach the canal. The amount of compensation offered was altogether inadequate, and the result would be that the Canal Company would be deprived of a valuable supply of water that they were receiving at present, and their interests would, therefore, be seriously compromised. He was acquainted with the several works that the Corporation were authorized to construct, and he believed that when these were completed they would afford a supply of about 7 million gallons daily to the town. He considered that the works now proposed would be very costly as compared with the amount of water that would be secured.

Cross-examined by Sir E. BECKETT: He certainly thought that the Corporation might with advantage go on with the Brunthwaite reservoir, but he would make it less. He thought it would require serious consideration before the Corporation abandoned the Brunthwaite reservoir; but, assuming it was to be abandoned, there was no necessity for the present scheme.

Mr. BIDDER intimated that this was the whole of the evidence he proposed to offer, and asked whether the Town Clerk was to be called to speak as to the resolution for the abandonment of the Brunthwaite scheme.

Sir E. BECKETT: I do not suppose there is any such resolution.

The CHAIRMAN said the Committee would like to have the matter cleared up, because at present, if the Bill were passed, there was nothing to prevent the Corporation still carrying out the Brunthwaite scheme.

Sir E. BECKETT: Oh, yes, there is; we have not purchased any land, and the time for such purchase expires in June. But I am content to leave the matter where it is, and Mr. Bidder may make such remarks on it as he thinks fit.

Mr. BIDDER then addressed the Committee on behalf of the Leeds and Liverpool Canal Company. He contended that by their Act they were placed in a stronger position with regard to their right to the flow of the stream than even an ordinary riparian owner; and, in support of his contention, quoted a case decided by the House of Lords on a similar point. As to the facts of the case, he urged that the Morton Beck was not, as had been stated, one of many feeders to the canal in this district, but was really one of two, and it was upon the Morton Beck that the Canal Company depended for the satisfactory working of the local traffic of the canal. Even with the help of the beck, in times of drought the canal was often drawn down to the extent of a foot, which showed that they were at the limit of their resources in the matter of water supply.

Supposing the case of the Corporation was proved in every other respect, he maintained that the amount of compensation offered by the Corporation was utterly inadequate to meet the rights of the Canal Company over the water of the stream. The Corporation, in fact, offered compensation which was compensation only in name. Instead of giving one-third of the water, they offered a third of the area, but the third they offered contained a mere fraction of the water. The proposal to give compensation was thus a most fallacious one. It would therefore require a very strong justification for a case which proposed to deal so arbitrarily with a long-established interest. But what did they find? So far from being a strong case, he held that there was no justification whatever for the scheme. It was not brought forward because the Corporation were wanting water; it had been proved that they had already 40 gallons per day per head of the population, and had also enormous unexercised powers. It was, in fact, simply from a determination to check the Bingley people in their desire to take the Morton water that the Corporation had first proposed the scheme. He regarded it as an insult to the common sense of the Committee for the Corporation to come forward and pretend that, with these enormous unexercised powers—which when carried out would provide storage to the extent of 1500 million gallons—it was necessary for them to interfere with the Morton district for the sake of getting a paltry 5½ million gallons.

Sir E. BECKETT, in reply, admitted at once that it was the proposal of the Bingley Commissioners to come to the Morton district that precipitated the intention of the Corporation to appropriate the district themselves. It was well known that it was the worst possible policy for one Corporation to allow another authority to come into their district and appropriate a supply of water that naturally belonged to the first. He (Sir E. Beckett) had had many instances in which authorities had suffered from allowing this to be done, and it was perfectly right that the Water Engineer and the Town Clerk should advise the Corporation to promote a Bill for acquiring possession of this district before some other authority should step in and take it. He did not pretend that the Bradford Corporation were actually in want of water at the present time, but it was the duty of the Corporation to look ahead. They knew that the town and district were fast increasing, and that at some future time they would want the water of this district. He therefore held that the Corporation were justified in doing at once, when opportunity was favourable, a thing that would have to be done sooner or later. As to the abandonment of the Brunthwaite scheme, he at once admitted that there was no resolution abandoning the scheme. No resolution was necessary, and there would probably never be one, but the abandonment was nevertheless a fact. The reason of it was simply that the Corporation had found out that Mr. Gott, in devising the Brunthwaite reservoir, had made a tremendous mistake. They had had one taste of Mr. Gott's successes in the case of the Barden reservoir. The embankment in the Barden case was the highest in the kingdom, and it had entailed a vast cost for construction; but even this embankment was not so high as the one proposed for the Brunthwaite reservoir, and the Corporation were advised by their Engineer that it would be unwise to go on with the scheme. Coming to the substantial part of the case, he asked whether it was true that the Bill proposed to do any harm to the Canal Company. He held that it did not, but that, on the contrary, it would do them a great deal of good. As to the necessity of a further supply of water to Bradford, he (Sir E. Beckett) pointed out that, by the Act of 1875, Parliament had declared it expedient that the Corporation should construct certain reservoirs and works. Well, the Corporation had now abandoned the Brunthwaite reservoir, which was calculated to contain 400 million gallons.

The CHAIRMAN: But you have not put this in the preamble of your Bill.

Sir E. BECKETT: We have not, it is true, but if you think it necessary we shall have the greatest pleasure in putting it in; there will be no difficulty in doing so.

In reply to the CHAIRMAN,

Mr. O'HARA said that the owners of the Sunnyside Mill were not satisfied with the proposal that had been made by the Corporation for the purchase of the property.

The room was then cleared for the Committee to consider their decision with regard to the water-works clauses of the Bill; and on the parties being re-admitted,

The CHAIRMAN said that the promoters of the Bill having, through their Counsel, stated that in the preamble of the Bill they were willing to say that they proposed to abandon the Brunthwaite reservoir, the Committee considered that the preamble of the Bill, so far as it related to the water-works clauses, was proved.

Sir E. BECKETT asked that the Committee should state that it was at their desire that the preamble was altered.

The CHAIRMAN: Certainly.

Mr. O'HARA thought it was contrary to the Standing Orders that this should be done without due notice. Such a freecit in the preamble, to be of any effect or value, would have to be followed by a positive enactment in the body of the Bill, and he doubted whether this would be sanctioned by the Examiner of Standing Orders in the other House.

Mr. PEMBROKE STEPHENS supported this view of the matter, and stated that by sanctioning the abandonment of the Brunthwaite reservoir the Committee would be sacrificing the interests of third parties who were not now before Parliament.

Sir E. BECKETT contended that there was no difficulty at all of the kind suggested. The 1875 Act did not lay obligations on anybody, and created no rights whatever beyond those of the Corporation; and, under these circumstances, by the Standing Orders of the House of Lords, the alteration in the preamble could be made without difficulty. At all events, he was prepared to take the whole of the responsibility if the Committee wished him to do so. But if they thought there would be any difficulty, perhaps the Committee would be satisfied if he gave a pledge that the Brunthwaite reservoir should be abandoned.

After some further discussion, the room was again cleared for the consideration of the point. On the doors being opened,

The CHAIRMAN said the Committee had considered the points that had been submitted to them, and had come to the conclusion that the preamble was proved, subject to the insertion of words to the following effect:—"That whereas the Corporation of Bradford do not propose to execute the powers conferred upon them by the Act of 1875, so far as the construction of the works of the Brunthwaite reservoir are concerned."

Sir E. BECKETT said he was prepared to take the whole responsibility.

Mr. CLERK, on behalf of the millowners, said they would submit clauses for the consideration of the Committee.

[The further proceedings on the Bill were then adjourned to the following Monday, when the borough extension and gas supply proposals were brought forward.]

(To be continued.)

Legal Intelligence.

COURT OF GENERAL ASSESSMENT SESSIONS.

WESTMINSTER.—FRIDAY, MARCH 25.

(Before Mr. P. H. EDLIN, Q.C., Assistant-Judge, and a Bench of Justices.)

SOUTH METROPOLITAN GAS COMPANY v. ASSESSMENT COMMITTEE OF BERMONDSEY.

This case again came before the Court, constituted to hear appeals under the Valuation (Metropolis) Act, 1869.

Mr. WEBSTER, Q.C., and Mr. GREEN, as before, appeared for the appellants; Mr. POLAND and Mr. WILLIAMS for the respondents.

Mr. GREEN stated that the printed copies of the accounts for 1880 and the information required by the respondents had been furnished. The Court would, he said, remember that Mr. Webster, in opening the case for the appellants, explained that the accounts for 1879 had been taken as a basis for the valuations made on behalf of the appellants; but a suggestion was made that the accounts for 1880 should have been taken instead.

The CHAIRMAN said as the present valuation was to be for the ensuing five years, and the accounts for 1880 disclosed a very different state of things as compared with those for 1879, the request was that Mr. Ryde should amend his figures in accordance with the 1880 accounts.

Mr. GREEN: And the suggestion of your Lordship and the Court has been carried out.

Mr. Ryde was then recalled and examined with reference to the amended figures, a printed copy of which was furnished to the Court. There was, he said, an error in regard to deductions made in respect of the reduction in the price of gas supplied by the Surrey Consumers' Company—£20,000, or one-fifth, had been named as the deduction to be made from a total of £100,000; but this was wrong. It should have been £10,000. According to the sliding scale, the Company for every 1d. per 1000 feet they reduced the price of gas, could increase their dividends by an additional 5s. per cent. per annum. The sum of £509,381 represented the total receipts for the year 1880. There was no difference in regard to bad debts; and there was no dispute until the question of salaries was reached. The item for law costs was not questioned. In regard to salaries, the amount was £30,079. This sum was £2300 more than in 1879. There was an item for compensation which he presumed was for dispensing with the services of officers not required now that the Companies were amalgamated, and this item he deducted as not being likely to occur again. In law charges he had struck out another item of £2410 in reference to an agreement for the purchase of land, which he regarded as a landlord's item. He thought £3000 per annum would never pay the average law charges of a Company like this, judging by his experience of the costs of such litigation. Substantially there was very little difference in the amount put down for statutory deductions, the figures being as he estimated them—£109,339, as against £105,763. The average cost of maintenance and renewal of the whole of the London Gas Companies' works he had based on the results of the year 1880, and they had taken the average for three years. As the sale of gas was still going on increasing, the expenditure would necessarily go on increasing, and therefore he considered this basis was the most correct. With respect to meters he had not valued them, but had taken the valuation of them made by the Company's Engineers. These things brought up the tenant's capital to £375,000. It had been decided that the life of a meter should be put at 14 years. The renewal of meters was part of the working expenses. Perfect meters had to be assumed. The various calculations made out a total rateable value for the whole property of £98,350. The sum originally estimated was £99,878, so that the results were actually in favour of the Company. It was equivalent to a rent of something like 7 per cent. upon the structural value of the property. He divided the figure arrived at between the unproductive and productive portion of the property. The productive portion was £48,816, or 5 per cent. upon the structural value, leaving £49,534 as the value of the productive works. The total was £98,350. The respondents put it at £173,555, which would be equivalent to 11·7 per cent. upon the structural value of the whole, which was in excess of what the Company would be allowed to divide by their Act of Parliament as profit to the occupiers. There was a difference between the parties of £75,000. As regarded this parish (Bermondsey), they distributed £36,500 upon the unproductive works; or 3·7 per cent. upon the structural unproductive, and £137,055 upon the productive—26 per cent. on the structural value of the property. So that the hypothetical tenant would, for one portion of the works, get 26 per cent. on his money, and only 3·7 per cent. on another, the fact being that the "unproductive," so called, was quite as necessary to the carrying on of the undertaking as the "productive."

Cross-examined by Mr. WILLIAMS: If there should be a still further increase in the profits, the benefit would go in about equal proportions to the gas consumers and the Shareholders. The lower the price charged for gas, the higher the dividends that could be paid.

Mr. WILLIAMS here read passages from the report of the Directors for the past half year, and questioned the witness upon them.

Mr. Ryde said it was possible that the good dividend then paid was due to an increase in the price of coke and a decreased price for coal. According to his experience with properties of this class, depending on an increase of population, the normal increase in the receipts would be about 2½ per cent. per annum. In the half-yearly report, 4 per cent. was referred to, and this might partly be accounted for by the great rapidity with which the suburban parts of London were being covered with buildings. Residual products were important matters in determining the price to be charged for gas. He did not think it necessarily followed that a diminished price for gas would cause a large increase in the consumption, because many persons would put the difference in their pockets.

The CHAIRMAN thought the Court could not act on the assumption that a decreased price for gas would necessarily increase the receipts of the Company. The Court had to consider what a tenant would be likely to pay, taking the value of the undertaking from year to year.

At the request of the Chairman,

Mr. GREEN read the 21st section of the Company's Act of 1876. This section provides that the standard price charged for gas should be 3s. 6d. per 1000 cubic feet; and for every 1d. reduction in the price of gas the Company are to receive an increase of dividend at the rate of 5s. per cent. per annum, and *vice versa*.

Cross-examination resumed: The amalgamation would no doubt result in a saving from greater economy in working expenses. With respect to law charges, he had reckoned £2987, and the respondents £1000. He considered £3000 per annum a very moderate sum to put down for law expenses in the case of a Company like this, who might have at any moment to go to law to protect themselves. The sum of 4s. in the pound was agreed upon in respect to rates and taxes. With respect to the tenant's expenditure—the "out-of-pocket" expenses—he estimated that out of £172,122 he would have to put aside five-twelfths, whereas the respondents put the proportion at three-eighths. The stock of coal depended upon circumstances; it should not be less than one-eighth of the quantity required for the year. In respect of sundries, stores,

AN advertisement recently appeared in the JOURNAL inviting tenders for the erection of new gas-works for Bovey Tracey, Devon. At a meeting of the Directors of the Company held last week, the tender of Messrs. Willey and Co., of Exeter, was accepted for the carrying out of the work.

and implements, he had put down £80,000, and this he did from the result of his 40 years' experience, believing that it was a fair sum in the case of a Company like this. In the Liverpool case it was decided that the life of a meter ought to be put at 14 years. Every year the Company took away partly worn-out meters and replaced them by new ones. A tenant would have to provide for some £9000 per annum for the repair and renewal of meters. In the case of railways, it was assumed that every year they expended sufficient to keep the stock in efficient condition. Formerly there was an amount allowed for depreciation of rolling stock. The meters represented a capital of £184,000, which could not be taken out so long as the undertaking was a going concern, and the £8000 to £9000 was considered sufficient to keep the meters in proper condition. Some gas companies did not charge anything at all for their meters. As a matter of fact, it was not the common practice to take off 3 per cent. on the prime cost of the meters. He had heard of 18 to 20 per cent.; but his estimate in the present case was 10 per cent. The Railway Commissioners, in a case referred to them by mutual agreement, allowed 17 per cent. on tenant's capital for profit, interest, insurance, and deterioration; 10 per cent. on capital invested in stores; and 5 per cent. on floating capital. The structural value of the appellants' works in round numbers was about one million and a half, and he thought a prudent tenant would be disposed to insure at least half this property. There were two courses open to a prudent tenant, either to insure in a company or to be his own insurer. For this 7½ had been put down, and the respondents' figure was not so very different, it being 7·16. As a matter of fact, gas companies did insure; they were entitled to put away a certain sum in respect to insurance. The South Metropolitan Company were entitled to insure everything but land. He considered the Company had a property equal in value to a million pounds which they could insure.

Re-examined: As to the amount on which a prudent tenant would insure in this case he put it at £800,000. The dividend was made up from landlord and tenant's profits. The statutory deductions, which had been placed at 7½ per cent., he had based upon Mr. Field's book. He considered that 17½ per cent. on the tenant's capital, for profit, interest, &c., &c., a moderate figure. The £144,000 for meters was for the exact number in use when he made his valuation. There could be no doubt that meters were chattels.

The CHAIRMAN said that, unless there was some agreement as to figures, this case would go on for a considerable time. He had hoped that, in the time that had elapsed since the last hearing, some progress would have been made in the direction of shortening the case, but the parties were apparently as much at sea now as they were a fortnight ago.

Mr. GREEN said they had supplied all the figures they possibly could to the other side.

The Court here adjourned, it being arranged to proceed with the case after the cause set down for hearing on Monday (yesterday).

Miscellaneous News.

THE GLASGOW EXHIBITION OF LIGHTING AND HEATING APPLIANCES.

REPORT OF THE JURORS IN SECTION III.*

The following report by the Jurors in Section III. of the Exhibition of Gas Apparatus, &c., held in Glasgow last autumn—gas-meters, gas-governors, &c.—has recently been completed, after the expenditure of a very large amount of labour in conducting the necessary experiments. The Jurors in this Section were Dr. William Wallace, F.R.S.E., Gas Examiner for the City of Glasgow (Convener); Mr. Hazelton R. Robson, and Mr. D. Corse Glen, F.G.S., Engineers; and Mr. J. J. Coleman, F.C.S., F.I.C.:—

The exhibits in this section consisted chiefly of instruments for the measurement of gas and the regulation of pressure. A few articles for which a place could not conveniently be assigned in the other sections were also examined.

All the exhibits were examined by the Jurors in the Burnbank Hall, but the gas-regulators were afterwards tested at the Gas-Meter Testing Office by the Convener. After the close of the exhibition it was determined to invite various manufacturers of dry gas-meters to send to the Gas-Meter Testing Office in the city one dozen meters, including three of each of the following sizes—2-light, 3-light, 5-light, and 10-light. The firms who were thus invited to send specimens of their manufactures were—Messrs. W. and B. Cowan, Messrs. Alder and Mackay, Mr. James Keith, Messrs. George Glover and Co., and Messrs. D. Bruce Peebles and Co. The response was favourable in all cases. Sixty meters in all were received, and these were subjected by the Convener of the Committee, and his chief assistant, to an exhaustive series of tests, the results of which are detailed in a table accompanying the report. Each meter was tested for accuracy of registration with one jet of gas burned only at ½ inch, 1 inch, and 3 inches pressure, and with a sufficient number of jets open to give the full capacity of the meter at ½ inch, 1 inch, and 3 inches pressure. The quantity of gas passed by the 2-light meters varied from 6 to 24 cubic feet per hour; by the 3-light meters from 6 to 30 feet; by the 5-light meters from 6 to 60 feet; and by the 10-light meters from 6 to 180 feet. It was suggested by one of the manufacturers that the meters should be tested also with the utmost quantity of gas which could be made to pass—that is, with the outlet open; but another maker objected to this arrangement as being entirely beyond the duty the apparatus is intended to fulfil; and upon consideration it was decided not to go beyond the quantities already mentioned. One meter of each size was tested for the quantity of gas passed per hour with one jet open, and a number of jets giving full capacity at 0·5 inch pressure. In all, 360 tests were made for accuracy of registration, and 120 tests for quantity of gas passed per hour. One meter of each size was also weighed, so as to give some idea of the strength of the material used in the construction of the meters.

The Sale of Gas Act requires only one test—viz., at full capacity at 0·5 inch pressure, and a range of 5 per cent. is allowed—from 3 per cent. slow to 2 per cent. fast.

In all the tests made at ½-inch pressure the steadiness of delivery of gas from the outlet of the meter was very carefully watched and noted. Most of the meters worked somewhat unsteadily at this pressure, when only one jet of gas was burned.

When the tests were completed the whole of the Jurors met in the Gas-Meter Testing Office, and the results were fully considered. One meter by each maker was opened up, the top and front plate being removed, and the works were examined. The meter makers were invited to be present and offer explanation to the Jurors; and all attended with the exception of Mr. Keith.

* It is but justice to the correspondent who sends us this very valuable and long looked-for report, to say that last Tuesday—before knowing that our Edinburgh correspondent was calling attention to the delay in the issuing of the reports by the various Committees of Jurors of the Glasgow Exhibition—he wrote apprising us of the fact that he intended to forward it.—Ed. J. G. L.

It is scarcely within the province of the Jurors to state the opinion formed in regard to the construction of the meters, but they consider it right to refer to one or two points. As regards the description of leather used, they can see no objection to the use of either sheepskins or Persian goatskins; but upon the whole they incline to the opinion that the Persian skins, with the hair or porous side shaved off, give the greatest strength with non-porosity and flexibility. They are clearly of opinion that no unguent should be used in preparing the leathers, but pure almond oil. Mixtures with fish oil, tallow, or palm oil—which have all been employed for this purpose—necessarily became semi-solid during very cold weather, and cause a very unpleasant unsteadiness in the delivery of the gas.

In tying on the leather, some meter makers use cord and others wire. Objections have been urged to both systems. Nearly all the makers of dry meters have now adopted the wire fastening, and probably it is, all things considered, to be preferred.

In order to arrive at a conclusion of the comparative degree of excellence of the meter as regards accuracy of registration under the varied conditions under which the meters were tested, the errors—fast and slow—were added up, and the following is a summary of the results:—

2-light meters—	Peebles, 14·5; Alder and Mackay, 18·5; Keith, 28·5; Glover, 31·5; Cowan, 39·5.
3-light "	Glover, 17·5; Alder and Mackay, 18; Peebles, 20·5; Keith, 23; Cowan, 27·5.
5-light "	Glover, 14·5; Alder and Mackay, 26; Keith, 27; Cowan, 27·5; Peebles, 42.
10-light "	Alder and Mackay, 10; Glover, 13·2; Keith, 15·2; Peebles, 15·2; Cowan, 29·8.

Considerable variations were observed as to the respective numbers of fast and slow tests, and we think it right to give the respective numbers of high and low tests; the former being favourable to the consumer, and the latter to the vendor of the gas:—

	Alder and Mackay.	Glover.	Peebles.	Keith.	Cowan.
Total of fast tests.	47·2	33·0	56·2	62·3	6·9
" slow "	25·8	43·1	86·0	31·4	117·4

As regards steadiness at low pressure, while burning only one jet of gas, an arbitrary scale was devised, which served to show the comparative excellence in this respect. The numbers are these—G. Glover and Co., 37; Alder and Mackay, 44; D. B. Peebles and Co., 45; J. Keith, 48; W. and B. Cowan, 63.

The Jurors are not inclined to attach too much importance to these tests, and have reason to believe that in some cases unsteadiness of action at low pressure, and with a single jet of gas burning, results from modifications in the construction which tend to make the meter more perfect in other respects.

The following are the weights in pounds of the various sizes of meters, and the total weight of one meter of each size:—

	Cowan.	Alder and Mackay.	Keith.	Peebles.	Glover.
2-light .	8½	8½	8	8½	8
3-light .	11	10	10½	10	10
5-light .	13½	13	13	13½	12
10-light .	20	19	18½	17½	18½
	53½	51½	50	49½	48½

The only wet meter that was prominently brought before the Jurors was the Warner and Cowan meter of Messrs. W. and B. Cowan. This is a most ingeniously contrived apparatus, and gives, under variations of water-line, an accuracy of registration which has not been attained by any other wet meter; and which appears to leave nothing further to be desired. It was pointed out to the Jurors that this meter, although of unqualified excellence under ordinary circumstances, is particularly susceptible of being tampered with by dishonest consumers of gas who are sufficiently ingenious to discover the weakness of the apparatus; and they were shown how the meter could be made to register only a proportion of the gas passed, or none at all. They do not, however, consider it within their province to point out how these frauds may be carried out. All wet meters are capable of being tampered with to some extent; and even dry meters may, by a clever trick, which was shown to the Jurors, be made to register backwards in the usual forward direction. Probably in the next Sale of Gas Act that is passed, attention will be given to this matter, and makers of all classes of meters will require to exercise their ingenuity in devising means to thwart the nefarious designs of dishonest gas consumers.

The gas-regulators examined were of three kinds—First, those having a diaphragm of leather or other flexible material acting upon a ball-and-socket arrangement; to which class belonged the instruments of Peebles, Hearson, Tice, and Hingston. Secondly, those in which a glass bell floating in mercury actuated a similar device for checking the flow of gas—including the regulators of Busch and Stott. Thirdly, Cox's automatic lever gas-pressure regulator, consisting of a rectangular inverted vessel floating in glycerine, and acting upon a ball-and-socket valve.

The regulator of Hearson, belonging to the first class, did not possess any means of regulating the pressure, and could not be tested; and Tice's instruments were withdrawn from competition. All the instruments were tested by being placed upon the outlet of a meter (a 5 or 10 light, according to the size), the inlet being connected to a gasholder in which the pressure could be varied at pleasure, while the outlet of the governor was connected with a series of gas-burners. At first the instruments were arranged to show exactly 0·5 inch pressure on the outlet with one burner lighted (6 feet per hour); the pressure on the holder being 1 inch. The pressure was increased to 3 inches with the holder, and the pressure on the outlet of the governor observed. The quantity of gas passed was increased to what was considered full capacity (30 to 60 feet per hour, according to size), and the regulated pressure taken, with the initial pressure varying from 1 to 3 inches. The quantity of gas passed per hour was also observed, so that for each governor there were taken four tests for pressure and four tests for hourly consumption of gas. It is sufficient to give the variations of pressure:—

Name of Governor.	Six Feet per Hour.	Full Capacity.	Greatest Variation.	Percent. of Variation.
	1 inch.	3 inch.	1 inch.	3 inch.
Cox's (glycerine) .	·50	·50	·45	·50
Peebles's (diaphragm) .	·50	·45	·48	·45
Busch's (mercurial) .	·50	·46	·48	·42
Stott's large "	·50	·67	·40	·50
" small "	·50	·32	·35	·30
Hingston's (diaphragm) .	·50	·80	·42	·20

There is thus a great difference in the amount of precision in the regulators; the error varying from 10 per cent. in the instruments of Cox and Peebles, to no less than 60 per cent. in that of Hingston. Of the two mercurial governors exhibited, that made by Mr. John Busch, of Oldham, was decidedly superior to that of Messrs. James Stott and Co., of the same town, although each instrument possesses valuable distinctive features.

The street-lamp regulators tested were—Peebles's needle governor; Thorp and Tasker's governor (exhibited by Messrs. James Stott and Co., Oldham); Sugg's new regulator, with steatite float; and Peebles's modified regulator (a small size for ordinary house burners). These were tested

simply for the quantity of gas passed at pressures from 1 inch to 3 inches, and gave the following percentage of variation :—

Thorpe and Tasker's lamp regulator	4.4	The performance of all these instruments may be considered highly satisfactory.
Peebles's lamp regulator—first	7.6	
second	8.0	
Sugg's "steatite" lamp regulator	9.4	
Peebles's small burner regulator	12.8	

It is only necessary to give now a detailed statement of the various exhibits, with the awards of the Jurors. The exhibits are given in the order in which they occur in the official catalogue :—

14. A. G. Henderson, Musselburgh—Compensating Gas-Meter.
50. William Grice and Co., Birmingham—Patent Self-sealing Gas Retort Mouthpiece. *Medal.*
52. Alley and Maclellan, Glasgow—Foulis's Patent Gas-Governors, with and without separate Air Vessel. *Medal.*
53. James Stott and Co., Oldham—Mercurial Gas Governors or Regulators. *Honourable Mention.*
Thorpe and Tasker's Street-Lamp Regulators. *Medal.*
Thorpe and Tasker's Air-rheometer. (An exceedingly ingenious instrument for testing the consumption of gas-burners, and which was found to give very correct indications.) *Honourable Mention.*
54. John Busch, Oldham—Mercurial Gas-Regulators. *Medal.*
55. William Tice, Southport—Improved Dry Gas-Regulators. (These were entered for adjudication, but were afterwards withdrawn.)
57. Alder and Mackay, Grange Works, Edinburgh—Dry Gas-Meter in tin-plate and cast-iron case. *Medal.*
58. John Foxall, Newport, Monmouth—Patent Illumination Power Dry Gas-Meter.
60. George Glover and Co., Royal Avenue, Chelsea, London—Dry Gas-Meters. *Medal.*
63. Carnaby and Co., 13, Broad Street, Bloomsbury, London—Patent Safety Gas Apparatus. (An ingenious arrangement for operating on the gas supply cock from any part of a house.) *Honourable Mention.*
73. William Sugg, Westminster—Lamp Regulator, with Steatite Disc. *Medal.*
76. Joshua Heap and Co., per D. M. Nelson, 48, Gordon Street, Glasgow—Pipe-Screwing Machine. *Honourable Mention.*
80. W. and B. Cowan, Buccleuch Street Works, Edinburgh—Warner and Cowan's Patent Meter. *Medal.*
Dry Gas-Meter, 10-foot holder, pressure-gauge, gas-fittings, &c. (Messrs. Cowan received the highest award for the Warner and Cowan meter, dry meter, and 10-foot holder, but preferred to have the award for the Warner and Cowan meter only.)
81. W. J. Hingston, Cork and Glasgow—Gas-Regulators.
96. James Keith, 4, Charlotte Street, Edinburgh—Dry Gas-Meters. *Medal.*
100. J. C. Stark and Co., Torquay—Cox's Patent Automatic Lever Gas-Regulators. *Medal.* McCormack's Patent Screwing Gear and Patent Wrench. *Honourable Mention.*
106. John Finlay and Co., Rumford Works, Glasgow—Hearson's Patent Gas-Governor.
163. John L. Smallman, 23, Temple Lane, Dublin—Buckley and Leech's Patent Hinged Stocks and Dies, Tube Cutter and Shaver combined, and Adjustable Taper Die Stock. *Honourable Mention.*

IMPROVED STREET LIGHTING AT WESTMINSTER.

At the meeting of the Chartered Gas Company on the 11th ult., it was stated by the Governor (the Hon. R. Howe Brown) that permission had been obtained of the Vestries, and other bodies concerned, to make an experiment in improved street lighting by means of gas, for the whole length of Parliament Street, Whitehall, and Charing Cross to Trafalgar Square; and that the matter would be immediately proceeded with. In accordance with this announcement, and with the least possible delay, considering the extent of the change contemplated and the number of the persons to be consulted in reference to the matter, the Chief Inspector of the Company (Mr. T. C. Hersey) arranged with Mr. Sugg for the carrying out of the work; and after various slight modifications, the experiment was successfully put into operation last week.

As the existing lamp-posts were sufficiently near together, they were throughout utilized, and no changes were made in their positions; two additional posts only being placed on refuges almost opposite Downing Street, in order to light the wide stretch of roadway at this part. A special form of shadowless lantern—the "Whitehall"—was designed by Mr. Sugg; and the burners used therein are groups of three, four, and five flat-flame governors.

As to the position of the different sized lights, as at present arranged there are 63 lamps with 60-candle burners fixed on the posts along the edges of the roadway from the Great George Street end of Parliament Street, through Whitehall, to Charing Cross. Here round the statue of Charles I. are 4 lamps with 100-candle burners each; while to complete the display there are, at intervals, on the refuges in the centre of the carriage-way, 11 lamps with 160-candle burners in each. The estimated consumption of gas will be 20, 30, and 50 feet per hour respectively, costing for the whole illumination of 6160 candles, by the consumption of 1920 feet of gas, 6s. 8d. per hour. It is intended, however, in order to economize, that the major part of the small-size burners—55 out of the 63—shall be extinguished at midnight; leaving the lighting to be performed by the whole of the larger lights assisted by 8 only of the small ones. This, it is stated, will reduce the cost, after twelve o'clock at night, to 2s. 1d. per hour; the lighting power then being equal to 2460 candles by the use of 710 feet of gas. It may be mentioned, for the sake of comparison, that formerly the 76 lamps then in use consumed 348 feet of gas per hour, at a cost of 1s. 0.2d., and gave, it may be assumed, something like 700 candles of illuminating power. The relative annual cost will be seen from the following figures :—

	New System.	Old System.
Before midnight	£713 6 8	£108 15 8
After midnight	222 19 2	108 15 8
Total for 4280 hours in the year	£936 5 10	£217 11 4

In connection with this experiment we learn that Mr. Sugg, on his own account, is proposing to light up Trafalgar Square, and the immediate neighbourhood, with similar sized lanterns and burners. It is intended to employ 40 of the 60-candle burners—9 only being retained alight after twelve o'clock each night—and 8 of the large 160-candle burners. The preliminaries only in regard to this proposal have so far been arranged, no step having been taken to carry out the work.

Mr. S. RUTTER, of Brampton, Cumberland, who has recently accepted a position in connection with the Uxbridge Gas-Works, was entertained on Saturday, the 19th inst., to a tea, by the members of the Brampton Debating Society, on which occasion a hearty vote of thanks was passed to him for his services to the Society.

TYNEMOUTH GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at North Shields last Thursday—Mr. W. H. ATKINSON in the chair.

The CHAIRMAN, in moving its adoption, said that one of the most satisfactory features of the report was that the Directors could declare the full statutory dividend, as by Act of Parliament, of 10 per cent. on the original shares, and 7 per cent. on the new shares; also that they could carry £1000 over to the reserve-fund, and further to reduce the price of gas 3d. per 1000 feet. From 1875 there had been a gradual reduction in price in the borough. In 1875 the charge was 4s. per 1000 feet; whereas it would be reduced, at the close of the meeting, to 2s. 9d. per 1000 feet.

Mr. G. WILLIAMSON seconded the motion, which was carried unanimously.

Dividends at the rate of 10 per cent. on the original capital, and 7 per cent. on the new capital, were declared; and £1000 was ordered to be carried to the reserve fund. A resolution was also come to that a reduction in the price of gas of 3d. per 1000 feet be made from the April quarter.

The CHAIRMAN, speaking of the quality of the gas, said it was satisfactory to know that it had never been below the standard of 14 candles, and that the average had been 15.12 candles. Besides, the Company were allowed 20 grains of sulphur, and the average had been 13 grains per 100 feet.

Messrs. J. Moffatt and Thos. Crow were re-elected Directors, and Mr. J. Richardson was elected one of the Auditors.

Mr. W. H. Atkinson, who had retired from the secretaryship after long years of service, and had been elected Chairman of the Company, was then, on behalf of the Shareholders, presented with an ornamental service of solid silver plate, in appreciation of his past valuable services as Secretary to the Company since its formation in 1843; while Mr. G. Williamson, who has been a Shareholder for 23 years, 13 of which he was Chairman of the Company, was presented with a dinner, dessert, and afternoon tea service, as well as a cake basket and salver in solid silver.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held at the London Offices, Lothbury, on the 22nd inst.—Professor ERASMUS WILSON, F.R.S., in the chair.

The SECRETARY (Mr. Roderick Mackay) read the notice convening the meeting, and the following report and accounts were presented.

The receipts on revenue account for the past year amount to £19,623 2s., and the expenditure to £952 15s. 7d., leaving a clear net revenue for the year of £10,370 6s. 5d. The amount available for dividend, including the balance brought forward from the previous year, as shown on the balance-sheet, is £12,034 18s. 3d., out of which an interim dividend at the rate of 5 per cent. per annum was paid for the half year ending June 30, 1880, £3641.

The Directors recommend a dividend at the rate of 8 per cent. per annum for the half year ending Dec. 31, 1880, amounting to £5844 16s., making a dividend for the year of 6½ per cent., leaving a balance of £2549 2s. 3d.

The water receipts for the year show an increase of £70 over those of the previous year. The gas receipts, from public and private lights, &c., for the year, show an increase of £464. The loss from gas leakage has averaged 5 per cent. of the make over the whole year.

After reducing the expenditure on capital account by the £1000 in each of the previous two years, the amount now stands at £151,517 14s. 6d., and the Directors recommend that the sum of £1000 be now carried from the revenue balance in further reduction of the capital expenditure account.

To anticipate the growing demands of the city, the filter-bed accommodation at the Company's water-works is being considerably extended.

Towards the end of the past year a marked improvement took place in the rates of exchange on Italian currency, and if this is maintained it will benefit the Company's revenue account in the future.

The Directors retiring by rotation are Mr. John James Barrow and Mr. John Aird who, being eligible, offer themselves for re-election.

Dr.	Revenue Account, for the Year ending Dec. 31, 1880.				Cr.
Maintenance of water-works	£403	5	2	Water—	
Expenditure at reservoir	277	9	4	The Italian Government, Province and Municipality of Cagliari	*£9,600 0 0
Gas manufacture—				* By the 11th Article of the Concession, the fixed annual payment for the water supply in Cagliari is :—For the first 30 years, from 1867 to 1897, £9600; second 30 years, from 1897 to 1927, £7600; third 30 years, from 1927 to 1957, £5600.	
Wages	705	0	5	From sundry consumers, viz. —	
Coals	2,191	13	6	For extra supply in Cagliari.	1,781 17 7
Stores	292	12	7	For supply beyond Cagliari.	1,138 1 4
General charges in Cagliari—				For supply to shipping	160 2 1
Salaries	1,183	7	6	Gas—	
Office rent, stationery, &c.	196	6	11	Public lamps	2,045 4 2
Rates and taxes in Cagliari	1,122	0	5	Private lights	2,928 9 7
General charges in London—				Products	1,478 11 4
Directors' and Auditors' fees	281	10	0	Transfer fees	5 12 6
Salaries and office rent	250	0	0	Sundry work and sales of material	485 3 5
Stationery, stamps, &c.	34	12	2		
Premium on insurance of the works	30	0	0		
Exchange on remittances	1,586	4	4		
Interest and discounts	448	13	3		
Sinking fund	150	0	0		
Reserve fund	100	0	0		
Total expenditure	£9,252	15	7		
Balance	10,370	6	5		
	£19,623	2	0		£19,623 2 0

The CHAIRMAN, in moving the adoption of the report, remarked that the Company's progress was satisfactory. It was not a Company in which any great expansion was to be expected, but on looking at the report the Shareholders would perceive that there was a favourable balance. On reference to the water receipts it would be seen that there had been an increase of £70 over the previous year, while with regard to gas there was an increase of £464 in the public and private lights. This was progress in the right direction, although it was not of a very elastic character. Their excellent Manager had succeeded in reducing the leakage to the very small average of 5 per cent. during the year. At one time it would be remembered that much vexation was felt at the large amount of leakage, and it was found that one of the mains had given way in a position difficult of access, and that the ruins of an ancient castle had become the reservoir, so to speak, of the gas. It was a long time before it was discovered how this escape had taken place, and where the gas had gone to. With regard to water, it had now become necessary to increase the filter-bed accommodation. The Company were admirably situated in reference to the collection of water. The water was collected in a shallow basin at the top of some high mountains, and all that need be done was by mechanical agency to bring it down to the valley. From the source of the water itself, however, it was occasionally subject to aberration—sometimes there might be heavy rains, at other times long-continued droughts; and under these circumstances it might occasionally happen that their works would be swallowed up in a deluge of the water, and probably in this way the Company be put to great inconvenience. Such an event had occurred, and it was for the purpose of preventing danger in this direction, and also for securing to the consumers a regular and pure supply of water, that the Directors had been obliged to build filter-beds, which was a matter of some considerable cost. As to the improved rate of exchange in the Italian currency, the benefit of it was felt at the present time as compared with the Company's past history. The Directors had not been unmindful of what had always been considered the proper course to be taken with regard to the Company's financial means, and this was to

maintain and secure the capital at the amount which it was originally intended should represent the capital of the Company. They had been obliged from time to time to obtain loans, which had increased the capital above the authorized £150,000; but when more successful days came, they were able, year after year, to make additions to their reserve fund to meet this contingency; and on the present occasion the Directors had been enabled to apply £1000 in reduction of the £161,517, at which the capital expenditure stood in the balance-sheet, leaving only £517 to be provided in the future. The Company's position was therefore perfectly satisfactory. It was not brilliant, but it was, perhaps, better—it was safe; and everything seemed to promise that the undertaking would be successful, although the Company might not perhaps be so rich as many other companies. From the beginning they had had the good fortune to have the services of an excellent Manager, who had carried on their affairs in an admirable manner, and had enabled them to keep their own, and to do so in a country where there was a constitutional and inconvenient habit of going to law. Probably they owed their immunity from law to there being so few lawyers among them. They had, however, been obliged from time to time to go into law courts to protect themselves, as there was sometimes on the Continent a little feeling of jealousy towards foreigners, particularly foreigners who usually did their work so well as the English. Under these circumstances, the Shareholders would see the importance of having the services of a gentleman who was a thorough man of business, and who understood Italian quite as well as English. He had endeavoured to give the Shareholders a slight sketch of the actual position of the Company, and he would leave the report and accounts for their approval.

Mr. JOHN AIRD seconded the motion.
Mr. R. ORMSBY asked whether the Company had the monopoly of lighting the island with gas, or could the inhabitants, if they chose, adopt the electric light.

The CHAIRMAN said the electric light must be allowed to have its own way, and it would be impossible to keep it out, if science ever brought it into a state to be practically useful. He thought it would be a great number of years before this was likely to take place. The light was useful for illuminating a large open space of ground, but there were so many objections to it that it was not at all probable that it would ever come into collision with a gas company in an Italian town, and particularly in a small one. A rich Italian town might possibly wish to make use of the electric light for large buildings and open spaces. One fault of the light was that there was too much of it, and it was found that unless the light was mitigated it was unfit for practical use. He did not apprehend any serious danger to the Company in this direction; but they probably depended more on water than on gas. It was very important in such a town as Cagliari that the water should be good, and the supply by the Company was most excellent, and was gradually being introduced into the houses. As the town increased, the consumption of water would likewise increase, and it might be required for a number of outward-bound ships, or ships navigating between the Mediterranean and the surrounding countries.

The motion was carried unanimously.

Mr. AIRD next moved the confirmation of the interim dividend, and the declaration of a dividend for the half year to December last at the rate of 8 per cent. per annum, less income-tax.

Mr. H. P. STEPHENSON, in seconding the motion, suggested to Mr. Ormsby to go and see the electric light at Charing Cross Station for an hour, when he would not be so enamoured of it. While gas companies had been paying large dividends for many years, not one electric light company had yet paid a dividend. Until, at all events, they were found to be dividing some profits with their shareholders, he thought they should not be believed in.

The resolution was adopted unanimously.

On the motion of the CHAIRMAN, seconded by Mr. J. ORWELL PHILLIPS, Messrs. J. J. Barrow and J. Aird were re-elected to their seats at the Board; and on the motion of Mr. ROBERT KING, seconded by Mr. ORMSBY, Messrs. H. Bishop and E. O. Coe were re-elected the Auditors of the Company.

A vote of thanks to the Chairman and Directors was then passed, and the proceedings terminated.

CITY OF ST. PETERSBURG NEW WATER-WORKS COMPANY, LIMITED.

The Eighth Ordinary General Meeting of this Company was held at the City Terminus Hotel, Cannon Street, E.C., on Wednesday, the 2nd inst.—Mr. W. T. WESTERN in the chair.

The SECRETARY (Mr. F. R. C. Grant) read the notice convening the meeting, and the report of the Directors was submitted. It stated that the scheme of arrangement submitted to the Bondholders and Shareholders at the several meetings held on Dec. 20 and Jan. 7, and unanimously approved by these meetings, had received the sanction of the Court of Chancery, and was now binding on all parties concerned. According to this scheme, the capital will now consist of £60,000 of "A" debentures bearing 6 per cent. interest, entitled to a first charge upon the property of the Company; £60,000 of "B" debenture stock, entitled to a charge upon the property of the Company ranking next after the "A" debentures, bearing a preferential interest at the rate of 7 per cent. per annum, such interest being cumulative, but payable only out of the net earnings of the Company after providing for the interest on the "A" debentures; and £200,000 in shares. The total amount of these is the same as was authorized in the original articles of association and prospectus of the Company.

The CHAIRMAN, when moving the adoption of the report, said it was with more than usual pleasure that he met the Shareholders, as he was able to congratulate them on having escaped those legal difficulties which at the last meeting surrounded the Company. He need not go into the history of all their troubles, which from various causes, many of them entirely beyond the control of the Directors, led the Company into great difficulties. They had now successfully overcome them, and had placed their affairs on a sound and substantial basis. During the past year the Company had made very satisfactory progress in their business. The Shareholders would have seen from the accounts that the gross increase in the receipts amounted to something like 25 per cent. over those of the previous year, being 101,000 roubles against 80,000 roubles—a result which exceeded his most sanguine expectations at the beginning of the year. On the other hand, the Directors had kept down the expenses to what he hoped would be considered a reasonable limit. The actual increase shown was only £200, but included in these expenses was the cost of some additional machinery, to the extent of between £400 and £500, so that in fact the expenses had been reduced during the year. The balance of revenue amounted nominally to £5890, but from this a reduction of nearly £1400 had to be made on account of the old story—depreciation in exchange. This was a severe tax on the Company, and one they could not avoid; but he hoped it would diminish in the future. The net earnings of the Company were consequently only £3480, against £1800 in the previous year, showing an

increase of £2180. This he hoped would be considered satisfactory, and during the current year he trusted that there would be a still further increase. The sum they had earned would be just sufficient to pay in full the interest on the new "A" debentures, and the holders of the "B" debentures would have the benefit of the whole of the increase there would be in the receipts. The Directors had not overlooked the question of reducing the expenses both at home and abroad, and they had made arrangements which he hoped would be satisfactory. With regard to the London expenses, a portion of them would be borne by other parties, and this without any detriment to the efficiency of their own service. The only outstanding liability the Company now had, which was not shown in the accounts, was the expenses incurred for legal services and printing during the formal process of the re-arrangement of the Company. It was found impossible to get these accounts into the report; but they would be produced hereafter. With regard to the administration of the Company in future, he might remind the Shareholders that during the negotiations that were made with the holders of the debentures, it was agreed that the holders of the debentures, who were now represented by the holders of the "B" debenture stock, should have the right to nominate a certain number of Directors on to the London Board. They would have this day to nominate two gentlemen to fill these posts. One of them was Mr. John Thomson, of Glasgow, who was by far the largest holder of the "B" debenture stock of the Company, and the other was Mr. Richard Seymour Guinness, of London, who was the next largest holder.

Mr. W. SANGSTER seconded the motion, and after a short discussion, in the course of which satisfaction was expressed at the improvement in the affairs of the Company, it was carried unanimously.

The CHAIRMAN then stated that the next matter on the agenda paper was to fix the number of the Directors; but their legal adviser had just pointed out to him that no special notice had been given of the matter, and that therefore it would not be competent to elect the two gentlemen named. As one of the old Directors, however, had retired, they might elect one of the two gentlemen in his place, and leave to a future meeting the election of the other.

After a short discussion, it was decided to act on the suggestion of the Chairman, and Mr. Thomson was elected in the place of Mr. Young. Lord E. S. Churchill, the retiring Director, was re-elected, and Mr. Guinness agreed to defer his election till a future meeting, to be specially called at the offices.

The Auditors, Messrs. Cooper Brothers and Co., of London, and Mr. Bernard Whishaw, of St. Petersburg, having been re-elected,

A resolution was passed voting £350 for the remuneration of the Directors in London and St. Petersburg for the current year, and special mention was made of the Directors having given up all arrears of remuneration for past services.

A vote of thanks to the Chairman and Directors terminated the proceedings.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns—furnished to him by the London Water Companies—of the average daily quantity of water supplied to the Metropolis during last month. From them it will be seen that 147,755,507 gallons, or 671,321 cubic metres of water (equal to about as many tons by measure, tons by weight), were supplied daily; or 246 gallons (111.8 decalitres), rather more than a ton by weight, to each house, and 34.6 gallons (15.7 decalitres) to each person, against 33.7 gallons during February, 1880:—

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Feb., 1880.	Feb., 1881.	Feb., 1880.	Feb., 1881.
Total supply	577,382	601,688	138,002,130	147,755,507
From Thames	275,819	289,094	69,737,858	72,110,499
„ Lea and other Sources	301,563	312,594	68,264,272	75,645,008
THAMES.				
Chelsea	29,915	30,618	8,330,960	8,636,900
West Middlesex	53,692	56,302	10,929,160	11,340,648
Southwark and Vauxhall	88,790	92,691	23,715,438	23,110,667
Grand Junction	40,285	43,169	12,164,860	12,227,784
Lambeth	63,107	66,314	14,597,500	16,794,500
LEA AND OTHER SOURCES.				
New River	129,741	132,740	26,151,000	27,799,000
East London	122,746	128,085	33,780,500	38,695,000
Kent	49,076	51,769	8,332,772	9,151,008

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for February, 1881, as compared with that for the corresponding month of 1880, shows an increase of 24,306 houses, and of 9,753,377 gallons of water supplied daily.

THE RESULT OF THE LAST GAS AGITATION IN EXETER.

Many of our readers will doubtless remember the opposition that was at first shown to the Bill promoted, in the session of 1878, by the Exeter Gaslight Company, for the purpose of obtaining further capital and other powers; and that, on a provisional agreement to purchase the undertaking being settled between the Corporation and the Company, the Bill was allowed to pass practically unopposed. The ratepayers, however, refused to sanction the Bill introduced the following session to legalize the transfer of the works; and consequently, though much expense had been incurred, it was withdrawn. The question of the payment of the costs remained in abeyance for some considerable time, but last July the Council ordered the Parliamentary Agent's bill to be settled; whereupon an action was threatened to prevent any of the money expended being charged on the funds of the Corporation. The matter, so far, has been settled adversely to the Council, as will be seen by the following report by the Town Clerk, which was read at last Wednesday's meeting:—

I beg to report to the Council that the question as to the liability for the payment of the costs incurred by Mr. Stone, in August last, in relation to his application to the Queen's Bench Division for a writ of *certiorari* to bring up and quash the order of the Council of the 28th of July last, directing payment of the costs of Mr. Norton, the Parliamentary Agent, in reference to the Exeter Corporation Gas Bill, 1879—when resolution was subsequently rescinded, no payment having been made under the order—came on for decision before the Crown Office Master on the 21st inst. In consequence of the order having been rescinded, and no payment made (to which effect an affidavit had been duly filed on the part of the Corporation), there was, of course, when the case came on, no existing order in respect of which a *certiorari* could issue, but Justice Field directed that the relator should have the costs of his application, and referred it to the Master to determine by what person these costs should be paid. Lately notice was given by the relator's Solicitors of an intended application to the Master to fix the liability for payment of the costs of the application upon the members of the Council who voted for the order. That application was not successful, and the Master made the following order:—"Costs, including costs of this reference, to be paid by the Corporation out of the borough fund or rate, to be taxed, if necessary, by the Master of the Crown Office."

BOLTON CORPORATION WATER SUPPLY.

At the Meeting of the Bolton Town Council on Wednesday, the 16th inst.—the Mayor (Mr. J. Musgrave) in the chair—the minutes of the Water Committee (among which was a resolution to the effect that in their opinion means should be taken for securing a further supply of water for the borough, and that the Council should fully consider the question before confirming the resolution) were presented.

Alderman RUSHTON, in moving the confirmation of the minutes, said he had for some time been of opinion that the period was approaching when it would be necessary to obtain a further supply of water for the borough. In arriving at this conclusion, he had taken into account the present supply, the gradual increase that was going on, and the probable length of time it would serve without any supplementary supply. Then he considered how long it would probably take the Council to get a further supply if they started immediately, and the conclusion at which he arrived was that they should set to work at once. The present supply amounted to something like 5 million gallons per day. In February of this year the Council distributed 900,000 gallons more water per day than they did in the same month of last year. The distribution had increased every year in something like the proportion in which the money receipts had increased, and this gave some idea of the probable future consumption in the borough. The total quantity of water the Council were capable of distributing was something over 7 million gallons per day. They were now distributing over 5,400,000 gallons daily, so that they might reasonably expect that in seven years hence they would be at the end of their resources. He believed if they were to commence now it would probably be seven years before they could obtain a further abundant supply from other sources, and therefore they had no time to spare. This led to the question, "Whence is a further supply to be obtained, and by what method?" [Mr. Rushton then exhibited a plan prepared by Mr. J. F. Bateman, C.E., for the use of the Committee of the House of Commons on the Liverpool Corporation Water Bill, and which showed the various water supplies throughout Lancashire.] He had carefully examined this plan, and the conclusion he had arrived at was that if the Council could get the Hordern or Longworth, or possibly the South Lancashire scheme, it would make their collecting-ground most compact, the connection with the existing reservoirs would be very easy, and the arrangements economical. If they failed to come to satisfactory terms with regard to these schemes, he did not think they could do better than go out beyond Preston into the Bleasdale and Fylde district, where there was a large collecting-ground; but this would necessitate the pipes being of very great length. He thought it desirable that the Council should negotiate with the owners of the various properties, to see if terms could be agreed upon before they determined to go to Parliament. He therefore proposed that the necessary steps should be taken with this object in view. Nothing had been done as yet with the exception of speaking to the parties, who had expressed their willingness to open negotiations, and nothing would be done without the approval of the Council. The Water Committee had fully considered the matter, and were of opinion that it was desirable that some steps should be taken, and if the Council were of the same opinion, the Committee, he thought, would agree to the appointment of a Parliamentary Committee, consisting of the Water Committee and a number of the members of the Council, to further consider the question. Nothing had been done towards the appointment of an Engineer. Mr. Bateman, who had before been Engineer for the Water Committee, and who was Engineer for the Manchester Corporation Water Committee in connection with their Thirlmere scheme, had kindly consented to give his advice and assistance in Parliament if it was thought necessary. Neither he nor anybody else, however, had been appointed Engineer, neither would any one be appointed without the consent of the Council.

Mr. HOUGH seconded the motion.

Mr. HOLDEN said the information laid before the Council by Alderman Rushton would require time for consideration, and he (Mr. Holden) should oppose the motion, in order that his course of action in the future might be perfectly clear. He should therefore move an amendment to that part of the Committee's proceedings which stated that it was desirable a fresh supply of water should be obtained. He considered the matter was premature, and thought it would be worth while for the Water Committee to finish the large undertakings they now had on hand in connection with the present supply, before going to Parliament with a fresh scheme. The Committee had evidently very suddenly made up their minds on this subject; but of course the matter would receive further attention at the hands of the Council. He would content himself now with simply moving an amendment to the effect that the proceedings of the Water Committee be approved, save and except that portion which related to action being taken at present to obtain a further supply of water.

Mr. BRIMLOW, in seconding the amendment, commented on the expense that would be incurred in carrying out the scheme suggested by Alderman Rushton, and also on the finances of the water department generally. It was, he said, stated that the present scheme, when completed, would last for the next 50 years; but it had only been at work three, and the Council were now called on to go to further expense. As to the fear of a scarcity of water, he failed to see it, considering that last month there had run to waste 447 million gallons, which, at 5½ million gallons per day, gave over 80 days' supply. He thought that before the Committee pledged themselves to go in for any new scheme, full particulars should be supplied to the Council of the previous supply of water to the borough, and also the probable requirements for the future, so that they might have proper figures and facts to work upon. He likewise suggested that Alderman Rushton should carry out what he proposed to do some years ago—viz., allow the public to be supplied with water at so much per 1000 gallons; which would result in an enormous saving. Something had been said about the progress of the town, but he himself could not look forward to anything like the increase in trade or the progress of the town in the same ratio as during the past 10 or 15 years.

Mr. BRADSHAW said in the year 1865 the average daily consumption of water in Bolton was 2,476,000 gallons. In 1877 it was 3,358,000 gallons, whilst in 1880 it was 4,400,000. These amounts were exclusive of the water supplied in bulk, which was about 400,000 gallons per day. In the 15 years from 1865 to 1880 the consumption went up from 2,476,000 gallons to 4,409,000 gallons per day, or in round numbers an increase of 2 millions in 15 years. If the same increase per day took place in the next 15 years, the Council would then be in an awkward position. Considering the length of time that works of this kind took to carry out, it was not desirable to defer the extensions until they found themselves driven into a corner. He maintained, looking at the figures as to the increase that had taken place in 15 years, and looking at the relatively small quantity of water supplied in bulk to other consumers, that it was a very serious question, and one requiring to be taken in hand without unnecessary delay. He should not object to the matter being deferred for one or two months; but it would not be wise to delay unduly, for which reason he should support the resolution of the Water Committee.

After some further discussion,

Alderman RUSHTON, in reply, said if delaying the matter for a reasonable time would contribute in any degree to its welfare, he should be glad

to acquiesce in an amendment to that effect; provided, of course, it was not used simply for the purposes of delay, and to prevent the thing being carried out. There was, he admitted, plenty of water at present, but there would not be plenty in a few years, when the Council came to extend their supply, and it would not do to remain until they were short before they commenced doing anything. It would not do to postpone this question till next September or October, or they would throw away another year. If they determined to apply for further powers that day, it would be nearly two years before they could get a spade into the ground. Under these circumstances, if there was a disposition to work cordially, he did not object to the appointment of a Special Committee, with which he would gladly co-operate.

The amendment was then put and lost by 36 votes to 16. It was thereupon agreed that a Special Committee should be appointed to consider the question of the proposed extension of the water supply, and the minutes of the proceedings of the Water Committee in other respects were confirmed.

SALES OF GAS SHARES.

Last Thursday, a sale by auction of stock—to the value (with premiums) of £10,000—in the South Shields Gas Company was held. This was part of the capital authorized by the Company's Act of 1879; and, according to the price at present being charged for gas, will entitle the holders to a dividend of 8½ per cent. this year. In all 785 lots of £10 each were sold, at an average price of £13 3s. each; the variations being merely between £13 and £13 4s. per lot.

On Wednesday, at Idle, near Leeds, £500 of original consolidated (10 per cent.) stock in the Airedale Gas Company was sold by auction, in 11 lots. Lots 1 and 11, each £25 of stock, sold for £53 6s. 3d. and £54 2s. 6d. respectively; the other lots realizing prices in the following order:—£107; £106 15s.; £107 2s. 6d.; £107 10s.; £107 10s.; £107 12s. 6d.; £108; £108 5s.; £108. Six £5 shares, £4 paid up, were afterwards sold for £58 10s. 6d.

HARWICH WATER SUPPLY.

One of the Provisional Orders applied for to the Board of Trade this session, under the provisions of the Gas and Water Works Facilities Act, 1870, is for the purpose of authorizing the maintenance and continuance of certain water-works, the construction of additional works, and the supply of water to the borough of Harwich, and the parishes of St. Nicholas, Dovercourt, and Ramsey, in the county of Essex. The draft Order sets forth that the undertaker is one Mr. P. S. Bruff, C.E., of Ipswich, who asks for authority to raise £25,000 for the above-named purposes. Opposition to the scheme being lodged with the Board of Trade by the Local Authority, Major Marindin, on the part of the Board, held an inquiry some three weeks ago, into the facts of the case, and he has since made his report on the subject.

Major Marindin recounts the circumstances under which Mr. Bruff, in 1854, entered into an agreement with the Harwich Corporation to provide, within two years, a sufficient supply of pure and wholesome fresh water for the town of Harwich, then comprising the parish of St. Nicholas only, upon the condition that the monopoly of such supply should be granted to him for a term of 75 years. The first operations, carried out at considerable cost, were not successful, but the agreement was extended in 1856 and again in 1862, for a period expiring on May 23, 1865. The report refers to the correspondence between Mr. Bruff and the Town Clerk, and continues: "It is impossible, after a perusal of all the correspondence, to come to any other conclusion than that throughout the whole period the agreement has been held to be valid, and it seems to me that the default of Mr. Bruff to make any improvement in the supply is due in a great measure to the neglect of the Corporation to give him definite information as to what they required, or to close the matters in dispute, by referring them to arbitration."

"It is not disputed that Mr. Bruff has incurred considerable expense in his attempts to provide a satisfactory water supply for Harwich, and that up to the present time he has received but little in return; and I am strongly of opinion that, in equity and fairness, the agreement should be considered as valid."

"The present supply is obtained from a well cased with brick, which is sunk to a depth of 27 feet below the surface, with a bore extending to a depth of 400 feet, about 312 feet into the chalk, and tubed to a depth of only 108 feet, or 20 feet into the chalk. A supplementary supply is turned into the well from a stream which runs at the side of the well-house; but it is stated that the supply from this source is used only for the railway works after all the cisterns for domestic supply in Harwich and Dovercourt have been filled up. It should here be mentioned that an examination of the works shows them to be in a condition very far removed from what is usually considered fit and proper for water-works."

"It is admitted on all sides that the supply of 50,000 gallons pumped from the well is quite sufficient, being little more than a quarter of what should be available, and a consideration of the evidence, and the analyses produced, leaves no doubt that the quality of the supply is bad, not only because it is exceedingly hard, contains too great a proportion of solids, and is impregnated with salt, but because other impurities, due possibly to the soakage from the surface water and the stream, are frequently apparent."

"It, therefore, becomes necessary to consider, in the interests of the inhabitants of the borough of Harwich, what is the best course to be adopted to make the supply such as is necessary for the requirements of the town in the shortest possible time."

"If the evidence on behalf of the undertaker were such as to convince me that the steps which he proposes to take would certainly be successful, I would, both in justice to him and in the interests of the town, have no hesitation in recommending that the Order which he seeks to obtain, under the Gas and Water Facilities Act (passed with the view of affording statutory powers to persons or companies in his position), should be granted. I am not, however, satisfied that such will be the case, and I am of opinion, both from the evidence and from the nature of the water supply from all the completed wells near the sea in this neighbourhood, that it is very doubtful whether a good and sufficient supply of water can be obtained on this site."

"It is evident that if the Order were granted without reservation, and the proposed operations were unsuccessful, the town would be in a worse position than at present, for statutory powers would have been given for the supply of a water which is not sufficiently good for drinking purposes. On the other hand, if the Order be refused, it may be assumed that Mr. Bruff will not take any steps whatever to improve the supply, and the Corporation will be driven to undertake it themselves. This they are willing to do, and, although there are certainly objections to the mains being carried along the line of railway as proposed, there is nothing impracticable in either of the schemes proposed by them, and there would, I have no doubt, be no difficulty in finding water at either of the places named."

"At the same time, the cost of the undertaking, even at the low estimate given, would throw so heavy a burden on the ratepayers of the town, and it is so probable that tedious and expensive litigation on the questions of the agreement would ensue, and probably postpone any operations for some considerable time, that I believe it will be to the

advantage of the inhabitants, and a great gain in time, if the Order be granted, but with a clause inserted to the effect that if within 18 months the undertaker has not succeeded in providing a supply of water which shall be considered by an arbitrator, to be appointed by the Board of Trade, to be both sufficient in quantity and good in quality, the powers conferred by the Order shall lapse.

"If the undertaker, having confidence in his own scheme, accepts the Order upon this condition, and is successful in his attempt, the town will have nothing to complain of; while if he refuse to accept it, or if it be found that a fit and proper supply cannot be obtained at Dovercourt, the hands of the Corporation will be strengthened in their endeavour to provide water themselves."

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

At last there has been a stirring of the pool in Edinburgh with respect to public lighting, and if only some enterprising electric light company would rush in, no one could foretell what benefits might accrue to the company as well as to the public. It may appear a very unimportant announcement that two members of the Corporation have had the temerity to table a motion, which will be discussed at the next meeting of the Council, that a remit be made to the Cleaning and Lighting Committee to consider as to the expediency of applying the electric light in the leading thoroughfares of the city, with power to make such preliminary inquiries as they may deem necessary; but to the inhabitants of this badly lighted capital it is one almost of unspeakable interest. Do not let it be supposed for a moment, however, that the interest centres in the fact of the motion relating to electric lighting. Such a view would be erroneous. Had the remit been to report upon the expediency of adopting paraffin, it would have been as joyously welcomed; because in many of the less important streets and thoroughfares—and these in reality constitute the bulk of the city—the public lights, as I have more than once pointed out, are the merest apologies for gas. The Gas Companies are not to blame for this, for I see, by the last published statement of the photometric value of the gas supplied, that that of the Edinburgh Company was equal to 27.15 candles, and that of the Leith Company to 25.50 and 23.40 candles. And beyond supplying gas, I understand the Companies have nothing to do with the lamps. If the Corporation of Edinburgh, either bodily or individually, had any interest in the promotion of electric lighting companies, I could easily understand why the lamps of the city should have been allowed to continue in such a disgraceful condition. Improvement, no matter from what direction it comes, will be heartily received by a large section of the community; and if the Committee's opinion should be in favour of experiments with the electric light, I have no doubt that a pean will burst from the lips of this long benighted city. The contrast will be so powerful that gas, in everything except the matter of expense, will sink into comparative insignificance. While the Corporation Committee are busy investigating, I would suggest to those who have the superintendence of the lamps, that they should be carefully overhauled; that all unworkable governors—and they are legion—should be removed; and that a pound or two should be spent in procuring a few gross of the most improved burners. With these alterations, all the benefit that can really be obtained from the hourly consumption of $1\frac{1}{4}$ cubic feet of gas, which is the allowance for each lamp, would be obtained, and there would consequently be less desire for the introduction of any other method of public illumination. The experiment at the east end of Princes Street—at the Register and Post Office—with the Bray lantern, has been such a success as to warrant the extension of the system. Were these, or other lamps of similar construction, substituted for those already existing in Princes Street, an effect would at once be produced which would reflect credit on the city, and show off to some advantage the natural beauties of a street of which every native of Edinburgh is proud. In this way, too, the community would have an opportunity of comparing the relative merits and expense of the two systems of lighting.

As the subject of stamping meters is one which is exciting a good deal of comment in Edinburgh, at any rate amongst those who are engaged in their manufacture, I may be excused for referring to another phase of it which has quite recently come to my knowledge, and which, taken in connection with other circumstances to which I have already publicly alluded, points to a determination on the part of those "clothed in a little brief authority," to drive a coach and pair through the Act of Parliament. Hitherto it has been the custom for the inspector in Edinburgh to stamp with the official seal test holders intended by gas companies for private use, when such are found to be correct. Of course a test holder may be absolutely correct and well fitted for the purpose for which it is intended, without passing through the inspector's hands; but somehow or other a spurious kind of importance is often attached to a piece of red sealing-wax on which certain words are embossed. The advantages of possessing such an instrument are manifest, especially in a country district, because the manager can, in the briefest possible time satisfy himself whether or not a meter is registering the flow of gas with legal accuracy, and if it is not, he knows where to send it to have the defect remedied, and even in large towns the possession of such a holder prevents any needless delay in arriving at a similar conclusion. Parties desiring to possess such a test holder may now obtain it from the maker, but it will be *minus* that important piece of sealing-wax, and although the instrument may be tested by the inspector, such testing is not, it seems, to "confer any legal authority on the gasholder." This I take to be one of the results of Mr. Chaney's visit to Edinburgh. Now it is interesting to see in how far the officials, whether here or in London, are justified in the course which they have resolved to pursue. And the first—and, indeed, almost the only point which requires any consideration is, What is the meaning of the word "meter"? Turning to the interpretation clause of the Sale of Gas Act, 1859, I find that the word is defined to mean "every kind of machine used for measuring gas." A test holder is a machine for the measurement of gas, and the logical conclusion, therefore, is that the inspector is bound to stamp it as correct when he is asked so to do, provided always that he finds the instrument accurate. No reason has been given for the adoption of this policy in Edinburgh, but it is supposed a fear is entertained that gas companies possessing such test holders might charge for testing meters. On the face of it, this is absurd; but even supposing a company, or an individual, were to use this instrument for testing meters, the illegal character of such a transaction would not relieve the inspector from his duty of stamping "every kind of machine for measuring gas." I trust that some of the Edinburgh meter makers will move in the matter, by throwing upon the inspector the onus of refusing to stamp a test holder, and then, by a proper action, test the validity of his proceedings.

The first of a series of improvements at the Edinburgh Gas-Works has been entered upon. I have had an opportunity of seeing the specifications which have just been issued by the Company for the alteration of the existing purifying arrangements. The alteration involves the removal of four old purifiers, 17 ft. 6 in. by 9 ft. by 2 ft., and the substitution of

new purifiers, each of which will be 24 ft. by 19 ft. by 5 ft., and these will be worked by an overhead hydraulic arrangement.

The town of Markinch, in Fifeshire, possesses a notoriety beyond the limits of the "ancient kingdom;" but I am not aware that it has reached so far south as London. Almost everything that is abnormal in the animal or vegetable world is to be found in that locally famous town. The correspondent of a Fife paper states that the Markinch Gaslight Company have lately purchased a piece of ground directly opposite their works, for laying down refuse, &c. It seems, however, that their purchase has given rise to the serious contemplation in some quarters of its being ere long used for the purpose of producing the electric light, "to which in a few years gaslight is likely to succumb." This is very funny, but it is nothing to what follows. "The water supply of the burn on the ground could advantageously be used for such a purpose, and, as it is well known that the electric light power can be conveyed a distance of six miles, it is not improbable that Markinch, owing to her central position, may enlighten many of her sister villages." If the village schoolmaster would take this correspondent in hand, the future publication of such nonsense might be obviated.

Mr. Thomas Stevenson, C.E., held an inquiry at Carnoustie, on Monday, on behalf of the Board of Supervision, relative to the water supply of the village. As I have already mentioned, the village is divided between two Boards of Local Authority. The Barry Board have charge of the sanitary condition of that part of the place which contains 2453 inhabitants, and the Panbride Board have a district with a population of 622. After a good deal of local squabbling, the Board having the larger district resolved to carry out a scheme by which a supply of water could be obtained from the Brax springs—these issuing from a disused quarry. On the ground of insufficiency of supply and bad quality of water, objections were raised by the minority, with the result that the Board of Supervision have instituted this inquiry. Evidence was taken by Mr. Stevenson, and his report on the subject to the Board of Supervision will be awaited with some interest by the people of the district.

With respect to the water supply of Elie, Sheriff Lamond has now issued an interlocutor, finding that a special supply district for the burgh of Elie Liberty and Williamsburgh should be made in terms of the requisition.

The fortnightly statement of the Edinburgh and District Water Trust shows that the quantity of water in the reservoirs on Tuesday last was 2,422,998,000 gallons, or an increase of 198,055,000 gallons during the past fortnight. In the same period the supply per head of the population was equal to 42.37 gallons daily.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Since the delivery of the lecture on "Electric Lighting" by Mr. J. W. Swan, to the members of the Philosophical Society of Glasgow, there has been quite a lively correspondence in one of the local newspapers. The issues raised by the writers are very numerous, and some of them are exceedingly important. The letter initiating the correspondence assumes that electric lighting companies will be formed by-and-by, and the writer is desirous of knowing how the light supplied to the consumers is to be satisfactorily registered. A reply comes from Mr. Swan himself, who says that there is no difficulty in applying either to each lamp, or to each group of lamps in a house or shop, a meter corresponding precisely to an ordinary gas-meter, in so far as the counting mechanism goes, which will show, instead of cubic feet of gas burned, the number of hours during which each lamp has been lit; and he concludes his letter by saying that he has, in fact, applied for a patent for such an electric meter. Another correspondent goes at considerable length into the question of cost, his aim being to show that, relatively to the amount of light eventually obtained, there must be a very large expenditure in providing the necessary power, and that there must of necessity be a considerable outlay for skilled attendance in connection with the engine employed, even though it be only a gas-engine. Mr. Joshua Horton, who is working locally on behalf of the British Electric Light Company, also enters the lists as a correspondent. He specially refers to Mr. St. George Lane Fox's incandescent lamp, and says that as this lamp is now complete and patented he may safely promise the citizens of Glasgow that they will shortly have an opportunity of witnessing electric lighting by incandescence in a complete form. I understand that the British Electric Light Company have secured a very direct interest in the lamp to which Mr. Horton refers. The Principal of the Glasgow Mechanics' Institution, Mr. Andrew Jamieson, who, from his long practical experience in the laying and repairing of submarine electric telegraph cables, ought to be able to speak with some degree of authority on such subjects as involve the principles of electrical science, takes part in the correspondence, and in the course of his remarks says that there are several practical difficulties attending the introduction of the electric light upon a large scale. Electricity cannot as yet, he says, be bottled up in large quantities, and kept ready for use like gas, but must be used the moment it is generated, otherwise it will dissipate or run to "earth." One of the correspondents is "big" on the question of getting the motive power from the Falls of Clyde, which are distant some 25 miles or so from Glasgow; but, referring to this matter, Mr. Horton says he does not think the motive power obtained from the Falls would be sufficient for the lighting of Argyll Street alone. The correspondence is certainly very interesting, but it abundantly shows that the days of gas lighting are not yet numbered.

A meeting of the Police Commissioners of Oban was held last Monday, when the account from the Gas Company for the public lighting of the town was presented. This circumstance induced the Town Clerk—who seemed to have the well-being of the town in his keeping—to speak out somewhat strongly on the question of street lighting. By way of showing the insufficiency of the lighting of the town, he instanced the night of Friday, the 18th inst., when, although pitch dark, not a single lamp was lighted along the whole front of the town; and he strongly advised the Commissioners that it was to their interest to have the town properly lighted. Some discussion took place on the subject, and the result was that the matter was remitted to the Lighting Committee, with instructions to revise the present arrangements for lighting the town, and a suggestion that two meters instead of one as at present should be used.

In consideration of the fact that the Gas Collectors' Office at Port-Glasgow is now vacant, owing to the resignation of the Manager, Mr. Carlow, the Town Council, at a meeting in committee held last Monday, resolved, by a majority, to put the collection of the gas accounts again into the hands of the Town Treasurer.

It is rather an extraordinary thing to relate, but I am assured of the fact that until quite recently there was not a single gas-engine in the town of Dumfries—a town which is frequently called the "Queen of the South," and is certainly a place of considerable importance, alike for its manufacturing and other industrial operations, and its somewhat extensive commercial relationships with other parts of the United Kingdom. Now, however, there is actually one at work, doing excellent service for a local printing firm. When the many advantages attending the use of

such a prime motor are taken into consideration, it is really surprising to learn that a beginning is only now being made. It is to be hoped, however, that Mr. Malam, the Gas Manager, will soon have his annual make of gas greatly increased by having to supply the necessary material for feeding many engines of a similar sort.

The gas-lighted buoy (Pintsch's patent) at Rosneath Patch, opposite Greenock, is continuing to give the utmost satisfaction. It was recently brought ashore to be charged afresh with gas. The works at present in course of erection at Port-Glasgow for the manufacture of the gas are being pushed forward, and will probably be ready in a few months. Soon thereafter, no doubt, steps will be taken to lay down at other points on the Clyde buoys similar to that at Rosneath Patch.

On Monday evening Dr. Wallace, F.R.S.E., the City Analyst, delivered a lecture in the Southern Police Hall, on the disposal of the sewage of the city. The lecture was illustrated by experiments made with precipitants—lime and sulphate of alumina—on Portland Street sewage; and in the course thereof Dr. Wallace mentioned that the cost of precipitating the sewage, exclusive of the interest on the capital expended on the works, would be about £25,000, or say, 2½d. per £1, without taking into account anything that might be obtained for the sludge. Such return might go to pay for the cost of removing the deposit. According to an estimate he had formerly made, the total cost of disposing of the sewage of Glasgow would, Dr. Wallace said, not involve an assessment of more than 6d. in the £1.

This week's Glasgow pig iron market has been very steady. Prices receded somewhat in the earlier part of the week, but the closing quotations yesterday were about the same as those at which business opened on Monday morning. There is little to encourage hopefulness, and nothing to induce buying, except the comparatively low prices. There are 121 blast furnaces in actual operation, as against 114 a year ago. One additional furnace has been blown in during the week.

The lull in the coal trade continues, and prices are inclined to recede.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is no pressing demand for coal in this district, and supplies continue to increase in abundance, many of the railway sidings being blocked with coal, whilst in some classes of fuel stocks are now accumulating at the pits. The cold weather keeps up a fair inquiry for house-fire classes of coal; but the lower classes of round coal, if anything, are rather a drag, the demand for either manufacturing or gas purposes being only limited, gas-works with the approach of summer naturally taking lessened quantities. Supplies of engine fuel are for the present in excess of requirements, and stocks of burgy are accumulating. Prices continue to ease downwards, something like 1s. per ton having already been lost upon the rates asked for round coal immediately after the termination of the strike, and there appears to be some anticipation that the close of the month may be followed by a formal reduction of list rates. Any definite step of this kind is, however, at present doubtful, although it is more than probable that concessions of one kind or another will continue to be made, which will represent an actual reduction, so far as round coals are concerned. The average prices at the pit's mouth are about 9s. 6d. to 10s. per ton for best Wigan Arley, 8s. 6d. to 9s. for common Arley and Pemberton four-feet, 5s. 6d. to 6s. for common Wigan mines, 5s. to 5s. 6d. for burgy, and 2s. 6d. to 4s. 6d. for slack.

For cokes there is only a limited demand. Made cokes are without material change in price, but gas cokes have receded from the prices that were being asked during the strike, and good qualities average about 5s. to 5s. 6d. per ton for quantities at the works.

The iron trade continues in an extremely depressed condition, with prices weakening. Lancashire pig iron is to be bought at 45s. to 46s. per ton, less 2½ delivered equal to Manchester; but there is very little demand. Finished iron also meets with a very limited inquiry, and local bars delivered into the Manchester district are offered at £5 17s. 6d. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The quantity of coal cleared at Cardiff during the past week has been very good, being some 10,000 tons more than the satisfactory total of the previous week. Most shippers, consequently, have been moderately busy, and are generally fairly well off for orders and tonnage stemmed to arrive. Prices have not varied, nor is there in any quarter any indication of alteration in the immediate future. The following are the clearances for the week:—Coal, 118,317 tons; patent fuel, 4215 tons; iron, 2654 tons; coke, 532 tons. The coal trade of Swansea has been very dull during the past week, and the shipments again show a falling-off. The trade of Newport for the past week has been good. The Alexandra Dock has been well supplied with steam and sailing tonnage, and the facilities have been also equal to the occasion, so that good despatch and few complaints are the order of the day. The Old Dock has also come in for a fair share of the trade, and with the extra hydraulic cranes and a disposition on the part of those connected with the docks to facilitate matters, a good deal more business is now done there than was possible some time ago. The price of coal does not seem to have varied during the week. In some cases where stems had become short, a slight alteration might be obtained for ready tonnage; but coalmasters seemed to have sufficient confidence in the future not to be drawn into engagements for future deliveries, unless at the prices recently quoted. Of course there are always some qualities to be obtained at a reduced price.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Consequent upon the return of cold weather, there has again been a momentary run upon best deep coal for household purposes, both at the local markets and at the hards as customers purchasing for metropolitan consumption. In other respects the coal trade of this district shows a weakening tendency. Furnace and forge qualities are selling but slowly, and there is an abundant supply in the market. In many instances prices below those ruling are accepted, but underselling is not so much complained of as was the practice in the early part of the year. Furnace coal at the pit's mouth is being sold in several parts of the district at 9s. and 9s. 6d. per ton. There appears to be a very general opinion that the present recognized rates will last but a very short time, and unless a decided improvement in the manufacturing department speedily turns up, it is difficult to see how existing prices can be maintained. There is but a limited call for cokes, and makers of both oven and gas qualities are offering on easier terms.

The iron trade continues to be in a depressed condition. In both raw and finished departments there is a scarcity of orders, and buyers, it is well understood, are withholding orders, in the full belief that at the next quarterly meeting, if not earlier, a reduction will be made. A few makers of finished iron, notably sheet and hoop manufacturers are running on full time with a fair supply of orders. There is also a good look-out for

tube, strip, boiler plates, and for plates for the gasholder trade; but with these few exceptions the business at both mills and forges is comparatively inactive, and far from what it was at the beginning of the quarter. Marked bars are quoted at £7 10s., but only a limited number of transactions are made at that basis, these, too, being chiefly for brands of the most notable makers. There is a great falling-off also in the call for unmarked bars, which are now offered freely at £6. Common sheets rule at £7 and £7 5s.; but boiler plates realize prices from £8 to £10. The pig iron markets are even more depressed than the finished, prices being weak and stocks on the increase. Cinder pigs are freely offered at prices varying from £1 17s. 6d. to £2. All-mine are quoted at £3 and £3 5s., but several lots are reported to have been placed at figures even lower. Northampton made pigs are freely offered at £2 2s. 6d. Derbyshire pigs are also pushed into these markets, and agents are submitting to very easy prices. Several furnaces will, it is believed, shortly be blown out unless a brighter aspect prevails.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade throughout Yorkshire is only moderate, and many works are not over well off for orders. The mills and forges rarely run full time, and, as a rule, engineers and fitters are not fully employed. The output from the blast furnaces in both South and West Yorkshire holds well up, and, considering the stocks are pretty large, prices remain steady for the best class of iron. There is a very large tonnage of ironstone received by the district furnaces from North Lincolnshire, the local pits being but partly worked. The foundries are still suffering from want of orders; but at one or two places where gas and water pipes are produced, together with similar apparatus, the operatives are fairly employed.

Since my last notice, the coal trade has, if anything, become more depressed, and in some parts of the county supplies are far in excess of the demand. This is particularly the case in the South Yorkshire coal-field, where the pits, with few exceptions, are again at work after the recent strike. There is, however, no denying the fact that a large portion of the orders which ought to have been placed in the district have found their way to Lancashire, Derbyshire, and the North of England.

The demand for house coal at the West Riding collieries is only quiet, whilst throughout South Yorkshire more is being produced than can be sold, and stacking is being resorted to. Owing to the pressure which was put upon coalowners by contract holders before the strike, the deliveries will for some time be very moderate. Complaints are being made respecting the limited tonnage that is passing over both the Midland and Great Northern lines to London and the Eastern Counties, and even where sales are effected prices are very moderate, and lower than when the men ceased work. The collieries working the Silkstone seam are not doing anything like so well as was expected and is generally the case at this period of the year.

The business doing in gas coal is not very good, owing to many of the contracts having been overdrawn before the stoppage. To some parts of the West Riding, where the woollen trade is good, fair supplies are sent, but the quantity sent to the Eastern Counties and the Midland district is scarcely so large as it was a month or two ago. Prices, as a rule, are moderate, and are likely to continue so, seeing that the output is in excess of the requirements of the trade.

There is a very desponding tone perceptible in connection with the steam coal trade, and it is to be regretted that the foolish action of the men has undoubtedly caused contracts to be placed in other districts which would have fallen to South Yorkshire coalowners, either in whole or part, had it not been for the stoppage of the pits. The tonnage sent to the Humber ports is very moderate indeed, and owing to many large vessels or steamers being frozen up the exports are remarkably low.

Not much change can be noted with regard to the coke trade. Prices are only low, yet a few makers have been able to make forward contracts for the ensuing quarter at slightly advanced rates over those obtained to the close of March. The bulk of what is produced in South Yorkshire is being sent to the district around Frodingham, for the use of the furnaces there. Although complaints are loud with respect to the extra tonnage rates imposed, it is said that no material alteration has been made by the Railway Company interested.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

After this week the activity in the shipment of gas coals coastwise will be shared by the Baltic trade. The over-sea trade is opening rapidly, and the gas companies abroad are hastening to replenish their stocks after the long winter. The gas is the only branch of the coal trade of the North wherein there is any great amount of business doing at the present time. Steam is dull, the household trade is quiet, and there is a limited demand for manufacturing coals. The coke trade has a tendency to fall away somewhat, and when the coke manufacturers have to go into the open market to sell, if they mean business they have to take somewhat lower figures than were expected to be current at this time. There seems to be no probability of a rise in the value of any kind of fuel in the first half of 1881.

Steamer freights coastwise are represented by 3s. 10½d. per ton for gas coals for London. Small sailing vessels of from ten to twelve keels have been needed to carry fire-bricks and other materials of that description used by the gas-works; 7s. per ton is paid them to load bricks for London river.

The iron trade in this district may be fairly described as dull. An active spring trade should now have set in, especially for pipes, but the reduction in the price of castings has not induced the buyers to come forward. The wrought-iron tube trade business, however, is well maintained. The finished iron trade is without improvement, and reduced prices fail to bring orders.

The chemical trade does not get better. A fair business is transacted in fire-bricks, but almost exclusively for the very best brands. Copper was steady over the whole of last week, with some disposition to firmness at the close. Lead is neglected.

THE GAS AND WATER SUPPLY OF BUXTON.—Last Wednesday, Mr. J. T. Harrison, C.E., held an inquiry, by order of the Local Government Board, into an application of the Buxton Local Board for a Provisional Order to enable them to borrow an additional sum of £6200 for works of water supply, sewerage, and gas manufacture. The Inspector went through all the items set down for the various purposes stated in the application. Objection was taken to several of the items by Mr. S. Darwin, a member of the Board, who protested against the high price of the gas—5s. per 1000 feet—and also against the Board asking for money to obtain various things which he considered were unnecessary. Mr. J. Sumner, a ratepayer, also objected to the Board's trying to borrow any more money, when they were already in debt, and had no contingent fund or reserve to draw upon. The Inspector promised to lay the whole of the matter carefully before the Local Government Board.

ILMINSTER GAS COMPANY.—A new Company, under the above title, has been formed for supplying the town of Ilminster with gas. The capital is £3000, in 600 shares of £5 each, and the Chairman is Major V. H. Lee, M.P. The Directors have purchased the existing works for £1400. The price now charged for gas is 5s. 10d. for 1000 feet.

REDUCTIONS IN PRICE.—The Brosley Gas Company announce a reduction from 5s. 10d. to 5s. 5d. per 1000 feet, with discounts as previously allowed—viz., 5 per cent. to consumers of under 20,000 feet; 10 per cent. to consumers of under 60,000 feet, and 15 per cent. to consumers of more than 60,000 feet per annum.—The Directors of the Guildford Gaslight Company last Friday announced that, from and after the 31st inst., the price of gas will be reduced 4d. per 1000 feet. The invoice price will then be 4s. 2d. per 1000 feet, subject to a discount of 6d. per 1000 feet provided the accounts be paid within a month of the date of invoice. Since the appointment of Mr. W. Longworth to the position of Secretary and Engineer of the Company in 1877, four concessions have been made to the consumers—in 1878, a reduction of 6d. per 1000 feet; in 1879, a similar reduction; last year the abolition of meter-rents; and this year the reduction now announced—while full dividends have been paid to the Shareholders of the Company.

ROCKHAMPTON (QUEENSLAND) GAS COMPANY.—At the last half-yearly general meeting of this Company, the Directors' report, which was read by the Secretary (Mr. Mills), showed a steady increase in business. The Municipality had, it stated, ordered additional street lamps to be erected, the gas for which the Directors had agreed to supply on reasonable terms. The productive power of the works had been increased by the erection of three additional benches of retorts, and it was proposed to erect a second gasholder, in order to provide adequate storage capacity for the gas manufactured. The works generally were reported to be in excellent order, and the utmost economy had been exercised in carrying them on. The Directors recommended the allowance of an additional discount of 7½ per cent. to the consumers, thus raising the rates of discount from 7½ and 10 to 15 and 17½ per cent., and making the price of gas for prompt payment 12s. 4½d. and 12s. 9d. per 1000 feet from Jan.-1. The usual 10 per cent. dividend was recommended and adopted, and a sum of £502 carried to the reserve fund.

THE BARNSELY TOWN COUNCIL AND THE GAS COMPANY.—Some dissatisfaction, it has been reported, exists at Barnsley in regard to the price charged by the local Company for gas—3s. 6d. per 1000 feet—and a deputation of the Town Council recently waited upon the Directors of the Company, and submitted the following questions:—(1.) On what terms will the Company sell the works? (2.) What reduction will the Company make in the charge for lamps on the same basis as that now existing? (3.) On what terms will the Company supply gas alone for the lamps, the Corporation buying the lamp-posts, and doing the lighting, cleaning, &c.? (4.) What will the Company ask for the lamps, in the event of terms being come to on the basis involved in the last question? (5.) What will the Company charge for gas, they retaining the lamps, lamp-posts, &c., and the Corporation lighting, cleaning, &c. To the first question, the Company reply that they will not make any offer to sell, but will listen to an offer of the Council. To the second the reply is that the price per lamp will be 45s., instead of 47s. 6d. To the third, 2s. 6d. per 1000 feet. To the fourth, that the Company are willing to sell the lamps at £4 10s. each to the Corporation. The fifth question they decline to discuss. At the meeting of the Council on Tuesday last the Company's replies were communicated to them by the Town Clerk, and the proposed reduction in the price charged for the public lamps not being considered sufficient, it was resolved that the Council should join with another gas consumer in a petition to Quarter Sessions, for the appointment of an Accountant to examine and ascertain the actual state and condition of the concerns of the Barnsley Gas Company.

OPPOSITION TO THE EASTBOURNE WATER BILL.—On Monday last week a meeting of the ratepayers of Eastbourne was held under the presidency of Dr. Jeffery (as Chairman of the Local Board), to consider a resolution for opposing the Bill of the Eastbourne Water Company now before Parliament. The Chairman having read the resolution, said if the ratepayers approved of the Water Company's proposal to take their water some nine miles out of Eastbourne, and were fully satisfied that the town was not likely to increase and require a larger supply of water than at present, then they would not oppose the Bill; but if they were of the opinion that the town might be more generously treated by the Company, then they would give their votes in favour of the resolution. Mr. Climpson contended that it was unjust to the Eastbourne people to take their water for the purpose of supplying outlying districts, the water under the town being, he said, the property of the ratepayers. If the Hailsham people required water, they could get it in their own neighbourhood. He also submitted that the supply of water by meter would prove of great advantage, not only to the consumers, but to the Company, and he hoped that the adoption of meters would follow in due course. He thought the water-works should be in the hands of the Local Board. Mr. G. A. Wallis pointed out certain fallacies in Mr. Climpson's remarks, and in reference to the supply of water to outlying districts, said the Company included gentlemen too deeply interested in the prosperity of Eastbourne to imperil its water supply by taking a quantity of the water from under the town to outlying places. The motion was then carried by a large majority,

and the meeting terminated.—At a meeting of the Local Board, held after the ratepayers' meeting, a motion to oppose the Bill, if concessions were not granted by the Water Company, was lost, the statutory majority of votes not being given in its favour.

ONE of the "Notes of the Day" in last Friday's *Globe*, entitled "Darkness Banished" was as follows:—"It would be very curious if by-and-by the various discussions and experiments with respect to the lighting of the interiors of houses and public buildings should result in the total banishment of all kinds of lamps—oil, gas, electric, or any other kind—from such interiors. That, however, is the possibility very clearly indicated by a proposal of the American Northern Electric Light Company. They want to be allowed to illuminate the Capitol at Washington, not by carrying their system into the building at all, but by simply banishing darkness from the vicinity of it. Over the Capitol, and at various points in the grounds attached to it, they propose to set up such a blaze of light as will fill the air with a sort of artificial broad daylight, which would, of course, find its way into the skylights and windows of the Capitol just as real daylight does. They would have altogether 450 lamps of about 6000-candle power each, the whole affording the light of 200,000 ordinary gas-burners, and as many of them would be some 50 feet above the roofs of the building, it is estimated that they would shed light enough over the city of Washington to obviate the necessity of street lamps. Of course the projectors of this scheme demonstrate in the most complete manner that it would be vastly cheaper than the present system of illumination, but Congress does not appear to be particularly captivated by the notion, and declines to have anything to do with it. This is a great pity, because the experiment would certainly have been most interesting, whatever the economical issue might have been. Whether we shall ever solve the domestic light problem in this way may be doubtful. In the winter we are most of us glad when the time comes for shutting out the raw cold daylight, and turning on the cheery warmth of the gas, and it perhaps would not be thought at all an improvement to merely prolong the diffused white light from the outer world."

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 1202.—BOULTON, M. P. W., Tew Park, Oxford, "Improvements in caloric engines, wherein the working fluid is heated by internal combustion of gas or other fuel." March 18, 1881.
1251.—CHANDLER, S., Newington Causeway, and STEVENSON, G. W., Westminster, "An improved automatic dip-pipe to be used in the manufacture of gas." March 22, 1881.
1302.—PARKER, T., Coalbrookdale, Salop, "Improvements in grates and stoves for burning anthracite coal, gas-coke, coke, and ordinary house coal." March 23, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 3865.—WESTON, F., Brixton, London, "Improvements in apparatus connected with increasing the illuminating power of coal gas." Sept. 24, 1880.
4817.—LOWE, C., and GILL, J., Manchester, "Improvements in the manufacture of certain derivatives from coal tar products." Nov. 20, 1880.
5156.—CHAMBERLAIN, A. P., Finsbury, London, "Improvements in the manufacture of gas for illuminating, heating, and other purposes." Dec. 10, 1880.
60.—ABEL, C. D., Chancery Lane, London, "Improvements in gas motor engines." A communication. Jan. 5, 1881.
84.—DOUGLASS, J. N., Dulwich, London, "Improvements in burners." Jan. 7, 1881.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 1024.—NAWROCKI, G. W. von, "Improvements in stop valves, especially suitable for water-pipes." March 14, 1878.
1032.—WEBSTER, G. E., "Improvements in gas-burners and their accessories." March 15, 1878.
1033.—LAKE, W. R., "Improvements in furnaces applicable for heating steam-boilers and gas-retorts, and for other like purposes." March 15, 1878.
1092.—MORGAN-BROWN, W., "Improvements in fluid-meters." March 19, 1878.
1096.—LAKE, W. R., "Improved apparatus to be connected with the stop-cocks of gas-pipes for opening and closing the same." March 19, 1878.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending March 23, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.3	16.6	16.9	8.7	6.2	7.3	0.1	0.0	0.0	None.	In excess.
	Camden Town	17.6	16.7	17.1	12.3	10.8	11.5	0.1	0.0	0.0	"	"
	Dalston	17.7	16.8	17.2	15.3	10.9	12.4	0.1	0.0	0.0	"	"
	Bow	18.1	16.7	17.2	13.5	10.0	11.3	0.9	0.5	0.7	"	"
	Chelsea	17.0	16.7	16.8	17.3	9.6	14.4	0.4	0.0	0.1	"	"
	Kingsland Road	17.4	16.6	17.1	16.5	11.6	13.6	0.1	0.0	0.0	"	"
	Westminster (cannel gas) . .	21.6	20.7	21.1	8.6	4.5	7.1	0.6	0.6	0.6	"	"
South Metropolitan Gas Company .	Peckham	16.8	16.3	16.6	14.8	10.8	12.6	0.4	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.3	16.6	16.9	14.9	10.0	12.4	0.4	0.3	0.3	"	"
	St. George-in-the-East . .	17.7	17.0	17.2	14.4	9.1	11.5	0.3	0.1	0.2	"	"

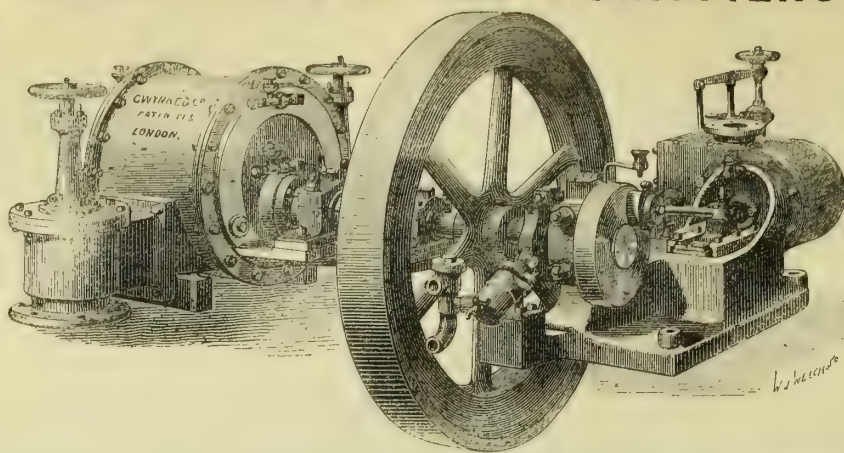
(Signed)

T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

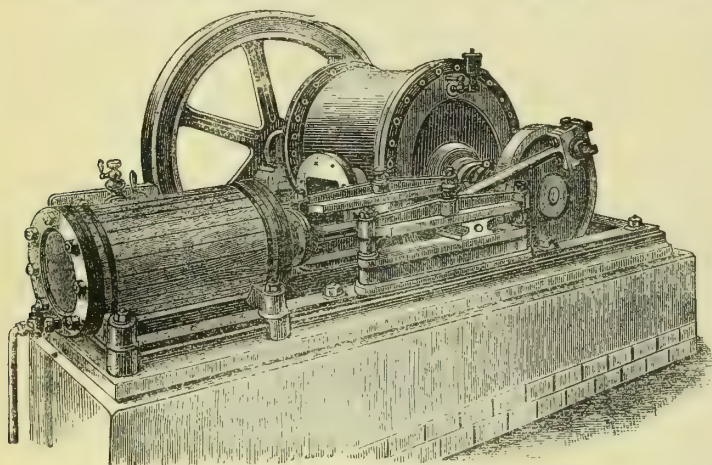
Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE OSCILLATION, FRICTION, AND POWER.

TO WORK BY BELT OR WITH

ENGINE COMBINED.



GEORGE WALLER & CO.,
Makers of BEALE'S EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, SELF-ACTING BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT PAGE 546.]

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.**

RE-ENGAGEMENT Wanted as Assistant ENGINEER, by a Gentleman, aged 33. Has had ten years' experience in Gas and Water Works with eminent engineers. Is a good general draughtsman and can prepare Specifications, Estimates, &c. Address A. S., care of Housekeeper, 106, CANNON STREET, E.C.

RE-ENGAGEMENT wanted as Manager or SECRETARY and MANAGER of Gas-Works, or ASSISTANT in large Works, by one who has for the last 12 years been Manager of Gas-Works in a large provincial city. Aged 34; married; abstainer. Can leave present situation at brief notice. Highest recommendations. Address No. 734, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO TAR DISTILLERS.

A Practical Man of eight years' experience is open for Engagement as **MANAGER.** Plant erected, with all latest improvements. Thoroughly understands and can Test all Tar Products—Carbolic, Sulphate, Rectifying Benzole, &c. First-class references. Address No. 734, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS ENGINEER Wanted, who has a thorough good Connection amongst Architects and Builders. None need apply unless thoroughly competent to give Estimates and Superintend the Carrying Out of Gas-Fitting of large buildings. Apply, by letter only, stating salary required, and where employed, to B., care of Messrs. Street Brothers, 5, Serle Street, Lincoln's Inn, LONDON.

RE-ENGAGEMENT.—Wanted, by the Manager of a Gas Works in Wales, now making 5 millions yearly, the charge of a Country Gas-Works, the Taking of Indices, and Collecting. Satisfactory reasons for thinking of leaving. Highest testimonials from Engineering Works. Well spoken of in the yearly balance sheets by the Directors. Under their employ for the past eight years. Distance no object; nor in immediate want. Prefer personal interview. Address No. 735, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Retort-Setter. Must have had experience in Setting Retorts and in general Repairs, &c. To a steady and industrious man it would be a permanent post. Wages 30s. per week. Apply, by letter, addressed No. 736, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS MANAGER.
WANTED, at once, for six months, or if services approved, continuous engagement, an Intelligent Working Manager for small Gas-Works in British West India. Make about 5 millions annually. Salary £200, progressive on results. First-class passage out and home. Send full particulars, with copies of testimonials, prepaid, addressed Box 14, G.P.O., BIRMINGHAM.

WANTED, two intelligent, practical, sober, trustworthy Men as **FOREMEN** in the RETORT-HOUSE, where from 300 to 400 retorts are used. They must be well able to control the Stokers under their charge, and be thoroughly competent to take charge of the carbonizing department. The wages will be not less than £2 5s. per week. No one need apply who cannot bring first-class testimonials, and who has not filled a similar situation. Preference will be given to men from any large provincial town. Application, by letter only, addressed No. 732, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gas-holder. Must be thoroughly sound. Price and particulars to be addressed to Mr. EDWARD BAKER, Engineer, Reading Gas-Works.

FOR SALE — A Telescopic Gasholder, 75 ft. diameter, two Lifts, 24 ft. each, with cast-iron Tank and Pipes complete to suit. Only been in use a few years; removed for extensions. Plans sent to intending purchasers. Apply, for price and cost of re-fixing, to ASHMORE AND WHILE, Hope Iron-Works, STOCKTON-ON-TEES.

FOR SALE, at a Country Gas-Works, Round Hydraulic Main, 8 ft. by 13 in.; five 4-in. White's Valves; one 6-in. Double-flange Tee; two 12-in. Furnace Doors and Frames; three Purifiers, two 8 ft. by 4 ft. by 4 ft., one 6 ft. by 5 ft. by 3 ft., with 4-in. Inlets and Outlets; two 4-in. Four-way Centre Valves. Apply to STRODE & Co., 48, Osnaburgh St., LONDON, N.W.

ON SALE—Four Purifiers, 4 ft. square, (cast-iron Lids), neat Lifting Gear, and Hydraulic Centre-Valve. Also a STATION-METER, with 6 in. Connections; 16 4-in. Ascension and H-Pipes; and a 12-in. HYDRAULIC MAIN, with Dip-Pipes—all in good condition. Apply at the Gas-Works, ORMSKIRK.

TELESCOPIC Gasholder for Sale, 100 ft. by 53 ft., with excellent Guide Framing; only been in use 12 years. Now being removed from a large Provincial Gas-Works to make room for extensions, for which there is no other space. If properly re-erected, will be equal to new, and the cost much less. Particulars on application to SAMUEL CUTLER AND SONS, Millwall, LONDON, E.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

J. M.—See paragraph on page 563.

T. E. (S. M. C.)—Your question is one that could only be answered after an examination of your works and plant.

Notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 5, 1881.

THE SOUTH METROPOLITAN GAS COMPANY'S RATING APPEALS.

It will be seen from the report of the final proceedings in these cases, which we publish in another column, that no legal decision has been given upon their merits, but that they have been settled and withdrawn because of a compromise agreed to between the Company and the Parishes concerned. A similar arrangement was arrived at, and upon very similar terms, between the London Gas Company and the unions against whose assessment they too appealed. Any expectation which may have been entertained of obtaining judicial help in determining disputed points and simplifying the practice in such cases is therefore disappointed, and, for the present at least, Parishes and Companies must go on

fighting after the manner of those who "beat the air," and with the somewhat rusty weapons at their disposal, while Courts will no doubt also continue, on the strength of evidence laid before them, to make awards and ratify agreements totally at variance with each other. The South Metropolitan Company, in this case, were possibly well advised, having regard to their own individual interests simply, in settling as they did; but it will be well when some important Company have again the courage to face the issue fairly and fully, and before a competent tribunal seek to determine an equitable method of rating such undertakings. Neither party surely can desire a continuance of the present hap-hazard lottery, where either side may gain an advantage to-day only to lose it to-morrow, and where differences of valuation of the same property, often in the proportion of two to one, are settled on no principle sounder than that of "splitting the difference."

Notwithstanding the unsatisfactory nature of the conclusion arrived at, there were several points of considerable interest either raised or suggested in the course of the trial to which we invite attention. Accepting that creature of rating necessities, the "hypothetical tenant," as a fixture, it is both instructive and perplexing to examine the nature of his contracts with his brother unreality, the hypothetical landlord. The structural value of the South Metropolitan Company's manufacturing and storing stations was determined at £967,320 by the Engineers engaged by the Company, and that of the distributing mains and service-pipes at £511,000—roughly, a million sterling for stations, and half a million for distributing plant. We may safely assume that these figures would be accepted with but slight variation by the other side. It is unnecessary that our readers should be told that neither the manufacturing nor the distributing plant of a Gas Company is of any value standing alone, but that the value of each is dependent on its being worked in conjunction with the other. This being so, how is it possible to justify the description of the stations as unproductive, and the mains as productive plant, and the putting upon the latter a rateable value of from two to three times the amount which is considered equitable, and accepted as such, upon the former. If a distinction is to be drawn between works and mains, would it not be more reasonable to reverse the relation in which they are at present placed? The stations cover land which if not so occupied would probably be covered by other buildings yielding an income to the Parish; if, on the other hand, the mains are removed from under the public streets, the space they filled cannot be re-used in any similarly profitable manner. We are not sure but that the Companies themselves may be responsible in some measure for the drawing of this distinction. It is easy for the Assessment Authorities, with the aid of competent valuers, to ascertain the worth of the land and buildings and plant forming a gas-works to which they have free access, but they are dependent upon the books and upon the officers of the Company for information as to the mains, which are out of sight, and the information needed for a valuation of these is not always freely given. Be that, however, as it may, the earning capacity of each section of the property being alike, we hold that they should be rated alike, and if the plan at present adopted of ascertaining the value from the profits of the undertaking is continued, then the distribution should be made rateably over the whole property.

The actual value of the South Metropolitan property being a million and a half, a charge of five per cent. on this amount would give a rateable value of £75,000. When determined, however, by taking as the rateable value the balance of profit after providing a fair return to a tenant upon his necessary outlay, as in the well-known case of the Phoenix Gas Company against the Parish of Lee, then the amount was returned by the Company at £98,350. From this was deducted, as the rateable value of the stations, £48,816, being five per cent. on £976,320, leaving £49,534 to be divided over the mains in the various Parishes, and as the total value of those mains is £511,103, a rateable value is allowed of over 9½ per cent. This would seem to be sufficiently unreasonable, but the valuation made for the respondent Parishes goes far beyond it. Making the rateable value of the whole to be £173,555, they allot to the stations £36,500, reserving £137,055 for the mains, the percentages being respectively 3·7 and 26·8! So that the imaginary tenant of these works would, according to the appellants, pay his landlord a rent for his distributing plant equal to 9½ per cent. on the outlay, while he paid only 5 per cent. on the stations; and, according to the respondents, the

same landlord would be content with 3·7 per cent. on the million he had invested in works, but would be entitled to 26·8 per cent. on the half million he had at the same time expended in mains; and this in face of the fact that each section is of the same value to the tenant, and each worthless without the other. Such a contention needs only to be stated to be condemned.

This plan of rating profits may, however, easily become unpopular with the Parishes. Take, for instance, an undertaking conducted on the principles which are followed by the Gas Committee of the Leeds Corporation. In such a case, where the price of gas is fixed at just such a sum as will cover its cost to make, and yield no profit, there might be actually nothing to rate, though the intrinsic value of the property may amount to millions. We are conscious that there are difficulties attaching to the plan of rating upon the structural value only, but they are of a character which we think can be dealt with fairly, while those now encountered are necessarily of so shifting and uncertain a nature that irregularity and frequent injustice in the awards made are inevitable. It would doubtless happen, if the structural determined the rateable value, that some Companies earning small dividends would pay heavier rates than others of the same size who divide the maximum profit allowed. An extravagant expenditure in plant would, by increasing the rateable value, add to the load which the Company making it has taken on itself. This, however, is a natural consequence of folly, and can hardly be used as an argument against a system, if it be otherwise sound.

ELECTRIC LIGHTING IN THE CITY.

On Thursday night last the long-promised exhibition of electric lighting in the City of London commenced. It may be repeated that so long ago as last August the Corporation determined to institute an experiment in electric lighting for several of the principal thoroughfares of the City, including the three City bridges over the Thames. It was decided that the district devoted to this exhibition should be divided into three parts, which were allotted to separate contractors, Messrs. Siemens Bros. taking the line of streets from London Bridge, past the Mansion House, to the Guildhall; the Anglo-American Electric Light Company (the Brush system) following with the remainder of Cheapside, through St. Paul's Churchyard and Ludgate Hill, to Blackfriars Bridge; and, as originally arranged, the Electric and Magnetic Company (the Jablochkoff system) were to have taken up the lighting of Queen Victoria Street, including the cross street to Southwark Bridge. Eventually, however, the last-named contractors dropped out, their place being taken by the Company working the Lontin system—the change causing such delay that the thoroughfares in question were not included in the scene of the display of Thursday night, which, therefore, consisted of the Siemens and the Brush lights in their respective districts. We have already described how the Siemens lights are divided into two classes, the one being composed of large lamps, nominally of 3000-candle power each, suspended on signal-posts eighty feet high; and the other class consisting of smaller lights ranged in the ordinary way along the footpath upon posts about twenty feet high. The large lights are in clear glass lanterns fitted with umbrella-like reflectors, and the smaller lamps are in frosted glass globes. It must be said at once, after careful inspection of the examples in the City, that the lofty lighthouse system does not recommend itself for street use. The so-called large lights are no more than the well-known regulator-arcs, and possess the old defects of unsteadiness, ghastliness, and of casting dense sharp shadows. It is difficult to see what is gained by hoisting these strong lights up so much out of the way at the comparatively open spaces where they are placed. Much of the light is wasted on the upper parts of the neighbouring buildings, while by the time the light reaches the roadway it is greatly enfeebled, without having any other advantage. If the electric arc-light must be moderated or diluted in some way before it can be used for street lighting, it is evident that this object may be better attained by the use of globes, which at the same time help to diffuse the light, than by retaining the well-known disadvantages of the naked arc, weakened only by passage of the illuminating rays through space. Messrs. Siemens' small lamps are more successful, but do not attain to perfect steadiness, neither are they altogether satisfactory in point of colour. Still they are greatly superior in both respects to the Jablochkoff candles as exhibited on the Victoria Embankment.

The Brush lamps are all that can be desired in illumination of this kind. There can be no question of their supe-

riority to the Siemens lamps, as there is no doubt of the advantages possessed by the latter in comparison with the Jablochkoff candles. The Brush lamps are fixed alternately on each side of the pavements, on pillars about thirteen feet high, the rather small frosted or opal globes containing the light being covered by an oblong reflector. The light afforded by these lamps, said to be of about 300-candle power each, is of good colour, well diffused, and very steady, offering a pleasing contrast in these respects to any other arc-light of which we have present knowledge. It would, of course, be premature to pass judgment on the whole exhibition until an opportunity is afforded of seeing the remaining portion lit up by the Lontin lights, when—including the Brockie light at the Cannon Street Station—five different methods of lighting by the carbon arc will be visible in London in close proximity to one another; but at the present time it must be acknowledged that the honours fall to the Anglo-American Company for the beauty and steadiness of their light.

All that has been said above must be considered as the preliminary observations which any careful observer of the present exhibition would make before attempting to decide upon the import of the whole thing as illustrating a possible means of lighting the busiest thoroughfares of a great city, in substitution for gas. As our epigrammatic neighbours across the Channel have aptly put it, illumination is one thing, lighting is another. It has been decided in Paris that the electric light, as there shown, is illumination—splendid, dazzling it may be—but not lighting. Upon careful consideration of the necessities of foot and vehicular traffic through the cramped streets of this City, it must be granted by an impartial observer that the present experiment in the line of thoroughfares from Blackfriars to London Bridge affords further proof of the truth of the French saying. The quality of street lighting must be valued by the amount of light received in the darkest part of the road. The fairness of this principle can scarcely be called in question. This being granted, we are free to maintain that, as far as can be judged without precise measurement, the amount of light available on the footpath in Whitehall, between the new gas-lamps recently erected by Mr. Sugg for The Gaslight and Coke Company, is equal, if it does not slightly exceed, the degree of illumination to be observed in a similar position with reference to either the Siemens or the Brush electric lamps in the City. Small and not particularly clear print of a type one size smaller than is ever used in the JOURNAL, is readable in both cases, and therefore it may be conceded that such lighting is quite good enough for streets where, as in this country, people are not in the habit of sitting or standing to read the newspapers. But if gas and electric lighting are to be credited with equal power under these circumstances, further consideration of the method in which the power is in each case supplied points incontestably to the superiority of gas. It will not be denied that, for all purposes of vision, an area dimly but uniformly lighted is preferable to one dotted over with powerful lights, at such intervals that no part of the field illuminated is absolutely darker than the darkest of the former. So in a thoroughfare lighted in its darkest parts equally well by gas and electricity, the strain on the eyes of a passenger, caused in the latter case by constant changes between a glare of light and semi-darkness, is much more distressing than when, as at this time in Whitehall, the same wayfarer may walk from one end of the street to the other without being made painfully aware of the means by which his steps are lighted. From the point of view of omnibus drivers and others, who, while passing along a street at a quick pace, must, in our narrow streets, and from their elevated position, be continually exposed in an especial degree to the worst effects of electric street lighting, it is very easy to believe that the experiment in the City may not be hailed as an altogether unmixed blessing. But considerations of this kind can only be fairly weighed after a duly prolonged experience of the advantages and disadvantages of the new system. The experiment is now fairly launched, and must be allowed to go on to the appointed end. If we were so fond of prophesying as some of our electrician friends, we might be more fully disposed than we really are to indulge in anticipations of the end. We are more inclined to wait for results than to predict them, either on the promptings of our hopes or fears. In any event, the termination of an experience in methods of street lighting, as we hope and believe, will not be an occasion for either undue exultation or despondency on the part of those who, while looking on street lighting as an important branch of business, yet draw the greater portion of their revenue from other sources.

THE MEETING OF THE COMMERCIAL GAS COMPANY.

THE half-yearly general meeting of the Commercial Gas Company, held on Friday last, was, without much apparent necessity, somewhat more animated than usual. There was nothing to complain about in the general state of the Company's affairs—in fact, there was never a time in the history of the undertaking when it held such a good position as now. The report, however, contained so many matters of direct personal interest to a number of the Proprietors present, that a somewhat lively discussion sprang up, and, although the Directors eventually held their own, this result was perhaps greatly due to the fact that a declaration not contained in the report itself was made by the Chairman in reference to a subject in which a number of Shareholders present took a lively interest. It will be remembered that at the last general meeting it was resolved to provide for the retirement of Mr. Robert Jones, the Company's Senior Engineer, upon the usual conditions. The Directors, on Friday, chose to bring forward, for sanction by the meeting, an arrangement for the commutation of the annual pension then voted, and at the same time to announce their intention to reduce their own number, without stating whether they proposed to place Mr. Jones upon the Board or not. It must be agreed that, apart from the policy of availing themselves of the experienced counsels of their former Engineer, courtesy to an old and faithful officer should have prevented the Board from appearing to desire his exclusion from a usual honour. Hence the small flutter of excitement in the meeting was excusable, and it was extinguished when the Chairman announced the unison of the feeling of the Board with that of the Proprietors upon the matter. This was the only cloud over an otherwise pleasant meeting, and it is to be regretted that the slight reticence on the part of the Chairman, or the unhappy phraseology of the report, should have caused even the semblance of a disagreement with reference to a necessarily delicate matter.

A METHOD OF EXTENDING THE CONSUMPTION OF GAS.

THE Directors of the South Shields Gas Company having fully entered upon a policy of selling gas as cheaply as possible, appear disposed to go farther, in the direction of assisting the consumption of gas for cooking and heating, than has yet been observed elsewhere. The Company have recently issued a circular to their customers and the public, pointing out the reductions that have been made in the price of gas, and directing attention to the fact that apparatus of all kinds for the use of gas for domestic or trade purposes are lent on hire to consumers. In addition to this, it is announced that the Company will undertake to make all necessary alterations in the pipes and fittings of their customers, in order to enable gas-stoves and apparatus to be used to the best advantage, or to lay new service-pipes, if necessary, free of charge. The advantage of this liberal policy will, we are assured, be great and immediate to both parties. It is an evident truth that many persons, otherwise willing to rent gas-stoves, do not care to incur the expense of the necessary connections, especially when the premises occupied are only held on short terms. Or in other cases it frequently happens that a connection is badly made by a plumber, at a cost to the householder exceeding that at which the Company could afford to connect a thoroughly satisfactory supply. Proper connections to gas-stoves are, of course, of the first importance in regard to the efficient working of the apparatus, and this duty may well be undertaken by the Companies supplying the stoves, at a generally small expense, which may be covered by an inappreciable increase in the rental of the stoves. In all respects the example of the South Shields Gas Company is deserving of the earnest attention of all who are interested in the work of popularizing the use of gas.

A BASELESS CLAIM.

FOR an example of the way in which Gas Companies are exposed to the designs of unprincipled persons, a recent action against the Londonderry Gaslight Company, a report of which is given in another part of the present number, may be mentioned here. It appears that in consequence of a settlement in a road, one of the Company's services, which, with questionable propriety, was of cast iron, had been broken, and some gas consequently leaked into a drain-pipe belonging to a house in the neighbourhood. The leak was found and was in course of repair, when two women, mother and daughter, living in a house near the place where the men were at work on the pipe—but not the house to which the drain in question was connected—raised an alarm of suffocation by gas. No gas could be detected by other inhabitants of the house, nor

could the Company's officials find any at the time or subsequently. The *soi-disant* sufferers, however, sued the Company for £10 damages, although it is certain that application to the Company in a different spirit would have met with a liberal response, irrespective of the question of right. On the principle involved the Company were, of course, obliged to take their stand, and the result was a decision by the City Recorder in their favour, so that the attempted imposition was wholly defeated, the complainants having no evidence in support of their claim.

THE SUMMER INSTRUCTIONS OF THE METROPOLITAN GAS REFEREES.

THE notification of the Metropolitan Gas Referees for the ensuing summer has just been issued, and is slightly different, in the matter of the standards of purity of the gas supplied by the various Metropolitan Gas Companies, to any previous document of the kind. Something like uniformity in this respect has been aimed at in the new regulations, but not quite attained. In the last Winter Instructions, the Referees expressed their intention of abolishing at this time the distinction hitherto observed between town and suburban works. The actual result now arrived at is the levelling up of the maximum allowance of sulphur to seventeen grains per hundred cubic feet in gas supplied from all stations of The Gaslight and Coke and Commercial Companies, and the allowance of twenty grains of sulphur per hundred cubic feet in the South Metropolitan Company's gas, in view of the necessity for alteration in the purifying apparatus at several of the manufacturing stations recently acquired by this Company. There is yet only one testing-station for the South Metropolitan district, the contemplated additional stations not being even mentioned in the present notification. The alterations in the maximum allowance of sulphur are, of course, of little practical moment, as the Companies have been always well within the requirements of former regulations, and, except on the question of principle, the South Metropolitan Company could afford to waive all special claims to official consideration. The rule as to ammonia remains unaltered, the maximum permitted being still four grains per hundred cubic feet.

Water and Sanitary Affairs.

THE remarks which we offered last week as to the apparent want of readiness on the part of the Government to deal with the Metropolitan Water Question, seem to be fully warranted by the reply which has been addressed on behalf of the Home Secretary to the Vestry of St. John-at-Hackney. The said Vestry passed a resolution some few weeks ago in favour of the constitution of a Water Authority to deal with the water supply of the Metropolis, and sent a copy thereof to the Home Secretary, at the same time asking for an interview to be granted to a deputation. The reply given was that the recommendation contained in the resolution should be "carefully considered;" but the Secretary of State "regrets" that, owing to the pressure of public business, he will be "unable to receive the deputation as desired." If there was any prospect of a Bill being introduced to deal with the question, it would seem inevitable that a statement to that effect should have been made on this occasion. If the Home Secretary is still giving "careful consideration" to the details of his measure, he cannot be supposed to contemplate very speedy action. The slow progress of the parliamentary machine is doubtless sufficient of itself to cause the loss of a session. But, in addition, it is quite probable that Sir W. Harcourt finds the water problem a little more difficult to deal with than he expected.

Lieut.-Col. Bolton, in his report on the Metropolitan Water Supply for the month of February, offers a stern rebuke to the indiscreet analyst who described the water supplied by the West Middlesex Company as having the colour of "urine yellow." We commented on the circumstance when the report first appeared, and Lieut.-Col. Bolton pronounces a censure much stronger than that which we ventured to make. The untoward expression occurred in the report of the Society of Public Analysts for the month of February, and we were certainly very much surprised that the Editors of the *Analyst* should have permitted such a phrase to appear. Lieut.-Col. Bolton suggests that the reporters in the publication referred to should use the same terms as those employed by Mr. Crookes, Dr. Odling, and Dr. Tidy in their joint report, to define the degree of tint depth. "This," says the official Water Examiner, "would at least give some uniformity,

"and prevent the use of sensational expressions, which in the name of common sense, and in the interest of the public, must be strongly protested against." Lieut.-Col. Bolton also suggests that the reporters in the *Analyst* should add to their other particulars the date and place when and where the respective samples were collected.

Mr. Crookes, Dr. Odling, and Dr. Tidy have presented to the President of the Local Government Board their third monthly report on metropolitan waters, the period being for the month ending March 19. They notice a great improvement in the supply since the date of their previous report, the suspended matter having sunk to an insignificant amount, and being, as a rule, entirely absent. In reference to the somewhat vexed question as to the colour of the water, they have devised a new and ingenious method, which it is hoped will lead to greater accuracy of observation. Two hollow prisms, one filled with a brown solution, and the other with a blue, are made to slide over each other until the tint is obtained which corresponds to that of the water as seen in a two-foot tube. The thickness of each prism at the central point traversed by the light is indicated by a graduated scale, representing millimetres. Thus on Feb. 21, the colour of the New River Company's water corresponded to 20 millimetres of brown, and 21 millimetres of blue solution. Whether the two colours brown and blue are sufficient to represent all the tints which water assumes, is perhaps a question. We read in some reports of water being "greenish yellow," as in the case of the Trafalgar Square fountains. Still the idea is good, and we may see it improved upon. It is curious that the water of the Chelsea Company is reported "clear," with 27 of brown and 26 of blue, while the water of the Lambeth Company is "slightly turbid," with only 10 of brown and 30 of blue. Again, the Grand Junction water is "clear" with 22 of brown and 28 of blue; while "very slightly turbid" with 15 of brown and 25 of blue. In no instance is a water reported as "turbid," which would mean that a trace of suspended matter was noticeable. In three instances the water was slightly turbid, in 21 "very slightly," and in the remaining 144 all the samples were "clear." In reporting on the results for the month, Mr. Crookes and his colleagues state that these "leave nothing to be desired in respect of efficient filtration, wholesomeness, or complete aëration."

The report of the Society of Public Analysts for the month of March gives the analyses of English public water supplies for forty-eight towns, together with the Metropolis. In addition, we have this month the first instalment of a periodical series of analyses of water as taken from the sources of supply, the present example being the seven deep chalk wells of the Kent Company. Corresponding tables relating to the supplies of other Companies will be published from month to month, as the results can be obtained. With reference to this new feature, it is observed that many Companies have various sources of supply, sometimes as many as eight or ten, and although the Society cannot at present undertake to publish the reports of all these monthly, yet it is hoped that an occasional analysis of each will throw much additional light on the causes of the variations in the character of the water as delivered, and may in some cases lead to the condemnation and abandonment of a bad spring or well. The Kent waters vary in their hardness, the supply from Plumstead being nearly three times as hard as that obtained from Shortlands, the comparison being made after boiling. The Plumstead well also has the highest proportion of chlorine. The water of the Crayford well had heavy traces of phosphoric acid. Among the provincial supplies, we find King's Lynn having water which, when viewed in a two-foot tube, had the appearance described as "dirty yellow, opaque," the deposit containing bacteria and diatoms. The water when heated to a temperature of 100° Fahr. had the smell of decayed vegetable matter. At Portsmouth the water was turbid, the deposit including vegetable *débris*, diatoms, and infusoria. At Wolverhampton the water was very turbid, with heavy trace of phosphoric acid, the deposit showing amorphous vegetable *débris*, *amœbæ*, diatoms, &c. In more than twenty cases the microscopic examination of the deposit is reported to have been "satisfactory," and in several others there was nothing really objectionable.

A decision given last week in the Queen's Bench Division of the High Court of Justice, as reported in another column, shows how peculiar are the traps and pitfalls which beset the path of a Water Company. During the severe frosts of the recent winter, complaint was made that the Companies failed to put up a sufficient number of stand-pipes. The East London Company, however, have good reason to consider that

it is possible to put up one too many of these contrivances, and that, on the whole, the fewer they have of them the better. During a severe frost which prevailed in the latter part of December, 1879, this Company erected a stand-pipe for the convenience of the public in a particular part of Walthamstow. By the interference of some unknown parties—probably children—the stand-pipe was pulled up, the water escaped from the plug-hole, the surface of the road became damaged by the flow of water, and ultimately a quantity of ice was formed. In the evening a banker's clerk, in attempting to cross the road, sprained his ankle in one of the ruts, and finally tumbled down upon the ice, breaking the small bone of his leg. The accident was a lamentable one, the unfortunate clerk being confined three months to the house, and kept away from work for another three months, besides being permanently injured. A special jury decided that the plaintiff had a right to receive compensation from the Company, and gave a verdict for £200. Certainly this affords small encouragement to Water Companies to provide accommodation which they are under no legal obligation to afford. The pulling up of the stand-pipe and the escape of water was another instance to be added to many others, in which the public authorities fail to give that protection to the stand-pipes which might properly be expected. The co-operation of the police in this respect was greatly wanting during the terrible frost of January last, and was commented on by at least one of the daily papers.

Extensive works for the purification of the sewage of Hanley have just been opened with due ceremony. The discharge from the main outfall sewer is first of all received into four reservoirs, where it becomes mixed with finely-powdered lime. Being raised by engine power, the sewage then passes through a series of four high-level tanks, the heavy matter settling down, until as the sewage leaves the fourth tank it is apparently clear from all impurities. At this point it is conveyed through drains on to the surface of a sewage farm, twenty-three acres in extent. Arrangements are also being made for sending an overflow into the River Trent direct. The entire cost of the works and the land is stated to be £62,000, and it is hoped that the complaints of the Duke of Sutherland and others as to the pollution of the Trent will thus be obviated. The solid matter will have to be cleared out from the tanks every morning, and from the reservoirs once a week.

A STUDY ON GASHOLDER CONSTRUCTION.

THE printed Proceedings of the Seventh Congress of the Société Technique de l'Industrie du Gaz en France, recently issued, contains a very elaborate memoir, by MM. Monnier and Thibaudet, upon the "Construction of a Telescopic Gasholder," which gained for its authors the prize of 1000 frs. awarded by the Society. With reference to this memoir—which, so far as it relates to matters of general interest, is reproduced hereunder—the Report of the Committee of the Society contains the following remarks:—

The authors first open up the question of gasholders from a general point of view. They establish the proportion that should exist between their capacity and the production of gas, and discuss the best type for adoption; then, concluding in favour of the telescopic form, they present, in great detail, the study of a gasholder of this class recently constructed at the Marseilles Gas-Works. They also explain the rules upon which the principal dimensions of the work have been decided. First considering the tank, they establish the proper formula for the calculation of its strength of resistance, they determine the coefficients of resistance to tension for various mortars and for sheet iron (for the case of a sheet-iron tank has been examined, although the comparison of price has led to the adoption of a tank wholly of cement concrete for the wall, and of hydraulic lime concrete for the dome). Considering, then, the telescopic bell, the authors study the dimensions of the structure, the thickness of the sheets, and calculate with great minuteness the arrangements for guidance, in order that they may resist not only the strains of ordinary working, but also the stress of the most violent wind. Lastly, the authors describe in a most complete manner the execution of the work, giving lists of prices; they also detail the materials employed and the tests to which they were subjected, and explain the precautions taken, and every particular of the construction.

In presenting the work of MM. Monnier and Thibaudet in an English dress, some preliminary explanations may be necessary. It will be observed that the metric system used by the authors has been retained, except where its reduction into English notation has appeared specially desirable. So much of the calculations are merely proportional (wherein the units employed are immaterial), that the simplicity of the metric system could not be interfered with except at the risk of destroying the value of the memoir.

MM. Monnier and Thibaudet begin their "study" by observing that the proportion between the capacity of gasholders and the production of gas may be thus determined: The production of gas should be as regular as possible, but as, at the same time, the requirements of the consumption are very variable, a work should have gasholder capacity sufficient for storing—(1) the excess of the production over the consumption, during the time when the latter is slower than the former; (2) a certain reserve of gas for the purpose of compensating for accidental variations in the rates of consumption

or production, which reserve should, with prudence, be made equal to 20 or 25 per cent. of the daily production. If now we make—

V = the total working capacity of the gasholders of a work,
 Q = the average daily production during the month of December,

θ = the time during which the production exceeds the consumption,

q = the total consumption during the time θ ,

we shall have—

$$V = \frac{Q}{24} \theta - q + 0.25 Q;$$

$$\text{or } V = Q \left[\frac{\theta}{24} + 0.25 \right] - q$$

Whence, in works wherein $Q = 60,000$ cubic mètres, $\theta = 17$ hours, $q = 20,000$ cubic mètres, V must be taken at 37,500.

Form of Holder to be adopted.—The total capacity of the necessary gasholders having been settled, the principal dimensions of those structures must be found. In the case of an extension of existing works, preference is given to a single holder, the cost of which is generally less than that of two holders of equal combined capacity. On the contrary, in the case of a new establishment, preference is more often given to a system of double gasholders, in order to lessen the consequences of possible accident to one of them.

Is a gasholder to be single-lift or telescopic? The authors do not hesitate to express their preference for the second type, because of the economy which is thereby possible in relation to a construction of given capacity. In the case of holders of larger dimensions, the use of the telescopic type permits of the realization of a notable economy even in the metallic portion, besides the economy in excavation, &c., of the tank.

Method of Construction.—The capacity and type of gasholder being settled, the principal dimensions of the work are determined with special reference to local circumstances of site, &c. The principal points to be discussed are—(a.) *Construction of the Tank:* Masonry (ashlar stone, brick, rough walling, concrete) in hydraulic lime or cement. Metal (cast or sheet iron). (b.) *Construction of the Holder:* Gasholder in two or more lifts. Interior framing (fixed, or forming part of the holder). (c.) *Guide-Framing:* Masonry, wood, cast or wrought iron. Pulleys, tangential or normal. (d.) *Inlet and Outlet Pipes:* Fixed or jointed. (e.) Lastly, in some cases, construction of the building necessary to enclose the holder, for shelter from frost and snow. Without entering upon all the considerations respecting the construction of gasholders in general, the authors now proceed to treat of the example at Marseilles.

The tank was required to have a diameter of 40 mètres (131.2 feet), the curb being on the same level as the existing holders, and the tank being of equal depth. Three methods of construction were studied in a manner permitting of an exact conclusion being drawn respecting them. These were—(1) Bricks in cement; (2) concrete with hydraulic lime; (3) wrought iron. The guide-framing was to be in wrought iron, with guide-channels extending to the bottom of the tank. The holder was to be telescopic, in two lifts, to rise no higher than the existing holders. It was also required to give a pressure of at least 200 mm. (about 8 inches) of water. The guide-carriages were designed on the tangential system, with the addition of a middle roller, acting normally, and intended to assure the stability of the holder during stress of wind. The holder was to carry internal or external brackets, intended to stiffen it against the action of the wind, thus causing the suppression of fixed supports in favour of trussing carried with the dome. The inlet and outlet pipes were to be of the articulated system adopted by the Paris Gas Company.

TANK.

Internal Dimensions.—The internal dimensions of the tank follow the given requirements. Its diameter is 40 mètres (131.2 feet), and the height of the wall is 8.5 mètres (27.9 feet), the working depth of the water being 8 mètres (26 ft. 3 in.), as in the existing tanks. The thickness to be given to the revetment of the tank is to be deduced from a knowledge of the internal dimensions, and the strain which it is called upon to resist.

Formula for Calculating the Thickness of the Wall.—The tank being a cylinder with continuous wall subjected to pressure from within, it is unnecessary to consider the weight of the shell as an element of resistance, for this weight evidently cannot be exerted except when the vertical wall begins to turn upon its external edge—which is supposing that the wall has been previously ruptured in one or many vertical lines, and therefore that the staunchness of the tank has been destroyed. It is needful, therefore, to calculate the thickness of the wall solely from the point of view of its resistance to tension under the influence of internal pressure, whether it be a tank of masonry or of metal.

The thickness of the wall has been calculated by the formula of Lamé (*Théorie mathématique de l'Elasticité des Corps solides*), viz.:—

$$\epsilon = \rho_0 \left[\left(\frac{A + P_0}{A + 2P_1 - P_0} \right)^{\frac{1}{2}} - 1 \right] \quad (1)$$

in which—

ϵ = the thickness of the vertical wall (in mètres).

ρ_0 = the interior radius of the tank (in mètres).

A = the maximum tensile strain (in kilogrammes per square mètre) to which the material of the structure may be subjected.

P_0 = the internal pressure (in kilogrammes per square mètre).

P_1 = the external pressure (in kilogrammes per square mètre).

From this formula we may deduce the important fact that for every kind of material there is a limit to the interior pressure, beyond which it cannot rise, whatever thickness may be given to the cylindrical wall. This limit is $P_0 = A + 2P_1$, and corresponds to an infinite thickness. If we designate the proportion $\frac{P_0 - P_1}{A + P_0}$ by α , the equation (1) may be expressed in this form—

$$\epsilon = \rho_0 \left[\left(1 - 2\alpha \right)^{-\frac{1}{2}} - 1 \right]$$

If α is very small—that is to say, if the difference between the internal and external pressures, or the effective pressure, is a small fraction of the coefficient of resistance of the material—the quantity $(1 - 2\alpha)^{-\frac{1}{2}}$ developed, may be reduced to its two first terms—namely, to $1 + \alpha$, and we then have—

$$\epsilon = \rho_0 \left(\frac{P_0 - P_1}{A + P_0} \right) \quad (2)$$

Formula for Calculating the Thickness of the Dome or Dimpling Floor.—The dome floor must have a strength such as to be impermeable to water, and to be able to resist any permanent or accidental stress which may be brought upon it. In comparing the thickness given by good designers to the domes of masonry tanks of different depths, it becomes evident that the condition of staunchness is fulfilled by giving the dome a thickness which is perhaps sufficiently expressed, in terms of the depth of water, by the following empiric formula:—

$$\epsilon = 0.30 \text{ m.} + 0.05 H \quad (3)$$

where ϵ = the thickness of the floor in mètres; H = the head of water over the floor.

When the subsoil of the locality of the tank is wet, it is necessary to reckon the force which the water may exercise underneath the bottom of the tank when empty. From this point of view the most reasonable shape to be adopted for the bottom is that of a spherical dome with its convexity upwards, and as high as possible. This cupola form has the further advantage of offering greater resistance to pressure from above than a plane floor, in cases where the subsoil is not very solid. A flat ring or trench is, of course, left between the wall and the commencement of the rise of the dome. The thickness to be given to the spherical flooring is thus calculated (Lamé):—

$$\epsilon = \rho_0 \left[\left(\frac{2(A - P_0)}{2A - P_0 + 3P_1} \right)^{\frac{1}{2}} - 1 \right] \quad (4)$$

in which—

ϵ = the thickness of the dome floor (in mètres).

ρ_0 = the inner radius of the sphere.

A = the maximum tensile strength of the material of the tank.

P_0 = the pressure upon the interior surface of the sphere (in kilogrammes per square mètre).

P_1 = the pressure upon the external surface of the sphere (in kilogrammes per square mètre).

The equation (4) may be put in the form—

$$\epsilon = \rho_0 \left[1 - \frac{3}{2} \left(\frac{P_0 - P_1}{A + P_0} \right) \right] - \frac{1}{2}$$

When the proportion $\frac{P_0 - P_1}{A + P_0}$ is a small fraction, the binomial may be developed to the second term, and the equation (4) then becomes reduced to

$$\epsilon = \frac{1}{2} \rho_0 \frac{P_0 - P_1}{A + P_0} \quad (5)$$

that is to say, to the half of the limit of thickness found for the cylindrical walling, under the same conditions.

(To be continued.)

IN reference to the report, published last week, of the Jurors in Section III.—meters, governors, &c.—of the Exhibition of Gas Apparatus, held last autumn, under the auspices of the Philosophical Society of Glasgow, we understand that, at the meeting of the Executive Committee of the Society on the 29th ult., it was agreed to remit the report to a Committee for consideration. The report, as we printed it, must not, therefore, at present, be considered to be final.

At the half-yearly general meeting of the Alliance and Dublin Consumers' Gas Company, held on Thursday last, the usual dividends at the rate of 10 and 7 per cent. were declared, and a balance of £3979 was carried forward. A report of the proceedings will appear in our next issue.

Mr. F. D. MARSHALL, Assistant Engineer to the Brentford Gas Company, has recently been appointed Engineer to the Danish Gas Company, and will leave England this week for Copenhagen to take up his new duties. The Danish Gas Company, as some of our readers are aware, have works in nine or ten of the larger towns in Denmark, their chief station being at Fredericksberg, Copenhagen. On Thursday last the employés of the Brentford Gas Company met to say good-bye to Mr. Marshall, and to wish him success in his new home. In the absence of Mr. Frank Morris, the Engineer, Mr. Faulkner, the senior foreman, presented Mr. Marshall, as a souvenir of his Brentford experience, with a handsome oak chest of silver goods, and a gold bracelet for Mrs. Marshall. The expressions of respect and goodwill with which the presentation was accompanied were heartily endorsed by the assembled workmen, and it was not their fault if Mr. Marshall left in any doubt as to the very friendly and cordial estimation in which he is held by them. Mr. Marshall's professional friends are by no means all resident in Brentford, and his future success will be looked for and welcomed by many who know his ability and appreciate his many attractive qualities.

Notes.

A RUST-PREVENTING PROCESS.

A new method of protecting the surface of iron from rust has been brought forward by Mr. Ward. The new "inoxidizing" process, as it is termed, consists in combining a silicate with the metal by the aid of heat. Cast or wrought iron objects are first coated, by painting or dipping, with a silicate glaze, which quickly dries, and the articles are then passed through a furnace, or rather oven. In this way the silicate composition is said to be fused and absorbed into the metal, which upon cooling is found to have assumed a dull black appearance. The coating is said to be so far homogeneous with the metal as to protect it from any change from long exposure to the atmosphere; and at the same time the silicate is not liable to disintegrate or separate from the iron. The articles treated in this manner may be ornamented by combining the silicate wash with any vitrifiable colours. Thus smooth-polished, coloured surfaces may be produced upon iron, which, while possessing features distinct from ordinary enamelling, yet present superior and more durable results than those obtainable by ordinary painting and varnishing.

A REFRACTION PHOTOMETER.

Herr F. Fuchs suggests a novel kind of photometer which is said to be practicable to some extent, as it is decidedly ingenious. Two prisms of the same glass, and of the same refraction angle, are united at their large faces in such a manner as to form a prism lozenge-shaped in plan. Two similar surfaces are to be illuminated by the two sources of light, the equality or difference of which is to be determined, and these surfaces are to be fixed parallel to two faces of the compound prism, in such a way that their intersection is in the plane of the separation of the two prisms. The eye is to be placed behind the double prism, but at no great distance, so that one of the lighted surfaces can be seen through the prisms and the thin sheet of air which separates them, while the other surface is visible by reflection at the surface of the same sheet of air. As the sheet of air constitutes a plane symmetrical to the whole system, two points of the lighted surfaces, proportionately symmetrical to the sheet of air, send to the eyes rays which follow a symmetrical path up to that plane, but beyond this point the direct and the reflected rays cover each other (supposing the sheet of air to be very thin), and thus enter the eye. If these two points in question are of equal luminosity, the losses by reflection and absorption are the same for both rays up to the sheet of air, beyond which the fraction of the first ray transmitted is complementary to the portion reflected, and the intensity of the mixed ray is equal to the intensity of one of the two incident rays. It is now to be observed that the angle of the two prisms is equal to the limited angle of the yellow rays for the kind of glass employed. Thus a ray falling normally upon the entering face is entirely reflected; therefore, all the rays to the left of the normal ray are wholly reflected, while rays to the right of the same ray are partially transmitted. In the case of the surface seen by transmission, the left half of the field will be completely obscured, the right half will be moderately bright, and between these two portions will be observed a coloured band with red as the predominating tint, showing that the violet rays are first reflected. For the surface seen by reflection, the half of the field corresponding to the totally reflected rays will be quite light, the other half less bright, and between the two a coloured band with a bluish-green tint. But the two images are superposed in the eyes; hence, as the reflected and transmitted rays are complementary to each other, if the luminous intensity of the two bundles of rays are equal, the field will appear uniformly lighted, and the coloured band will be invisible. If the two intensities are unequal, a part of the field corresponding to the reflected rays will be uniformly lighted; the other will present refraction images.

CO-OPERATIVE HEATING AND LIGHTING.

Mr. B. H. Thwaite, in the *Builder*, brings forward anew the proposal to carry out the work of heating and lighting the houses in a district, and also providing power and facilities for general domestic work, from a central station. He proposes to generate heat in Siemens generators situated in a special building. These generators would heat directly the tubes containing air and steam for warming. The steam, at a pressure of 35 lbs. per square inch, would be carried to every house in the district, where it could be utilized in coils for warming apartments or in stoves for cooking. The baking would be done by steam, all labour involved in bread-making being performed by machinery. The arrangements for washing are to be equally economical, the great labour of washing, squeezing, and mangling being done by machinery, by power supplied by a Corliss engine, which would also drive the electro-dynamic machines. These machines are to give out energy, which is, of course, to be used for lighting the neighbourhood as well as doing all the domestic dirty work. These establishments are to be managed by companies, vestries, or corporations, and it is suggested that every householder would pay a fixed tariff in proportion to the requirements of his establishment. Mr. Thwaite says, in conclusion: "When this suggested concentration arrangement is carried out, the public will then fully appreciate all the blessings derivable from the modern brilliant discoveries in science, instead of, as now, merely reading of them before a smoky fire, in an atmosphere vitiated by a coal gas light, rendered necessary by a still greater nuisance—a black, suffocating fog—filling the atmosphere with sulphur, and preventing the passage of the warm and invigorating rays of the sun."

CRANSTON'S DEEP ROCK BORING MACHINE.

A highly interesting operation is at present being carried on by the Hartlepool Gas and Water Works Company at West Hartlepool—viz., the sinking of a series of deep bore-holes through the magnesian limestone which abounds in the locality, and is somewhat difficult to bore, on account of the extremely hard and irregular nature of the strata. The object for which the boring is being pursued is to obtain an additional supply of water for domestic service in consequence of the rapidly increasing area of the district of the Hartlepoons. Previously this work has been effected by hand labour; but the Directors of the Company, desirous of keeping pace with the requirements of the district, determined, on the representations of their Secretary (Mr. T. Trehwitt), to obtain a much larger supply than that afforded by the small holes hitherto put down; and their Engineer (Mr. T. Mossman) was instructed to take the matter in hand. After a careful consideration of the subject, it was decided to employ the steam apparatus known as the Cranston deep-boring machine, which is now in most satisfactory operation. Steam is supplied to the boring engine by a pipe 340 feet long, connected with the water-works boiler. The whole arrangement is very simple, consisting of a steam-engine gearing to a centre crank-shaft, to which is attached a pulley, working to about 120 revolutions per minute. This pulley is connected with a counter-shaft pulley, by belting running at three to one. The counter-shaft pulley is provided with a cam roller, which operates on a long spring-arm lever, raising and lowering it at each revolution. At one end of this lever an adjusting link and chain is attached (over the bore-hole). The bore-rods are screwed to the adjusting link, and, as the spring-arm lever is caused to vibrate up and down, with a rod and boring-tool attached, the rod is slightly rotated and fed forward by the man in charge, in the following manner:—The hole (which is 6 inches in diameter) is bored, by a series of blows, with an amazing degree of simplicity and rapidity. Water is conveyed to this hole by 1-inch wrought-iron piping, 320 feet long; and as there is a regular pressure of 50 lbs. to the square inch, the *débris* or mud accumulating at the bottom of the hole, as the rock is being pounded up, is washed or forced out by the flow of water taken from one of the Company's reservoirs. There is also a crab-winch, or derrick, provided, and by this means the bore-rods can readily be withdrawn and re-inserted. The rods are made from 1½-inch wrought iron, in lengths from 1 ft. 6 in. to 12 ft. each, with screw joints. The boring tool is made entirely of steel, its shape being similar to the letter X. This tool makes a perfectly round hole, which is a great advantage where tubing is required. The entire apparatus has been inspected, at work, by a number of engineers, the inventor—Mr. J. G. Cranston, of Newcastle-on-Tyne, who has supplied the machine—being present to explain its capabilities. All expressed themselves highly satisfied therewith; and the Hartlepool Gas and Water Company's Directors, who have purchased the machine, are in every way pleased with its successful operations.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. W. COWAN'S GAS-GOVERNOR.

SIR,—I observe in your issue of the 29th ult. a letter having reference to my recently patented invention for improvements in gas-governors. In reply thereto, permit me to say that I was perfectly acquainted with M. Giroud's system, and only lament that he does not see the difference between his plan and my own, the latter being, in my opinion, far simpler and far more useful, inasmuch as it is capable of being adapted to existing governors. What M. Giroud says in reference to compensating for the altered weight of the bell, when more or less immersed, is so well known and provided for here when necessary, that it is needless to take up your space with a description.

Edinburgh, March 31, 1881.

WILLIAM COWAN.

EXPRESSING THE PURIFYING CAPACITY OF GAS-WORKS.

SIR,—The figures by which Mr. Greville proposes to express the proportion which the bulk of purifying material of each kind bears to the bulk of gas to be purified may prove very useful. By taking the make per minute, he brings down the bulk of gas operated upon below the bulk of purifying material; and it furnishes a particularly clear conception of the relation in question to figure to oneself that the smallest proportion that would be used of any purifying material is about equal, in bulk, to the volume of gas passing through it each minute, while the largest proportion is about seven times this volume. If the make per minute can be established as the standard for comparison, a complete account of the proportion of each purifying agent will be given by saying, with tacit reference to this standard, that its bulk is 2, or 5·5, or as the case may be.

"Contact-time" cannot well be used as the name for these figures, since the actual time of contact is considerably less than the number of minutes they represent. The times calculated by Mr. Greville are the times in which each minute's make of gas would pass through the space occupied by the purifying material if there were no purifying material there. But since the grains of purifying material fill part of this space, only a part is left for the gas moving through, and it has to move quicker, shortening the contact-time.

Oxford, March 31, 1881.

A. VERNON HARCOURT.

A MANAGER writes: "Will some of your kind readers give me the formula for test acid as used in estimating the strength of ammoniacal liquor by alkalimetry?"

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION, 1881.

PROGRESS MADE TO SATURDAY, APRIL 2.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Commons Bill	March 29				
Alnwick "Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 8	March 28	..
Barrow-in-Furness Corporation Bill.	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
Beverley "Water Bill"	Commons	Jan. 27	Jan. 28	Feb. 2	..	..	..
Bingley "Water and Improvement	Lords	Feb. 4	Feb. 7	Feb. 15	March 22	..	..
Bill	Commons	Commons Bill	March 25				
Birkenhead Corporation (Gas and	Lords	Jan. 27	Jan. 28	Feb. 2	March 11	March 24	..
Water) Bill	Commons	Jan. 31	Feb. 2	Feb. 7	March 24	..	..
Bradford Water and Improvement	Lords	Jan. 27	Jan. 28	Feb. 4	March 18	..	..
Bill	Commons	Feb. 18	Feb. 18	Feb. 25	..	..	..
Bray Township Bill	Lords	Commons Bill	March 15				
Brighton and Hove Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 14	March 3	March 14	..
Cambridge University and Town	Lords	Commons Bill	March 11	March 21	March 22	March 25	..
Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
Cheltenham Corporation Water Bill.	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Cleator Moor Local Board Bill . . .	Lords	Jan. 27	Feb. 7	Feb. 14	March 15	..	..
Colne and Marsden Local Board Bill.	Lords	Jan. 28	Jan. 28	Feb. 3	March 15	March 21	..
Dudley "Gas Bill	Commons	Lords Bill.	March 28				
Dundalk "Water Bill	Lords	Commons Bill	April 1				
Eastbourne Water Bill	Commons	Feb. 2	Feb. 3	Feb. 15	March 22	March 31	..
East London Water "Bill.	Lords	Jan. 28	Jan. 31				
Egremont Local Board Bill.	Commons	Jan. 27	Jan. 28	Feb. 15	March 22	March 31	..
Fylde Water Bill	Lords	Jan. 27	Jan. 28	Feb. 2	..	..	..
Goole and District Gas and Water	Lords	Commons Bill	March 31				
Bill	Commons	Jan. 27	Jan. 28	Feb. 9	March 18	March 29	..
Hexham Gas Bill	Lords	Commons Bill	March 31				
Holland (Parts of) and Sutton	Commons	Jan. 28	Jan. 31	March 2	March 18	March 29	..
Bridge Water Bill	Lords	Jan. 31	Feb. 2	Feb. 7	March 22	March 31	..
Hyde Gas Bill	Commons	Jan. 28	Jan. 31	Feb. 14	March 25	..	..
Irvine Burgh Bill	Lords	Jan. 31	Feb. 2	Feb. 7	April 1	..	..
Kirkcaldy and Dysart Water Bill . .	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
London Sea Water Supply Bill . . .	Lords	Jan. 28	Jan. 31	March 14	..	..	..
Lower Thames Valley Main Sewer-	Commons	Jan. 28	Jan. 28	Feb. 1	Preamble	not proved.	..
age Board Bill	Lords	Commons Bill	April 1				
Matlock Water Bill	Commons	Jan. 27	Jan. 28	March 2	March 22	March 31	..
Oban Burgh Bill	Lords	Jan. 28	Jan. 28	Feb. 1	March 11	March 22	..
Paisley Water Bill	Commons	Lords Bill	March 25				
Reading Corporation Bill	Lords	Commons Bill	March 22	March 31	..	..	..
Richmond Gas Bill "	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Ryton Local Board (Water) Bill . .	Lords	Commons Bill	March 25	Feb. 7	March 15	March 28	..
Sevenoaks "Gas Bill"	Commons	Jan. 31	Feb. 2	Feb. 7	March 15	March 24	..
Sheffield "Water Bill	Lords	Commons Bill	March 22	Feb. 2	March 15	March 21	..
South Metropolitan Gas Bill	Commons	Jan. 31	Feb. 2	Feb. 21	March 31	..	..
Stalybridge Extension and Improve-	Lords	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
ment Bill	Commons	Jan. 27	Jan. 28	March 4	..	..	..
Stirling Water Bill	Lords	Jan. 28	Jan. 31	Feb. 7	March 15	..	..
Westbury-upon-Trym Gas (No. 1)	Lords	Jan. 31	Feb. 2	Feb. 7	..	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 4	..	..	..
Westbury-upon-Trym Gas (No. 2)	Lords	Jan. 27	Jan. 28	Feb. 7	..	..	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 7	..	..	..
Westgate and Birchington Gas Bill.	Lords	Commons Bill	March 24				
Woking "Water and Gas Bill	Lords	Jan. 28	Jan. 31	Feb. 7	March 11	March 22	..
"	Commons	Jan. 28	Jan. 31	Feb. 7	..	..	..

HOUSE OF COMMONS COMMITTEE.

MONDAY, MARCH 14.

(Before Mr. J. G. TALBOT, Chairman; Mr. H. SAMUELSON, Mr. ROSS, and the MARQUIS OF TAVERHAM.)

BRADFORD WATER AND IMPROVEMENT BILL.

(Continued from p. 526.)

The next part of the Bill taken into consideration was in regard to the extension of the borough; and this raised the question upon which the Clayton, Allerton, and Thornton, the Shipley, and the Pudsey Gas Companies opposed.

As before, Sir EDMUND BECKETT, Q.C., Mr. VAUGHAN RICHARDS, Q.C., and Mr. LITTLE, Q.C., appeared for the promoters. The petitioners against the Bill were represented as follows:—Mr. MICHAEL, Q.C., and Mr. BALFOUR BROWN for the Clayton, Allerton, and Thornton Gas Company; Mr. MICHAEL, Q.C., and Mr. JEUNE for the Pudsey Gas Company and the Pudsey Local Board; Mr. BODDER, Q.C., for the Leeds and Liverpool Canal Company; Mr. CLERK, Q.C., and Mr. O'HARA, for millowners and others; Mr. VENABLES, Q.C., and Mr. SHREWS WILL, for the Shipley Gas Company; and Mr. GRUBBE for the Calverley District Water-Works Company.

Sir E. BECKETT said the part of the Bill he proposed to open now was that relating to the extension of the borough into two adjoining townships. The Tyersal part of the extension was, however, the only part that was opposed; and it was opposed by the Pudsey Local Board, but not by the Tyersal people themselves. The local Gas Companies also objected, and their objections not only applied to the Tyersal part of the extension, but to the rest. The real objection of these latter petitioners was to certain customers being lost to them, and to their buying gas from others who could supply it more cheaply. The promoters had, however, no desire to compete with these Companies. There was usually a difference in the price of gas between a borough and places outside; but if the places now in question were incorporated with the borough of Bradford, the Corporation would never have any peace until they supplied the outer people with the gas at the same price as the inner.

Mr. J. H. COZ, the Borough Surveyor, was then called to depose to the advantages likely to accrue to the districts proposed to be incorporated, especially from a sanitary point of view.

Alderman E. WEST, the Chairman of the Finance and General Purposes Committee of the Corporation, said he had been Mayor of the borough. There had been some difference of opinion in the Council on the subject

of these incorporations; but it was owing to their having originally proposed to take in Shipley, Clayton, and Thornton. This they did not now propose. Heaton would be some expense; Allerton he did not think would be much; and Thornbury and Tyersal would not eventually cost the borough anything. The Shipley Gas Company had the right to light the whole of Heaton, but they did not do it. The only opposition in respect to Heaton came from the Company, and, with regard to Allerton, the only opposition was from the Clayton, Allerton, and Thornton Gas Company. The borough did not ask to prevent the Companies supplying gas; but it would not be fair to the inhabitants of these districts to say that the borough should not be allowed to supply them with gas at the same rate as the Bradford people. If the people in the districts proposed to be incorporated had to pay the higher rates of the borough, they should share all the advantages of connection with the borough, amongst which was cheaper gas.

Mr. VENABLES (in cross-examination): By your Bill, you propose to take power absolutely to ruin the Shipley Gas Company, without giving a shilling of compensation?

Witness: I cannot say exactly what the effect of the Bill will be; but the Company can reduce their charges for gas.

But whatever they reduce its price to you can by the aid of the rates undersell them?—The ratepayers would object to gas being supplied at the cost of the rates.

Mr. MICHAEL: You resolved to incorporate only those districts which would be profitable to Bradford in the future?

Witness: We struck out those districts which would have involved us in immediate expense.

By the Bill you will be able to compete with all these Companies in the supply of gas?—Yes.

That is contrary to the practice of Parliament?—We obtained something like these powers in our last Act. We are willing to give compensation.

I do not know about compensation. Are you willing to have the gas limits struck out of the Bill?—No; but we are willing to give compensation.

By Mr. GANE: The people of Tyersal were strongly in favour of incorporation.

Both Mr. MICHAEL and Mr. VENABLES objected to Mr. Gane's cross-examination, as it was, they said, really carried on in favour of the Bill.

The CHAIRMAN said a cross-examination upon a cross-examination was rather stretching a point.

Mr. MICHAEL said cross-examinations must of necessity be hostile.

The CHAIRMAN remarked that he had never heard of friendly cross-examination before.

Mr. VENABLES said that if it had been contemplated that a petitioner would support a Bill, Parliament would have allowed another petitioner to object to the *locus standi* of any petitioner who was acting in collusion with the promoters, and was probably going to get his expenses paid by the promoters.

Mr. GANE said the Tyersal people had given instructions, and were represented there at their own expense.

The CHAIRMAN said Mr. Gane's questions must be founded on the examination-in-chief.

Witness, in reply to Mr. GANE, stated what he knew of the complaints of the Tyersal people.

By Mr. GRUBBE: The Corporation were quite willing to settle with the Calverley Water Company. The Company had a monopoly of supplying for 12 years. The compensation offered by the Corporation did not include prospective profits. If the borough was extended so as to include Thornbury and Tyersal, the people of these places could be supplied with water by the Corporation. When the agreement with the Calverley Company was renewed, the price charged for water sold to the Company was raised. No doubt the inhabitants of Tyersal would want the Corporation to supply them with water.

Re-examined by Mr. RICHARDS: The Company was only a sort of tenant of the Corporation for 12 years. The Corporation now offered the same clause as Parliament in 1873 thought should satisfy the Gas Companies. Heaton was only a small portion of the district supplied with gas by the Shipley Company. It had Shipley, Idle, Baildon, and Esholt besides.

Mr. S. C. Hirst, Mr. W. A. Whitehead, and Mr. T. Stead, inhabitants of Tyersal, were next examined as to the advantages likely to accrue to the district if the proposals of the Bill were carried out.

Mr. Joseph Smith, recalled and examined by Mr. RICHARDS, said it was important to Heaton on sanitary grounds that it should be incorporated with Bradford. There was a decided majority of the people in favour of it. Heaton was part of the Shipley Gas Company's district. The rating of the Company in Shipley was £1120; in Idle, £120; in Baildon and Esholt, about £150; and in Heaton, £21. Heaton was not a very important part of their district. There was a part of the Shipley Company's district—Sandy Lane Bottom—which was lighted by another Company—the Clayton, Allerton, and Thornton Company. The general desire in Heaton was to be annexed to Bradford, in the hope, among other things, that Bradford would afterwards supply them with gas. The Bolton clause, which had been offered to the Shipley Company, was, in his opinion, a fair one.

Cross-examined by Mr. VENABLES: He knew there was a revision of rates going on in Heaton, and there might have been an increase of the Company's assessment above £20. Heaton desired annexation on sanitary grounds, and if they had to pay the increased rates they thought they ought to have the benefit of cheap gas. If the Bill passed, the property of the Gas Company would not be confiscated. The Company would get, under the Bolton clause, fair compensation.

Mr. VENABLES: Can you point out anything to entitle the Bradford Corporation to come in and compete with the Shipley Gas Company?

Witness: Bradford ought to be allowed to supply the Heaton people with gas, but ought to give the Shipley Company compensation under an arbitration clause.

Mr. VENABLES: Are you aware that the clause offered is not an arbitration clause?

Sir E. BECKETT: I beg your pardon.

Mr. VENABLES: By an arbitration clause I should understand a clause which allowed an arbitrator to say what should be paid; but by this clause he would be prevented from taking everything into consideration.

Witness repeated that if the compensation was fixed by arbitration the Company ought to be satisfied.

At the close of this witness's examination,

The CHAIRMAN asked if this concluded the case for the promoters, as the Committee understood that case very well.

Sir E. BECKETT said he wished to call some Engineers.

TUESDAY, MARCH 15.

Mr. G. W. Stevenson, examined by Mr. RICHARDS, said that, having read the Bolton clause which the promoters offered to the Companies in the Bill, he considered it a very fair offer.

Sir E. BECKETT remarked that since the previous day he had discovered

that the Bradford Corporation had at present powers of competing in these districts.

Mr. VENABLES replied that if the Corporation had the power now they did not want it in the Bill.

Witness said the clause now offered was analogous to that sanctioned by Parliament in 1863. It was the same sort of clause as had been passed in the case of Over Darwen. There was no account taken in that case of prospective profits.

In answer to the CHAIRMAN, witness said he would not, if he were an arbitrator, take into account prospective profits either in the case of gas or water companies.

In reply to Mr. ROSS, witness said 25 years' purchase was paid in the case of Over Darwen.

Mr. H. E. Jones said that he also had read the Bolton clause, and considered it was a fair clause to offer to the Gas Companies now opposing the Bill. He did not, however, think compulsory purchase was just.

Sir E. BECKETT observed that he might as well at once state that he did not propose to insist upon compulsory purchase. The promoters would modify the 30th clause of the Bill thus: "It shall not be lawful for the Corporation to supply gas in the added districts within the gas limits of either of the Companies until the Corporation shall, by writing under the hand of the Town Clerk, have offered to such Company to purchase, by agreement, or arbitration under the Land Clauses Acts, the pipes and mains laid for the supply of gas by such Company in the said districts, and including the profits arising to such Company from the gas at present supplied in the said districts, through the said pipes and mains, and if the said Company shall accept such offer, the Corporation shall be bound to make such purchase accordingly."

Mr. VENABLES considered this clause as objectionable as the first. His learned friend did not, he said, seem to consider it compulsion to hold a pistol at a man's head and ask for his money. If he did not insist upon a compulsory clause, he had better tear up this one as well as the other.

Cross-examined by Mr. VENABLES, witness said he did not think there was any fear of the Corporation lowering the price of gas below cost in order to kill the Companies. This would be a fraud upon the ratepayers. The Companies ought to be able to manufacture gas as cheaply as the Corporation, and thus to compete with them on equal terms.

By Mr. BALFOUR BROWN: There would be some hardship in taking away the most populous part of the Clayton, Allerton, and Thornton Company's district; and if the best part of the Pudsey Company's district were taken away, it would be a disadvantage to the Company.

Re-examined by Mr. RICHARDS, witness said it would be hard on the Tyersal and Thornbury people to have, after their incorporation with Bradford, to pay more for their gas than the Bradford people.

The CHAIRMAN: Do you not think the Company ought to have better terms than it would have if the proposed competition were to be between it and another Company?

Witness: I do not see the difference between competition between two companies and between a company and a corporation.

You do not attach any importance to the power that the corporation has of drawing upon the public purse?—There is something in that.

Do you think it is right to take into account prospective profits?—I should take into account prospective profits where the company was absolutely to be absorbed, but where they have the option of going on in competition to secure these prospective profits I should not. I assume that there is no compulsory purchase in this Bill.

Mr. VENABLES: Is this new clause not compulsory?

Witness: It gives the option of competition. Besides, the Corporation do not go into these districts for your gas profits; they go in for other purposes.

Mr. RICHARDS said this concluded the case for the promoters of the Bill.

Mr. VENABLES then addressed the Committee on behalf of the Shipley Gas Company. He said this was not a mere question of price; his opposition was founded on the circumstance that the Company could not possibly go on in competition with the Corporation, but would be obliged to sell, and that when they came to sell they were to go before an arbitrator subject to this condition, that nothing was to be allowed for prospective profits.

The CHAIRMAN asked if there were in the Bill any actual words affirming this.

Mr. VENABLES said there were. Even the proposed new clause contained the words that the price was to be based on "the profits arising from the gas at present supplied in such districts." Now, the consumers of gas and the ratepayers within the borough had one and the same interest. The consumption of gas might not in all cases be in equal proportion to the rates paid, but the difference would not be such as to make it worth while to distinguish between consumers of gas and ratepayers. The Corporation need not supply gas in the places they proposed to absorb for municipal purposes. There was no connection between the management of drains and sewers and the supply of gas; and the Bill, if passed as it stood, would not only do great injury to the Company for whom he appeared, but would unsettle the whole course of such legislation. The proposal of the promoters was only comparable to the offer of Griffith's valuation.

Mr. F. J. Bramwell, examined by Mr. SHIRESS WILL, said he had seen the Shipley Gas-Works, which were sufficient for more than the supply of the district, and were in very good order. He had made an analysis of the records of gas sales from 1876 to 1880. The increase per cent. over the whole area, including Heaton, was 15 for five years, or 3 per cent. per annum. The increase in Heaton separately was 145 per cent. in the five years, or about 30 per cent. per annum. The gas supply was likely to increase in Heaton at a greater ratio in future, as Heaton was a residential suburb of Bradford. The Bill as it stood contained a proposition very much worse than compulsory acquisition. It did not propose to take the whole works and pay for them, but to take the right of supply in the best of the Company's district, and compete with them by the aid of the rates. He believed, indeed, that the Shipley Company might be ousted altogether from the incorporated district under the existing Act possessed by Bradford. There was nothing in the Bill to force the Corporation to charge equal rates over the whole of the borough, and they might charge less in the districts where they desired to stifle competition. The Corporation were not required to make any profit on their gas, and on the other hand they were not limited to any profit; hence in succeeding years they might make up by high charges for the losses sustained by low charges whilst they were putting down competition. He could not see why the powers of the Corporation should include the supply of gas amongst the sanitary purposes they had in view in the extension of the borough. The price actually charged, after the discount was taken off, by the Shipley Company was 3s.; while by the Corporation the net charge was 2s. 11d. per 1000 feet.

By Mr. BALFOUR BROWN: He had visited the works of the Clayton, Allerton, and Thornton Gas Company, and had found them ample for the supply of their district. If Allerton was included in Bradford for gas supply, it would cut off the connection of the mains of the Company with Wilsden. The increase in the supply of gas in the whole district of the

Clayton, Allerton, and Thornton Company had, during the past five years, been 16 per cent., or $8\frac{1}{2}$ per cent. per annum. In Allerton alone the increase had been 25 per cent. in the five years, or 5 per cent. per annum. He believed a more profitable future was in store for the Company. Allerton was the most prosperous part of the district.

By Mr. JEUNE: The increase in the sales of gas in Thornbury and Tyersal was nine times as great as in the rest of the Pudsey district. The works of the Pudsey Company were fully sufficient for the supply of the whole district. Thornbury and Tyersal were the cream of the district. If the Pudsey Company were left alone, a great decrease in the price of gas was inevitable, because the maximum dividend had been reached; but if Thornbury and Tyersal were taken away this could not be done; and the rest of the district would suffer.

Cross-examined by Sir E. BECKETT, witness acknowledged that the discounts shown to have been allowed by the Bradford Corporation in the price of gas were greater than he had imagined. He knew of no case in which a Parliamentary Committee had sanctioned such an iniquity as was here proposed, which would be fatal to all statutory companies.

Sir E. BECKETT: Suppose the Corporation engaged not to charge a lower price in the annexed districts than in the main borough, how would it be fatal to the Companies to allow the Corporation to compete with them?

Witness: It would diminish the number of the Companies' consumers, and therefore their revenue, while their outlay would continue the same.

You say they ought to have prospective profits; but what are they to do with them when the Companies have reached their maximum dividends? How can selling at their present profits be fatal to the Companies?—It would be fatal in this sense, that the price of gas throughout the rest of the district would have to be kept up.

How would that hurt the Shareholders, or be fatal to the Companies?—I may have used an incorrect term; but it would be fatal to the rest of their districts.

By Mr. MICHAEL: If the profitable parts of the districts are taken away, the maximum profits would be taken away?

Witness: Certainly.

The CHAIRMAN: You said the Shareholders cannot get more because they are getting their maximum dividends?

Witness: I said it on the assumption that the remainder of the Companies' districts might be sufficient to give the maximum dividends.

Mr. George Vint, the Chairman of the Shipley Gas Company, examined by Mr. VENABLES, said his Company were now paying maximum dividends, and when their reserve was filled up, as it would be soon, they would have to reduce the price of gas to the consumers in the district. The township of Heaton was a most important part of the district; it was a suburban residential locality. Good dwelling-houses were more profitable to a gas company than mills, because mills only burned during a limited time, and in periods of bad trade they did not burn anything. In his opinion the Company could not compete with the Corporation. Whenever the Corporation came the Company must retire. Indeed, he had been given to understand by the promoters that they could not be content to be in the same locality with the Company.

The CHAIRMAN asked who had told him this?

Witness could not say; but he had stated his impression.

Examination continued: The Corporation could sell gas at a less price than the Company, and when the Company had been compelled to retire the Corporation could reimburse themselves by raising the rates. The Company had no wish to part with their property at all. They wanted to be left alone. As they could not compete with the Corporation, they would be obliged to sell, and this amounted to compulsory sale. When the Company parted with their Bolton district they were not properly compensated by the Corporation. But the loss of Bolton was not to be compared with the loss of Heaton.

Cross-examined by Mr. RICHARDS: The Company did not care much for Bolton; yet they fought stoutly in both Houses of Parliament against its being taken by the Corporation. He did not believe the Company would ever be satisfied unless the promoters paid them an extraordinary price. They wanted to keep their property. They began to pay a dividend of 10 per cent. in 1860. For two years in the interval they had paid $8\frac{1}{2}$ per cent. In the rest of the years up to 1880 they had paid 10 per cent., and last year they paid the amount free of income-tax. This was paying more than 10 per cent.—their maximum dividend. Their suspense account consisted of undivided profits not put into the reserve fund. If the two had been put together the reserve fund would have reached to more than the legal amount.

Re-examined by Mr. VENABLES: When the Company parted with Bolton they had 37 customers. In Heaton there were now 383; but the Bolton houses were not so good as the Heaton ones. The suspense account was in coals and stores, and the money they had received as compensation for places they had parted with. They had 1874 customers in Shipley; but there were many cottages there.

By the CHAIRMAN: One small portion of Heaton was supplied by another Company.

Mr. VENABLES here stated that he had procured the original Act possessed by Bradford with reference to the supply of gas, and he found that Sir E. Beckett had been entirely wrong in saying that the Corporation had no right to compete with any of the Companies in their present districts.

Mr. T. Hawksley, examined by Mr. MICHAEL, said he had read the Bill of the promoters, and the meaning of it was that it would give the Corporation power to steal their neighbours' district.

Mr. MICHAEL: It would enable the Corporation to use the public funds in competing with private enterprise?

Witness: Yes.

Sir E. BECKETT: This is a letting down from "stealing."

Examination continued: Private capital could not compete with public funds. Powers of compulsory purchase had never been given to a corporation against a company in the way here proposed. Though the Shipley Company had long paid maximum dividends, the Clayton, Allerton, and Thornton Company had a great amount of arrears of dividend to make up, and never could do this if Allerton, the best portion of the district, were taken away. Assuming that the Committee thought fit to extend the borough, there was no reason why violent hands should be laid on the local Gas Companies. Gas Companies existed in London, Edinburgh, Dublin, Liverpool, Sheffield, and Newcastle-upon-Tyne, as well as in many other places, and got on harmoniously with the Corporations. The fact that Bradford already supplied their present districts would not alter the situation. The Companies could not compete with the Corporation, because the latter could sell gas cheaper; and so they would suffer by the extension of the borough.

Sir E. BECKETT: How are the Companies to suffer if they are already paying their maximum dividends, and if their districts that will remain to them will keep up their maximum dividends?

Witness: In many ways. They will be prevented from extending their profitable concerns.

But these will not be the existing Shareholders?—Yes, they may.

But in respect of future shares?—Certainly.

But we are dealing with the value of the present shares. These have already reached the maximum dividends?—Yes.

WEDNESDAY, MARCH 16.

At the commencement of the proceedings to-day, The CHAIRMAN said: I have formally to announce that the Committee have determined, so far as the gas question is concerned, that the preamble of the Bill is not proved.

Mr. RICHARDS: May I remind you that you have decided without allowing us what is our privilege, the right of reply?

Mr. MICHAEL: And I have not yet had an opportunity of speaking in favour of two of the Companies.

Mr. RICHARDS: But you have obtained a decision in your favour.

The CHAIRMAN: I thought we might so far shorten the case in stating the conclusion to which we had come.

Mr. RICHARDS: Pardon me for saying that you were not justified in depriving us of our right of reply.

The CHAIRMAN: I think we now come to the clauses of the Bill.

Mr. MICHAEL, however, reminded the Committee that the opposition of the Pudsey Local Board to the borough extension was not yet disposed of. This matter was then gone into, after which

Mr. GRUBBE stated the case for the Calverley Water Company against interference with their right to supply Thornbury and Tyersal. This Company, he said, entered into an agreement in 1863 to purchase water from Bradford for the supply of Thornbury and Tyersal, as well as other places; and, on the faith of this agreement, the Company laid out a large amount of capital. In 1879 the agreement was renewed, and had yet 12 years to run. But Bradford heightened its terms, and consequently the Company had to raise their rents to consumers until now the water-rates in Thornbury and Tyersal were higher than those in Bradford. He claimed that the Company had a right, not only to be compensated for the loss of the profits they at present derived from Thornbury and Tyersal, but for the loss of prospective profits during the remaining 12 years on increased plant.

Mr. RICHARDS admitted the facts, but contested the right of the Company to compensation in respect of prospective profits on more than the existing plant.

The CHAIRMAN suggested that they might provide for a reference to an arbitrator to give reasonable compensation for the pipes and mains of the Company in Thornbury and Tyersal, and for probable future increase of the revenue therefrom during the remainder of the term; but they might leave out the words "from the existing plant."

Mr. RICHARDS said they might make the reference still more general.

Mr. GRUBBE contended that the arbitrator should receive some direction as to the principle on which he should proceed. He was willing to accept the suggestion of the Chairman.

This was ultimately agreed to.

Much discussion hereupon took place on the question as to whether the Corporation should pay the expenses of the arbitration; but this the Committee left in the hands of the arbitrator.

The CHAIRMAN then intimated that the Committee considered the preamble of the Bill to be proved, so far as regarded the boundaries of the borough.

THURSDAY, MARCH 17.

The arrangement of the clauses of the Bill occupied the whole of to-day. In the course of the conversation on the wording of the clauses relating to the water supply,

Mr. CLERK attempted to re-open the question of the compensation to be given to his clients, contending that they ought to have a guaranteed quantity of water instead of one-third area compensation, with reservoir capacity as fixed by the Bill.

Mr. RICHARDS submitted that the question could not be re-opened, the decision of the Committee to pass the preamble having been a sanction of the Corporation's proposals in regard to compensation.

Mr. CLERK then wished the whole matter to be left to arbitration in the same manner as was provided by the 55th clause of the Bradford Corporation Act of 1854.

Mr. RICHARDS asked whether the Committee had not already settled the point.

After some deliberation in private,

The CHAIRMAN announced that whatever might have been the intention with which he had pronounced the words as to the preamble being proved, they were now satisfied with the main provisions of the Bill, and therefore they did not want to go into the questions which had been raised.

Mr. CLERK asked if the Committee thought that every clause in the Bill had been proved.

The CHAIRMAN did not go so far as this. The Committee were ready to hear Counsel on the details, but not upon points raised on the preamble and decided with it. The question of the overflow water was decided in favour of the millowners.

There was some difficulty in giving effect to the decision of the Committee against the Corporation's proposals with regard to the supply of gas to the districts to be incorporated with the borough. It was ultimately agreed that the following should be inserted as a proviso to clause 20:—"Provided always that the Corporation shall not supply gas within the limits of supply of the Shipley Gaslight Company, the Clayton, Allerton, and Thornton Gas Company, and the Pudsey Coal Gas Company respectively, and nothing in the Act contained shall prejudice or affect the rights of these Companies respectively." The following was also arranged:—"The Pudsey Gas Company hereby agree that, notwithstanding the passing of the Bill of the Corporation of Bradford, now being promoted in Parliament, the Corporation may supply gas to the premises now in the occupation of Mr. Thomas Stead, situated in New Briggate, on Swaine Green, in the township of Tyersal, and other persons, if any, now being supplied with gas by the Corporation, in the said township, without objection on the part or on behalf of the said Gas Company."

The Bill, as amended, was then ordered to be reported to the House.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

WEDNESDAY, MARCH 30.

(Before Vice-Chancellor BACON.)

OTTO V. LINFORD.—THE GAS-ENGINE.

This was an action commenced as long back as July last year by Mr. N. A. Otto, to restrain the defendants, Messrs. C. Linford and Co., of Leicester, from, as plaintiff alleged, infringing certain letters patent, dated May 17, 1876 (No. 2081), granted to his agent, Mr. C. D. Abel, in reference to the gas-engines manufactured by him. The plaintiff's case was that his firm were the first to introduce a cushion of non-combustible gas between the piston and the explosive material in the engine; that

they were the first to draw in, behind a piston, first air, and then air and gas mixed; that they were the first to utilize the heat generated by the explosion in expanding the cushion of air before referred to; and that they were the first to compress a charge by the working piston in the working cylinder, and so render possible the combustion of comparatively dilute mixtures of gas and air. The defendants, besides denying that they had committed an infringement, disputed the validity of the plaintiff's patent on the following, among other grounds—viz., that the first and second claims in the plaintiff's specifications were claims for a principle, and that the mechanical appliances for carrying the principle into effect were not particularly described in the specification; and that the invention had been anticipated by a number of prior patents. The case came on for hearing on the 23rd ult., and occupied the Court for an entire week, a quantity of scientific evidence being produced.

Mr. ASTON, Q.C., Mr. HEMMING, Q.C., and Mr. LAWSON appeared for the plaintiff; Mr. KAY, Q.C., Mr. BRETT, and Mr. H. H. CUNNINGHAM were for the defendant.

The evidence having been concluded, and the learned Counsel having addressed his lordship, the following judgment was delivered to-day:—

The VICE-CHANCELLOR said: I have listened to this case so long, that I think it will be unnecessary that I should add anything to the knowledge I already possess. It seems to me that although a great deal has been said and a great deal of time occupied, the question is one merely of law. As far as I can gather from the facts before me, the first thing I have to consider is whether the specification upon which the plaintiff claims does explain this invention, which Mr. Aston has described in his own words—whether it does sufficiently inform the public of the nature of the invention upon which the plaintiff relies. In proceeding to inquire into this, I must ascertain what was the state of public knowledge at the time the plaintiff took out his patent, because the cases which have been referred to in the House of Lords and before other tribunals all recognize the same principle. It is merely common-place to say that a man who proposes to secure to himself the advantages of a monopoly in the shape of a patent must make a full disclosure of the invention which he claims, and the means by which his invention is to be carried into practical effect. He must prove that it is new; in the words of the statute, that it is "a new manufacture"—elastic words, no doubt, which have very extensive application, but at all events he must prove that it is new. Well, is it new? It is not a new discovery that a gas motor engine may be made by which the combustion of gas in air will perform an office similar to that which the expansion of steam does by working a piston, giving power to work other machinery. Barnett's specification, which has been referred to, contains a distinct enunciation of this principle and that invention. He says: "My invention consists in certain methods of producing and employing as a prime mover the explosive or expansive force of certain inflammable gases, as hydrogen or carburetted hydrogen gas, mixed with oxygen or atmospheric air in such proportions as to form an explosive mixture, the various proportions and explosive force of which are well known to chemists generally." I must assume, then, that the whole world knew—I believe, in point of fact, they knew it long before, but I must assume from the date of Barnett's patent that the whole world possessed that knowledge—that by a mixture of carburetted hydrogen with atmospheric air there could be obtained a vapour in its nature explosive, and that, by its explosion, motion could be given to machinery. This we have to start with. Barnett, moreover, says: "The operation of this engine is as follows:—If the cylinder be considered as charged when the piston is in the position shown in the drawing, and that the piston is ascending, by the time the piston completed its ascent, the contact of the platina"—which is the material employed—"with the explosive mixture, aided by the compression of the latter"—the explosive mixture produced by the ascent of the piston, which by nature and by the laws of nature it will do—"causes the mixture to ignite and explode, and the sudden and powerful expansion of the gases thus produced impels the piston to the bottom of its stroke." This, in my opinion, is a full and complete description of what the plaintiff calls his invention. It shows the thing that is to be done; it shows the means of doing it; and after this had become public property I do not think any patent could be sustained for making a piston in a cylinder move by means of the explosion of atmospheric air and carburetted hydrogen. But this is not all. The patent of Johnson seems to me to cover the whole subject of the discussion before me. Johnson in his patent says: "The invention consists in the application and use of an inflammable gas mixed with a proper proportion of atmospheric air, and ignited inside the cylinder, the expansion thereby produced acting upon the piston and imparting motion thereto, which will be transmitted by means of a shaft," &c. "Suitable means are employed for admitting atmospheric air into the cylinder; and along with this air there is also admitted, by means of a pipe employed for the purpose, a supply of ordinary lighting or other inflammable gas or vapour." [His lordship then quoted from Johnson's specification the parts referring to the introduction of atmospheric air, and the mixture of air and gas, into the cylinder.] Now what has been most insisted upon in the course of the arguments before me—and the most liberal interpretation is given to the words of the plaintiff's specification—is that the great invention upon which he relies is that he introduces a quantity of atmospheric air, which by ascending in the cylinder impinges upon what is called the cushion—the residual of combustion which has before taken place, and after this comes in the mixed atmospheric air and gas, upon which the combustion takes place. There the very words are, "a supply of air will have already entered the cylinder." It goes on: "The slide opening one of the orifices, the gas and air both enter the cylinder, but without becoming entirely mixed together, and will exist in the space behind the cylinder in distinct strata." Then after describing the slide and the electric spark being produced, it says: "The gas explodes and heats the air and its combination, which expand considerably, and the pressure produced operates on the piston so as to force it to the opposite end of the cylinder." Then, that there may be no doubt about the supply of air, it says: "The object of introducing the supply of air into the cylinder before the gas is allowed to enter is to neutralize the effect of the carbonic acid gas formed by the combustion of the first portion of the inflammable gas, as the carbonic acid gas without being thus neutralized might prevent the ignition of the remainder of the inflammable gas." No words can describe what the plaintiff calls his invention more perfectly than those words do. In the examination of witnesses it was admitted that Johnson's invention, as he specifies it, is in substance the same as that of the plaintiff; but the witnesses say Johnson's machine is not workable, and thereupon I have an argument addressed to me that as the defendant has not proved that Johnson's machine was workable, therefore not only is Johnson's patent bad, but, what is much more to the plaintiff's purpose, the knowledge conveyed to the public in the words I have read is not available by the public for public use. It is not necessary for the defendants to prove what Johnson did or did not with his engine. It is like the case of Strutt's wheel. No doubt the decision in that case would be applicable if this was a plaything—a mere attempt to make a machine which had utterly failed, and had been thrown aside; but another man, who never saw it, or heard of it, makes a wheel of his own, and the man says: "My right is not to be invaded because this plaything was made

use of sometimes in the road, and sometimes to take things to the farm, and then thrown aside, and never used by anybody." It is not in the slightest degree like that. Here it is: To all whom it may concern—all who want to make gas motor engines—know all men from this moment that by the means which Johnson describes, the end which Johnson shows is attainable will be perfectly attained, and in the course of it separate supply of air is one of the ingredients and the main feature in the invention, and which Johnson insists upon. Can I say that any man who avails himself of this knowledge which Johnson's specification conveyed to him is not entitled to use it? What is there in the plaintiff's specification which would induce me to believe—as, if I adopted what Mr. Aston has addressed to me, I must be bound to believe—that the plaintiff said: "Now, people before this have made atmospheric gas motor engines; they have all blundered about it. I have invented quite a new thing; it has occurred to me, and I have tried and proved, and I now demonstrate, that by letting in some cold air or pure atmospheric air first then you can perform the combustion which others knew and invented, and which I have a right to use." There is no such thing said in the plaintiff's specification; the plaintiff nowhere claims to be an inventor of anything. He says: "In making a gas motor engine this is the process which I adopt;" and he describes a process perfectly identical with Johnson's—not a particle of difference between them. The pith and marrow of Johnson's specification is adopted by him, and because he lets in a quantity of cold air, or atmospheric pure air, independently of the supply of mixed atmospheric air and combustible gas, therefore he says he is entitled to hold this as a perfect invention, and in the terms of his first claim, which is the thing upon which the arguments have principally turned, he says: "I claim admitting to the cylinder a mixture of combustible gas or vapour or air, separate from a charge of air"—which was exactly what Johnson had done—"or incombustible gas, so that the development of heat or the expansion or increase of pressure produced by the combustion are rendered gradual, substantially as and for the purpose therein set forth." If the defendant is entitled, as I think he is entitled, to have all the knowledge and apply all the means which Johnson had indicated, can it be said that he is not at liberty to do that which he has done because the plaintiff has claimed in these terms, with Johnson's patent before his face, and with the admission on all sides that Johnson's invention—whether it was capable of supporting a patent or not is a matter of indifference—had shown the very thing which the plaintiff does or tries to do, and which the defendant is accused of having imitated? That he has imitated it is a fact not in dispute; he has done the thing which Johnson describes in his patent, and he has made his engine in a somewhat different form—making a double piston instead of a single piston. Now, what is there in the case but this? The statement of defence puts in issue the validity of Johnson's invention, as far as it would sustain the allegation in the defence that the plaintiff's invention was not new at the time he took out his patent. Unless the words of Johnson's patent can be erased and obliterated, or unless it can be decided that Johnson's machine never was an acting—and I do not think this would be enough—an acting and useful machine, there is no ground whatever for saying that the plaintiff is an inventor. There is no invention in letting in the atmospheric air separately from the combined air and gas. The mode of ignition is the same, the invention is the same, and in my opinion there is no ground whatever upon which the plaintiff can insist that the defendant has invaded his invention, nor is there any ground upon which the plaintiff's patent can be sustained against the defendant. There is another part of the case which I need not refer to very particularly, but upon which, if it was necessary to decide conclusively, I should require some further information. It is admitted that there was an error in the drawing by which the plaintiff shows the means of performing his invention. It is treated very lightly by the plaintiff's witnesses—it is called a clerical error. The defendant's witness, Mr. May, entertains a different opinion, he says it is not what you would expect an ordinary workman to find out and correct. The plaintiff's witnesses say if you read the specification and the drawings together, an ordinary workman might find out the mistake, and might readily supply the correction. I must have much more distinct and positive evidence upon this subject before I admit that as an excuse. It is admitted—and no reason is ascribed for so making it—that the drawing is erroneous; it is misleading. On the other side, I cannot help observing that Mr. Bramwell seemed to think that Johnson's patent misled the reader from the true nature of the invention. I cannot say so; I have read Johnson's specification, which is an extremely plain and distinct document, much more explicit and plain than the plaintiff's specification—and I cannot say that there is anything in it which engenders in my mind the slightest doubt but that Johnson did invent a mode of moving a piston in a cylinder by means of the combustion of atmospheric air and gas, and having first admitted a supply of atmospheric air into the same cylinder, that the invention is fairly and fully described. It might be doubtful whether the principle which the plaintiff relies upon is one that would sustain a patent; I do not find it necessary to go into this; but upon the short ground I have mentioned—that the invention the plaintiff claims is not only in substance, but literally and entirely described in Johnson's patent—I am of opinion that the plaintiff fails in his demand before me.

Judgment for the defendants, with costs.

QUEEN'S BENCH DIVISION.

FRIDAY, APRIL 1.

(Before Justice FIELD and a Special Jury.)

KENNETT v. THE EAST LONDON WATER-WORKS COMPANY.

The plaintiff in this case, a bank clerk, claimed damages in consequence of having fallen, through water having been allowed to flow from a plug-hole during a frost.

Mr. MURPHY, Q.C., and Mr. PHIPSON appeared for the plaintiff; Mr. GRANTHAM, Q.C., and Mr. FINLAY for the defendants.

The case for the plaintiff was that the accident happened on the evening of the 27th of December, 1879. The plaintiff was passing along the footpath of Markhouse Road, Walthamstow, and at the corner of Long-fellow Road he stepped from the path to cross the road. The channel, however, had been deepened by the flow of water, and in stepping down he sprained his ankle. He tried to save himself from falling by struggling across the road, but it was a mass of ice, and he fell, and broke the small bone of his leg. He was for three months confined to the house, was six months away from work, and was permanently injured.

Upon the question of liability there was some evidence to show that there had been want of care in connection with putting up a stand-pipe at the plug-hole for people to get water.

For the defence it was said that everything in connection with putting up the stand-pipe was done in the usual way, and without any negligence on the part of the Company's servants. Afterwards, however, the stand-pipe was pulled up by somebody—probably children—and it was in this way that the flow of water was caused.

The Jury found a verdict for the plaintiff—damages £200.

COURT OF GENERAL ASSESSMENT SESSIONS.

WESTMINSTER.—MONDAY, MARCH 28.

(Before Mr. P. H. EDLIN, Q.C., Chairman, and a Bench of Justices.)

SOUTH METROPOLITAN GAS COMPANY V. ASSESSMENT COMMITTEE OF BERMONDSEY.

The further hearing of this case was resumed to-day.

Mr. WEBSTER, Q.C., and Mr. GREEN again appeared on behalf of the appellants; Mr. WILLIAMS represented the respondents.

The CHAIRMAN said when the case was last before the Court he understood that the accounts presented were based upon the hypothesis that the Company did not contemplate a larger consumption of gas, but they deducted the receipts in respect of gas for the last year, and allowing the difference between 3s. and 2s. 10d. per 1000 feet, they calculated that the same quantity of coal and lime would be required to produce the same bulk of gas, and they carried out the same amount of working expenditure as last year.

Mr. GREEN said he thought the coal required for a similar quantity of gas would be the same, but the Company would get less for the gas.

The CHAIRMAN said he understood the reduction in price would not result in any diminution of the net receipts; that there would be such an increase in the consumption of gas as would be sufficient to recoup the Company in respect of the production, and lead to such an additional consumption as would render the net receipts undiminished.

Mr. WILLIAMS said this was so; the gross receipts would be larger.

Mr. GREEN said the gross expenses would also be larger.

The CHAIRMAN said the gross receipts would be so much larger as to leave the net receipts undiminished. This he understood to be the proposition.

Mr. WILLIAMS said this was the case; low prices were apt to bring a larger return.

The CHAIRMAN remarked that if the price was reduced, and the net receipts remained the same, there must be a consumption sufficiently large not only to restore the gross receipts to the original amount, but to cover the loss to the Company in consequence of the reduction in price, and this was the position which the respondents had taken up.

Mr. Edward Ryde recalled.

The CHAIRMAN: In order to maintain the net receipts, you must not only maintain the gross receipts at the former sum, but they must be larger.

Witness: They must be larger to the extent of the diminution in price, plus the extra material for the manufacture.

They must be sufficiently large to compensate the Company entirely for the diminution in price?—Just so.

Then your account which treats this reduction in price as productive of loss to the Company brings out a net receipt so much less than the reduction in price?—It assumes the same quantity of gas to be consumed on the 1st of January as would be consumed on the 31st of December.

Are you of opinion that the reduction in the price has diminished the rateable value?—The mere reduction in price has not reduced the rateable value.

In your opinion does this reduction in price reduce the value of the rateable hereditament?—No; not trading under this Act of Parliament. A tenant who would be allowed to charge the price the Company charged last year might be reasonably expected to pay a higher rent for the hereditament this year than he might be expected to pay if he was limited to the price charged this year. If they charged the price this year they would overrun the limitation of the Act of Parliament.

You are of opinion that a tenant would give the same for the rateable hereditament as he would have given if there had not been any reduction in price?—No; quite the contrary. A tenant who could charge 3s. per 1000 feet for the gas would give more than if he could only charge 2s. 10d. per 1000 feet.

Does it not follow that the value of the rateable hereditament has been reduced in consequence?—The rateable hereditament remains the same for the purpose of rating. The Company cannot charge the same for gas when they are making a certain profit; the Act of Parliament limits the price. There is a sliding scale. If the Company reduce the price of gas 1d. per 1000 feet, they can pay a higher dividend by $\frac{1}{4}$ per cent. than they could previous to the reduction; if they do not reduce the price, they will have money which they cannot divide, and then the public step in and say the price must be lowered. If the price continues as it is now, it may be that the Company will be able still further to reduce the price of their gas.

You ask us to assume that the reduction in price will produce a diminished revenue?—Yes.

Mr. WILLIAMS says it will not, and that the Company are too shrewd to make such a reduction if they thought it would?—Experience shews that the reduction in price has not produced an increased revenue.

Mr. WILLIAMS said with reference to this very Gas Company, in the parish of Bermondsey in 1879 the receipts were £32,284, and in that year they reduced the price of gas; but, notwithstanding this, in the year 1880 the receipts were £34,536.

Mr. WEBSTER said he did not wish to interrupt, but the comparison was quite erroneous, as one-fifth had been taken off the £32,284 on account of the reduction in price.

Witness: Gas is a thing that cannot be manufactured without certain materials, therefore reducing the price does not reduce the expense of manufacture one bit. There may be a reduction in the cost of production if the residuals sell well. They sold very well last year, but I have given credit for the whole, though the fair thing would have been only to give credit for a portion.

Mr. WILLIAMS said he had to show that the increased consumption would result in such an increased return as not only to cover the deducted 2d., but also to cover the increased user of materials.

Mr. WEBSTER said it would be found from the evidence that the Company actually did contemplate a lower net receipt.

The CHAIRMAN said they contemplated a lower net receipt corresponding entirely with the difference between 3s. and 2s. 10d. per 1000 feet.

Re-examined by Mr. WEBSTER: The total rateable value of the whole works, productive and unproductive, was, upon the 1879 accounts, £99,878, and the corresponding figure for 1880 was £98,350. In order to get at the rateable value of the productive works, we have to deduct the unproductive. Roughly speaking, I have taken the structural value at a million sterling, and putting 5 per cent. as the rateable value, it comes out at £48,816, but this figure does not correspond with the £36,525 given by Mr. Castle. In the parishes of Camberwell and Rotherhithe the assessment was agreed to in one sum for all the Company's property; the net value of the Old Kent Road property being put at £8789. I do not know of any figure corresponding to this; it is a figure I never heard of before. A compromise was effected between the Company and the parish, and the whole assessment was looked at as one; there was nothing put down for the different parties. Rotherhithe is included by Mr. Castle at £6113 net. He gets this by deducting from the total assessment a sum which he says is the value of the mains. I have never heard of the figure £6113 before. I am told that in Lambeth the Vestry Clerk said how much he put upon the mains and how much upon the stations; but I agreed to the sum as a

whole, and never heard of separate figures. If this kind of calculation were to be adopted it would necessitate an inquiry into the actual condition of rating in each parish. It would render it impossible for any surveyor to advise upon the rateable value in any one parish. The only way to value the whole undertaking would be to assume that the unproductive works in the various parishes are properly rated. It would not be a sound or a safe thing to assess the rateable value in the parish of Bermondsey upon a hypothetical estimate that the value of some of the unproductive works in other parishes had been under-stated.

Cross-examined by Mr. WILLIAMS: I made a valuation of the whole of the Company's works and stations. I had the total amount of structural value from the Engineers, their experience being greater than mine.

By the BENCH: I put the capital at a million and a half sterling, one million being spent upon the unproductive works and half a million upon the productive works, and the £100,000 of rental value should be divided by putting £66,667 upon the unproductive part, and £33,333 upon the productive.

Mr. Alfred Penny, C.E., examined by Mr. WEBSTER.

I am a Member of the Institution of Civil Engineers, and have been for many years connected with gas undertakings, and am well acquainted with the practical management of gas-works and with all the minutiae of the accounts. I have seen Mr. Ryde's figures, and, speaking generally, the way in which the working expenses have been put down is correct. I have made my calculations upon slightly different lines, but practically we arrive at the same result. I have reduced the salaries, and have taken out the receipts for meter-rents and the expenditure upon repairs to meters from both sides of the account, as I treat meters as chattels, not rateable. I take the gross receipts at £682,958, which includes £509,381 gas-rental; and for the purpose of ascertaining the rateable value in the present year I have taken the receipts for gas at a sum representing the sale for 1881 at 2s. 10d. per 1000 cubic feet instead of 3s. per 1000 cubic feet as in 1880, for the reason that the rate is not yet made, but it will be made upon the receipts for the present year, and the price of gas for the present year will be, not 3s., but 2s. 10d. per 1000 feet, and I did not consider it would be right to take that which was only intended to guide us—that is, the receipts of 1879 or 1880—when we know that the receipts would be diminished by the alteration of price in 1881. To the £509,381 I add the receipts for residual products £177,420, less £3843 bad debts. This is exactly the same figure as Mr. Ryde gave. In the expenditure I put down as follows:—£21,264 for salaries, against £30,079 as given by Mr. Ryde; £259,130 for coals, £10,287 for lime, £56,048 for wages, £9086 collectors' commission, £4791 office and incidental expenses, £2987 law charges, £4292 directors and auditors, £11,076 lighting, cleaning, and renewing public lamps, and £20,000 for rates and taxes. These sums added together amount to £398,961, which form the working expenses, and this amount deducted from the gross receipts of £682,958 leaves a net receipt of £283,997. If this vast business were in the hands of a tenant, he would require a capital of at least £400,000; that is to say, £135,000 for the purchase of the consumers' meters, and £265,000 for the absolute working of the concern; and according to my experience this would be too small a sum, as my actual calculations, based upon the Company's balance-sheet for 1880, show that £448,000 would be required; but I take the amount for this purpose at £400,000. To this sum I apply the usual 17½ per cent. allowed to a tenant for interest, trade profits, risks, and casualties on the capital employed; this amounts to £70,000, which is the amount a tenant or occupier might expect to receive as interest and profit upon his outlay, and for carrying on the undertaking. This sum deducted from £283,997, the net receipts, will leave £213,997, which represents the gross value, subject only to the further deduction of such a sum as will provide for the ordinary repairs, maintenance, and renewals of the buildings, machinery, &c., so as to keep the premises in a condition to command the rent. For this I take a sum represented by 7½d. per 1000 cubic feet of gas sold—the average expenditure for this purpose by all the London Gas Companies for 1879—that is to say, £3,546,132,000, which produces a sum of £109,339, and to this I add £4000 for insurance, making together £113,339. This deducted from £213,997 leaves a sum of £100,658, which is the rateable value of the whole undertaking, as against £98,350 found by Mr. Ryde. In conjunction with Mr. Spice, Mr. Stevenson, and Mr. Woodall, I made a structural valuation of the whole of the Company's works. For the buildings, manufacturing apparatus, gasholders, and dead mains I put down £976,320, and applying the usual 5 per cent. to this, it comes out at £48,816. The result of these calculations is that after deducting £48,816 for the unproductive works from the rateable value of the whole undertaking, there remains a sum of £51,842 due to the productive part, which gives 10½d. per cent. on the receipts for gas. This applied to the receipts in Bermondsey, £34,536, amounts to a rateable value in this parish of £3519. In the appellants' case, based upon the accounts for 1879, the figure was given at £3220; but I have added to this sum, in consequence of the expressed opinion of the Court as to salaries, &c.

Cross-examined by Mr. WILLIAMS: On the face of the accounts it appears that for 1879 the actual receipts were £32,284, and for the year 1880 they were £34,536, though in 1880 there was a reduction in the price from 3s. 4d. to 3s. per 1000 feet. As a matter of fact there was an increased receipt in 1880 over 1879 of something like £2000; but this does not shake my faith in the anticipated reduction in receipts in consequence of the lowering of the price. The lower the price is reduced the less chance there is of the receipts swelling. It is possible that the result of this reduction of 2d. per 1000 feet will be to decrease the receipts. I think the Company will be very fortunate if they can secure the same receipts at the reduced rate at which they now supply gas. Taking into consideration the reduction of 2d. per 1000 feet, and the increased expenditure in material in order to satisfy the increased consumption, it is not my opinion that the net receipts of the Company will be increased. It is quite a moot point whether the receipts will be maintained at their present level or not.

The CHAIRMAN: You need not trouble yourself further on this point. Having regard to the fact that this is a trading company, it may presumably be supposed that they know what they are about, and that they would not have made the reduction without knowing it would not result in a loss to the Company. We have to consider what a tenant will give from year to year for the property; and the question the tenant would have to consider would be, whether the reduction in the price of gas lowered the net value of the property. As at present advised, the Bench are of opinion that the tenant would think it did not. Of course if the appellants have further evidence they may call it; but Mr. Williams is not asking to increase the net receipts. All he says is that the Bench ought not to assume that the reduction would have the effect of diminishing the net receipts at the disposal of the Company, and so reducing the rateable value. The Bench agree with him so far, and think they ought not to be troubled with further evidence upon the point.

Mr. GREEN said he would put Mr. G. Livesey in the box after the cross-examination of Mr. Penny was completed.

Cross-examination continued: I reduced my figures for salaries, and took out the meter-rents, having regard to the opinion I understood had been expressed by the Court.

The CHAIRMAN remarked that he was not quite sure he was right in expressing the opinion he had done.

Cross-examination continued: I add the receipts from residual products to the gas-rental, but it does not make any difference if the receipts are deducted from the cost of the coal and lime. A tenant would be in possession from day to day of the sum received for residuals, but I have given full allowance for this in my calculation of tenant's capital. I have given evidence on behalf of parishes, and I then adopted the course now taken by Mr. Castle in arriving at the value; but I am of opinion that this is not the proper course.

The Court adjourned for a short time. Upon resuming, Mr. WEBSTER stated that his clients were exceedingly desirous to fall in with the views of the Court, and his attention having been called to the questions put by Mr. Williams, and to the expression of opinion of the Court, he did not think it right to argue to alter this expression of opinion, and therefore he proposed to admit at once that he should not strike off any deduction with respect to the reduction in price in 1880. The figures for gas-rental now stood at £509,381; to this should be added £42,769, making £552,150, and to earn this sum the Company would have to sell a considerable number more thousand feet of gas. The increase of expenditure would be £33,771, making a net gain of £8998, and this had to be added to the rateable value. Although this assumed an increase in the sale of gas of 8 per cent., as a matter of fact the increase was only about 4 per cent.

Mr. WILLIAMS said it did not appear to him that in substance his friend accepted the decision of the Court.

The CHAIRMAN: He meets you half way.

Mr. WILLIAMS thought it was only a third of the way. He might point out one obvious fallacy. His friend said that to earn the increased receipt the Company would have to make so much more gas, but he did not give credit for the fact that the amount to be received from the sale of residuals would be increased at the same time.

Mr. WEBSTER said the Company had increased in every instance the sale of residuals.

The CHAIRMAN asked whether the concession which had been made satisfied the respondents.

Mr. WILLIAMS replied that it did not.

Mr. WEBSTER stated that the gentlemen who advised him in the matter were prepared to give their reasons for the figures. In making the concession, he had gone the full length, and had not even increased the tenant's capital as he might have done.

Cross-examination continued: Having been a lessee of gas-works, I may say it is not usual to purchase meters. I think the meters should be taken at their prime cost, because I cannot understand, when a person becomes a lessee of gas-works, his going about buying second-hand meters. He would necessarily have to put new meters into the consumers' houses, and at the end of 50 years the meters would be, for all practical purposes, as good as new, because a certain amount was expended every year in keeping them in repair and renewing them. I maintain it is not a novelty to take meters at their prime cost. I have heard of the Lee case, but I do not know that the valuation was made by Mr. Ryde, or that the meters were not taken by him at their prime cost. I do not know that one-half of the meters belonged to the Phoenix Company. I have simply valued them as belonging to the South Metropolitan Company. [The witness was then examined at considerable length as to the sum he had allowed for structural value at the different stations.]

Re-examined by Mr. WEBSTER: To enable the Company to produce upon their gas-rental the same receipts at 2s. 10d. per 1000 feet as they received at 3s. per 1000 feet, they would require to make about 8 per cent. more gas, representing in round numbers 300 million cubic feet of gas, and taking the cost of manufacture roughly at 2s. per 1000 feet, it would come out at £80,000 additional expenditure to produce the additional receipts.

By Mr. WILLIAMS: A reduction of 9d. per 1000 feet would stimulate the consumption, but a reduction of 2d. per 1000 feet would not do so to any great extent. I think the increase in consumption from that cause would be infinitesimal now, whatever the reduction might be.

Mr. Corbet Woodall, C.E., examined by Mr. GREEN.

I am a Member of the Institution of Civil Engineers, and have had a great deal to do with gas-works. Until last year I was Chief Engineer to the Phoenix Gas Company. I have made a detailed structural valuation of the Company's stations, &c. I put the buildings, land, &c., at £976,320; the mains at £469,707; meters, £134,509; service-pipes, £50,000; making a total of £1,621,932. I have prepared an abstract of the accounts of the Company, which agrees entirely with that of Mr. Ryde. When we took the figures for 1879 as the basis of the calculation, we were obliged to make allowance for the reductions made in that year, and so in taking the figures for 1880 we were obliged to take into account the further reduction made at the end of that year. In order to maintain the receipts at their former level after the reduction of 2d. per 1000 feet, the working expenses must naturally be increased. If there has to be an additional quantity of gas sold to make up for the sum returned to the consumers in the shape of a reduced charge for gas, the expenditure will go up in exactly the same percentage as that increase. In 1879 the cost of making gas by the Phoenix Company was 2s. 2d. per 1000 feet, and by the South Metropolitan Company 2s. per 1000 feet, so that Mr. Penny was about right in taking 2s. per 1000 feet as the cost of manufacture. Additional capital would have to be employed, and the rateable value of the works would thus be increased, and there would be less to divide among the parishes upon productive mains.

The CHAIRMAN: You say the Company having reduced the price from 8s. to 2s. 10d. per 1000 feet, if there was an increase in consumption it would necessitate an enlargement of the structural works of the Company?

Witness: Unquestionably.

Examination continued: We should want more retorts, &c. It does not matter whether the increased quantity of gas is consumed because of the reduction in the price; any increase in consumption must involve an enlargement of the works.

The CHAIRMAN: When you charged 3s. per 1000 feet were the works so constructed that they did not admit of being used for the purpose of producing a larger quantity of gas?

Witness: All gas-works must have a margin in order to meet contingencies.

Were not these works constructed to meet the possible contingency of a reduction in price and an increased consumption?—The works must be allowed a certain margin to provide for contingencies, such as foggy days; this is a margin constantly available to meet enlargement of consumption; but if you have a consumption from an increased demand, your works must be increased so as to keep up the margin for the other contingencies.

In fact, you use up your margin, and have to get another?—Yes.

You have had three months at the reduced price, have you proceeded to enlarge the works?—The works in the London gas district are always being enlarged. The increase last year of the South Metropolitan Company was 4 per cent., which necessitated a considerable extension to provide for it. Some people see signs of the increase in the consumption of gas not being so great in the future as it has been in the past.

Mr. GREEN: Something was said the other day about the reduction in

price being made to increase the dividend: Just explain the operation of the sliding scale?

Witness: I should like to explain the two systems under which gas companies conduct their business. Parliament gives them certain rights, but in return it requires them to perform certain duties, and one is to supply as much gas as is asked for. A certain price is fixed, and the company are told that if they can earn the maximum dividend at this price they may do so; but if they can make gas more cheaply, then they must reduce the price of gas, as all money earned beyond that required to pay the maximum dividend belongs to the consumers. The South Metropolitan Company are working under the sliding scale; and the same principle holds good, except that it is modified in this way: The Legislature says, "If you can reduce the price you shall increase your dividend." They give a low initial price upon which to work, and then if, by economy, the price can be reduced, the dividend may be increased; but, on the other hand, if a company cannot earn their dividend, and have to raise the price above the initial price, they must reduce the dividend.

The CHAIRMAN asked whether the appellants had many more witnesses to call upon this point.

Mr. WEBSTER replied that he had two other witnesses, but he was bound to say they would only present, in a different way, perhaps, the same story.

The CHAIRMAN remarked that the question to be considered was, given the altered state of things, would a tenant give less for the hereditament in consequence, or would he not fairly base his calculations upon the returns of the last year.

Mr. GREEN suggested that his lordship should put the question to the witness.

The CHAIRMAN said the witness had heard the question, and might answer it.

Witness: He would unquestionably give less, because this reduction takes away so much money, which is clear profit, out of the pocket of the tenant.

Mr. WEBSTER said he was pleased to be able to inform the Bench that the matter need not be further discussed, the parties having agreed upon the following figures:—Battersea, £2900 appealed against, to be reduced to £2200; Bermondsey, £7400 appealed against, to be reduced to £5800; Clapham, £4360 appealed against, to be reduced to £4000; Eltham, £617 appealed against, to be reduced to £540; Lea, £2240 appealed against, to be reduced to £1930; Lewisham, £2502 appealed against, to be reduced to £2200; Mottingham, £37 appealed against, to be reduced to £30.

The CHAIRMAN asked, as there had been a material reduction, what was proposed to be done about costs.

Mr. WEBSTER said there would be no order as to costs, but the deposit would be returned.

OVERSEERS OF GREENWICH V. SOUTH METROPOLITAN GAS COMPANY.

Mr. TICKLE appeared for the appellants; Mr. GREEN for the respondents. Mr. TICKLE said the parties had in this case agreed upon the figures. The rateable value would be £3400, increased from £2600, and the gross value diminished from £3900 to £3800. Both parties would pay their own costs.

Mr. GREEN informed the Court that the remaining cases in which the South Metropolitan Gas Company were concerned had been settled, and the costs would be borne by each party.

The Court then adjourned till the 21st of June.

DERRY CITY SESSIONS.—WEDNESDAY, MARCH 30.

(Before Dr. ELLINGTON, Q.C., Recorder.)

DOYLE V. THE LONDONDERRY GASLIGHT COMPANY.

The plaintiffs in this case, mother and daughter, sued the Londonderry Gaslight Company for £10 damages, alleged to have been sustained by plaintiffs by reason of defendants, through negligence, permitting certain gas to escape, and to continue for a long time to do so, whereby the plaintiffs were severely injured; and for their negligence in not warning the plaintiffs after the escape was discovered; and generally for breach of duty by the defendants, on the premises.

Mr. J. E. O'DOHERTY appeared for the plaintiffs; Mr. M'CORKEILL for the defendants.

Catherine Doyle, one of the plaintiffs, said she lived with her mother, and for some time they had suffered greatly from escapes of gas. The smell was felt mostly when they were in bed, and so bad did it become that they had to leave the house. She accompanied a man to examine the gas-pipes; and he said he could not find the escape. The smell generally started about twelve o'clock at midnight, and continued up to five or six o'clock in the morning. A man of the name of Steele said to witness that if he had known that she was sleeping in the room which she occupied, he would have told her about the escape. She was very ill, and attributed the illness to the results of the escape of gas.

Edward Malarkey deposed that he lived in the same house as the previous witness. On the night of the escape he was sleeping upstairs, and neither there, upstairs, nor in the kitchen was there any smell. On that night he was awakened by the older plaintiff, who said that her girl was dead. Witness got up and went down to the room the plaintiff slept in. The mother could not rise at first, but in about ten minutes she managed to open the door. He got hold of her, and placed her upon a chair. He then went over to the girl in the bed. At that time—between twelve and one o'clock—several men were working at the gas-pipes in the street. Witness went to the door and called the men, remarking that there was a woman in the house who was dying. A man named Steele went in, and the other men came into the doorway.

Cross-examined: He did not know what was the matter when he went into the room. He thought from her general appearance that the girl was dying. He had no gas in the house, and could not explain how the gas came in. He did not find the gas smell at first, but it was very bad for some time afterwards.

For the defence, James M'Mullan said he was in the employ of the Gas Company, and was resident foreman. It was not his duty to look after breakages in the streets, which were attended by men who were engaged in the yard. He, however, received information that there was an escape reported in Bennett Street, about four o'clock on the 17th of January. He went, along with a couple of men, to examine the place. They traced the main, and ultimately discovered where the leakage was taking place. At the time there was a very intense frost, and they had to get the ground thawed by lighting fires, and by the use of warm water. The escape was ascertained to have arisen because of a leakage in the main-pipe leading to a local school. The week following he received information that there was an escape in Doyle's room; but he could not find any escape of gas.

John Steele said he was superintendent of pipes in the employ of the Company, and remembered going over to Doyle's house on the night in question between one and two o'clock. He remembered the witness Malarkey coming to the door and calling that the girl Doyle was dying. When witness went to the door he saw the old woman, and lifted her up. At the time she was calling out that her girl was dead. He went to the girl, and she seemed to be all right; he then told the old woman not to

be frightened, as her daughter was perfectly conscious. Witness felt her pulse, and it was regular enough. There was no smell of gas in the house. Catherine Doyle, so far as he could hear, had been ailing for a very considerable time before. He called at the house about twelve or fifteen times, and the strongest smell was perfumed hair-oil, or something like that. He did not tell the girl that if he had known she had slept in the room she did he would have warned her.

Mr. John Macnis, examined by Mr. O'DONERTY, said: I am Engineer and Manager and Secretary to the Londonderry Gaslight Company. I know where the breakage in Lecky Road took place, but had no intimation, until the occurrence of which this forms the action, that there had been any escape in that quarter of the city. I went over myself to see what the men were doing. In my opinion the gas got into the opposite house through a sewer-pipe. I think it exceedingly improbable that the gas could have permeated into Doyle's house from this escape. I thrice visited the house, and could not find any smell. The house is built on a marshy foundation of road scrapings and other rubbish. I did not find any smell beyond anything one might experience in the street.

Mr. M'CORKELL contended that, from the circumstances, as represented in the evidence, the plaintiffs were unable to sustain an action. It did not appear that it was from the escape of gas that the woman suffered. The woman herself had said that she did not know what was wrong with her, and Melarkey had stated in evidence that he smelt no gas until Steele came to the door to render assistance to the girl, who was said to be dying. There was no evidence whatever that there was any smell in the house that night. It was submitted that the girl was delicate, and that, whatever was wrong with her, there was nothing to show that the Gas Company were responsible for it. He therefore submitted, in the first place, that it was not from a leakage of gas she suffered. Further than this, there was

no evidence of negligence. Gas companies were bound by very stringent rules; and he contended that there was no evidence whatever of negligence against the defendants.

Mr. O'DONERTY argued that the very quality of the joints of the pipes, which were of lead, joining metal pipes, was evidence of negligence, and he submitted that, as an escape of gas did occur within 12 feet of the place, and as the girl was admittedly ill, she must have felt the effects of it.

His Worship said the case was a very serious one as presented to him. There had, no doubt, been a smell of gas previous to the date of this action, but it was a remarkable fact that nobody had been affected by it but the girl Doyle. It was surprising to him that no one else in the house was affected, though the witness Melarkey was sleeping in a room above that which was occupied by the plaintiff. No doubt the room had a ceiling, but the circumstance was remarkable. He was not assisted by medical evidence to show what disease the girl suffered from. There was another view of the case, which was that, even supposing there was the fullest evidence on the part of the plaintiffs as to the escape of gas, there was no evidence of negligence. But the woman and her daughter had noticed the smell for weeks before, and they did not take the ordinary precautions to have the nuisance stopped. It must be admitted that this fact raised a very serious difficulty. If people continued to sit in a room where gas escaped, he confessed he could not see his way to hold the Company liable for the results of an accident like this. On the whole, he did not think it was clear to him that the effect produced upon the girl was sufficiently attributable, by any evidence he had received, to the escape of gas; but he could not see that the mere circumstance of the leak could be called negligence on the part of the Company, and therefore he thought the process must be dismissed.

Miscellaneous News.

COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Friday last, at the Cannon Street Hotel—RICHARD BRADSHAW, Esq., in the chair. The SECRETARY (Mr. H. D. Ellis) having read the notice convening the meeting, the following report and statement of accounts were submitted:—

The Directors submit the accounts for the half year ended Dec. 31, 1880.

The revenue account shows a net profit for the half year of £53,866 9s. Deducting therefrom £1575 for interest on debenture stock, there remains the sum of £52,291 9s., of which, having regard to the sliding scale prescribed by the Company's Act of 1875, and the price of gas charged during the half year, the sum of £36,973 8s. 8d. is available for dividend. The Directors therefore recommend the payment of dividends at the rate of £11 10s. per cent. per annum upon the old stock, and of £8 10s. per cent. per annum upon the new stock, both less income-tax.

The sum of £6758 9s. 1d. will, in accordance with the Company's Act, be added to the insurance fund, and invested in Government securities, and the balance of the net profits—£8559 11s. 3d.—will be carried to the next half year.

The new tank at the Poplar station, referred to in the report of last March, has been completed, and the erection of the new gasholder is being proceeded with.

No. 1.—STATEMENT OF CAPITAL (Stock) on Dec. 31, 1880.

Acts of Parliament relating to the Raising of Capital.	Dividend Authorized with Gas at an Initial Price of 3s. 9d.	Paid up.	Remaining to be Paid up and Unissued.	Total Amount Authorized.
		£ s. d.	£ s. d.	£ s. d.
Commercial Gas Act, 15 & 16 Vict., cap. 155	10 per cent.	450,000 0 0	..	450,000 0 0
Ratcliff Gas Act, 18 Vict., cap. 12	Ditto.	100,000 0 0	..	100,000 0 0
Commercial Gas Act, 38 & 39 Vict., cap. 200	7 per cent.	125,845 10 0	154,154 10 0	280,000 0 0
		675,845 10 0	154,154 10 0	830,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL on Dec. 31, 1880.

Acts of Parliament Authorizing the Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amt. Authorized.
Ratcliff Gas Act, 18 Vict., cap. 12	Mortgage or Bond.	5 per cent.	..	£20,000	£20,000
Commercial Gas Act, 38 & 39 Vict., cap. 200	Debenture stock.	4½ per cent.	£70,000	210,000*	280,000
* At interest not exceeding 5 per cent.			£70,000	£230,000	£300,000
Total share capital paid up (see No. 1)			£875,845 10 0		
Total loan capital borrowed (see No. 2)			70,000 0 0		
				£245,845 10 0	

Dr.

No. 3.—CAPITAL ACCOUNT.

Cr.

Expenditure.

To Expenditure as on June 30, 1880	£667,650 16 7
Do. during this half year on gasholder at Poplar works	7,000 0 0
Balance	£674,650 16 7
	71,194 13 5
	£745,845 10 0

	Certified Receipts to June 30, 1880.	Received during the Half Year.	Total to Dec. 31, 1880.
By Stock	£550,000 0 0		£550,000 0 0
New stock	105,180 13 6	£20,664 16 6	125,845 10 0
Debenture stock	70,000 0 0		70,000 0 0
	£725,180 13 6	£20,664 16 6	£745,845 10 0

No. 4.—REVENUE ACCOUNT, for the Half Year ended Dec. 31, 1880.

To Manufacture of gas—	
Coals, including dues, carriage, unloading, and trimming (see account No. 8)	£55,954 13 4
Salaries of Engineers, Superintendents, and other Officers at works	2,016 2 6
Wages (carbonizing)	13,234 13 2
Purification, including £1253 18s. 5d. for labour	3,009 8 1
Repairs and maintenance of plant and works, materials, and labour (less £69 1s. received for old materials)	11,895 4 3
	£86,110 1 4
Distribution of gas—	
Salaries and wages of Officers (including Rental Clerks)	£2,616 4 1
Repairs, maintenance, and renewals of mains and service-pipes, including labour	6,365 6 11
Repairs and renewals of meters	1,977 8 9
	10,958 19 9
Public lamps—	
Lighting and repairing	2,074 11 2
Rent, rates, and taxes	4,008 7 11
Management—	
Directors' allowance	£1,250 0 0
Company's Auditors	75 0 0
Salaries of Secretary, Accountant, and Clerks	758 17 10
Collectors' commission	838 9 9
Stationery and printing	518 7 5
General charges	550 16 7
	3,991 11 7
Bad debts	995 4 10
Law and parliamentary charges	630 5 3
Superannuations	333 6 8
Official officers	69 5 10
	£109,221 14 4
Balance carried to profit and loss, net revenue account (No. 5).	53,866 9 0
	£163,088 3 4

By Sale of gas—	
Common gas, per meter, at 3s. 3d. per 1000 cubic feet	£109,956 3 8
Public lighting and under contracts, common gas (See statement No. 10.)	10,495 11 9
	£120,451 15 5
Meter-rental	2,143 19 11
Residual products—	
Coke, less £1609 4s. 6d. for labour	£20,352 18 10
Breeze, less £116 9s. 3d. for labour	229 10 6
Tar	11,039 15 4
Ammoniacal liquor	8,750 14 4
	40,372 19 0
Miscellaneous receipts, viz.:—	
Rents	£78 1 6
Transfer fees	41 7 6
	119 9 0

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£1,575 0 0
Balance available for dividend carried to balance-sheet	88,243 12 7
<hr/>	
£89,818 12 7	
Balance, June 30, 1880	£69,923 2 7
Less amount available for dividend, to June 30, 1880, and paid	34,600 0 0
	<hr/>
	£35,323 2 7
Balance from revenue account (No. 4)	53,866 9 0
Interest	629 1 0
	<hr/>
	£89,818 12 7

No. 6.—RESERVE FUND.

Balance on Dec. 31, 1880	£33,480 18 7	Balance on June 30, 1880	£32,208 18 0
		Dividend received	497 0 7
		Balance of amount available for dividend	775 0 0
	£33,480 18 7		£33,480 18 7

No. 7.—INSURANCE FUND.

Balance on Dec. 31, 1880	£16,120 5 10	Balance on June 30, 1880	£15,881 9 11
		Dividends received	238 15 11
	£16,120 5 10		£16,120 5 10

No. 7.—INSURANCE FUND.

Balance on Dec. 31, 1880 .	£16,120	5	10	Balance on June 30, 1880 .	£15,881	9	11
				Dividends received. .	238	15	11
	£16,120	5	10		£16,120	5	10

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1880.	Received during the Half Year.	Carbonized during the Half Year.	In Store Dec. 31, 1880.
	Tons.	Tons.	Tons.	Tons.
Common	13,123	74,026	70,553	16,596
Cannel	1,915	4,229	4,855	1,289
	15,038	78,255	75,408	17,885

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, June 30, 1880.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, Dec. 31, 1880.
Coke—Chaldrons of 36 bushels*.	1,942	99,509	31,130	63,021	7,300
Breeze do. do.	765	9,181	..	9,360	586
Tar. gallons.	121,586	†927,808	..	959,394	90,000
Ammon. liq.—Butts of 108 galls.	2,151	25,012	..	22,642	4,521

* Under "Weights and Measures Act, 1878." † Including residuum of old tar well

No. 10.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity Made. Meter Register.	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	795,525	52,245	676,653	728,898	8,751	737,649	57,876	4,865

BALANCE-SHEET.

[illegible]

THE CHAIRMAN: On the present occasion I do not propose to trouble you with any lengthened remarks. You are aware that the winter of 1880 was not so favourable for gas companies as the previous winter of 1879. Dark, foggy days and severe cold weather favour gas companies, and tend to increased consumption of gas. Still, I think our accounts show two things—first, a steady and satisfactory growth in the business of the Company; and, secondly, that which is of equal, or perhaps greater importance, good and careful management of its affairs. I will now refer for a few moments to two or three items in the printed accounts, in order that I may show you the progress made by the Company; but first let me say that throughout the half year the gas supplied was in excess of the illuminating power required by our Act of Parliament, and was of a purity far in excess of the standard prescribed by the same Act. If you will turn to the accounts for one moment, I will point out the most important items—those which, in my opinion, give you the best insight into the working of the Company. First of all you will find that we sold 728,898,000 cubic feet of gas last half year, against 707,435,000 cubic feet in the corresponding period of the previous year. You will also find that our gas-rental for the half year ended the 31st of December, 1880, was £109,956, against £106,716 in 1879; the public lighting was very much the same; and the total figures for the gas-rental—private consumption and public lighting—were £120,451 in the past half year, and £117,103 in the corresponding period of 1879. In residual products there is a still larger increase, the figures being in the last half year £40,372, against £32,592 in the corresponding period of the previous year; but it is fair I should say that in the items making up this total our tar stands for £11,039, which included a residuum of tar found in the old wells, and which realized about £2000. You must therefore allow in this manner for £2000 of the increase in residuals. The total receipts for the past half year were £163,000, against £151,000 in the corresponding period. On the other side of the account you will find that we have spent £55,954 for coals, against £57,285, showing, therefore, that the larger quantity of gas was made for a smaller cost of coal. I may tell you that the average price was 14s. 6½d. per ton, against 15s. 5½d. per ton in 1879. Then there are the other items in the manufacture of gas, and altogether the amount under this head is £86,110, against £87,364 in the corresponding period of 1879. Distribution of gas was a little higher, but we have laid at least three miles of extra mains during the half year. The result of our operations is a net profit of £53,866 for the past half year, against £45,820 for the corresponding period of the previous year. Deducting £1575, which has been paid for interest on debenture stock, there is a sum of £52,291 remaining. Of this amount, having regard to the terms of the Company's Act of Parliament, £36,973 is available for dividend, and the Directors propose to appropriate that sum in the following way:—In payment of a dividend at the rate of £11 10s. per cent. per annum on the old stock, and of £8 10s. per cent. on the new stock, which will absorb the whole amount. I think this dividend will be satisfactory to you. In accordance with our Act of Parliament, a sum of £6758 will be added to the insurance fund, and be invested in Government securities; and then we shall have £8659 to be carried to the credit of next half year. I think this is a very satisfactory statement of our affairs, and I trust you consider it so. I only hope it may be my good fortune for many years to come to meet you with an equally good account. You will remember that at our last meeting I announced our determination to reduce the price of gas from 3s. 3d. to 3s. per 1000 cubic feet. This determination has been carried out, and the price of gas was reduced

from the 1st of January this year to 3s. per 1000 feet, and I have no doubt this reduction will lead to a large increase in the demand for gas, and the result prove that our policy—which is to give to the public the best possible gas at the lowest possible price consistent with the maintenance of our statutory dividends—is the right and wise policy. You will also remember that at the meeting this time last year we proposed to you, and you passed a resolution authorizing an increase of the capital to the extent of £60,000, by the issue of new stock to that amount. This sum was created; it was offered to the Shareholders in rateable proportion to their holding, and the whole has been accepted and paid up, excepting a sum of £4000. With the capital so raised we have constructed a new tank at our Poplar works, at a cost of something like £15,000. This tank has been successfully completed, and is without a flaw. Those among you who are acquainted with gas matters will know that some tanks have flaws—for instance, sometimes they will not hold the water, and sometimes they will let the water in. This tank has been built entirely of concrete, and I am told that with one exception it is the largest of its kind. The gasholder is now in course of erection for the tank, and it will be completed and ready for use before the next winter. I come now to the paragraph in the report in which we inform you that, in accordance with the resolution which you were good enough to pass at the last meeting, we have made arrangements with Mr. Robert Jones, our late Engineer, for his retirement from the service of the Company; and in accordance with that resolution we have given him a retiring allowance of £1200 a year. You will remember that at the last meeting I referred at some length to the eminent services that had been rendered to the Company by Mr. Jones, so I do not think I need go over the same ground to-day. You all know Mr. Jones, and all appreciate his services, and the great benefit he has been to the Company, and I am quite sure you will cordially and unanimously do that which I am about to ask you to do. In fixing this retiring remuneration to Mr. Jones, the Directors came to an understanding with him (of course, subject to the approval of the Shareholders), that we should follow what I think is the usual course—a course sanctioned by the Board of Trade, and which I believe they are anxious to see carried out—that we should commute the annual sum for a money payment; and I shall presently propose to you a resolution authorizing the Directors to carry this out. I shall also submit to you a resolution for increasing the remuneration of your Secretary. In this we are only following the course you yourselves adopted on a similar occasion. After the same length of service, and under somewhat similar circumstances, it was your unanimous wish that the salary of the then Secretary should be increased from £600 to £700; and we make the same proposal to you on the present occasion. It is right to Mr. Ellis to say that we have now had some experience of him. He does his work most efficiently, and I have very great pleasure in recommending you to adopt this resolution. The next paragraph in the report informs you that two of the Directors go out of office, but that Mr. Henry Baddeley does not offer himself for re-election. My friend Mr. Gill does ask you to re-elect him, and I am sure you will do so. The Directors will then be seven in number. The report goes on to inform you of the death of one of your Auditors, Mr. Henry Webb, who was connected with the Company for many years. He had, I believe, been Auditor of the Company from the very commencement. He performed his duties most efficiently, and the Board desire to record their appreciation of his services. There is a vacancy in the office of Auditor, and I have letters from two gentlemen offering themselves to supply the vacancy. It will rest with you to deal

with that matter as you please. I now move—"That the report and accounts be received, adopted, and entered on the minutes."

The DEPUTY-CHAIRMAN (Mr. J. D'A. Samuda) seconded the motion.

The CHAIRMAN, in reply to a question with respect to the amount of the insurance fund, said the fund stood at £16,120. It was intended to add £6758 to it, which would increase it to about £23,000. The Act of Parliament made it imperative on the Company, when they had the money, to add 1 per cent. to the insurance fund till it amounted to 5 per cent. of the capital.

Mr. BADDELEY expressed his satisfaction—which he was sure was experienced by his brother Shareholders—at the position in which the Company had been maintained, no doubt owing to the ability and anxiety displayed by the Board. He had, he said, no doubt that while there were such gentlemen on the Board the Shareholders would have no decrease of dividend, and that the position of the Company would always be maintained. He thought the report was satisfactory throughout. There was an item in the balance-sheet of "amount invested," £49,601, and he should be obliged if the Chairman would state where it was invested.

The CHAIRMAN: That sum of £49,601 is partly invested in Consols and partly in Reduced Three per Cents. Part of it is your reserve fund, and the other part your insurance fund. It has not been recently invested, but is the accumulation of years.

Mr. RUNTZ, as one largely interested in the Company, observed that it was a matter of great congratulation to the Shareholders to find themselves in such good condition. The Company had been successful from the commencement, and, no doubt, they would be successful in the time to come. Personally he had not the slightest fear of their future, if the same policy and practice were adopted as had existed from the beginning of the Company. The Shareholders had heard that they owed a great deal to the Board, and no doubt this was so, and also to the Engineers and all the Officers of the Company. There was, however, one point to which he wished particularly to refer, and this was the statement that henceforth the Board would consist of seven, "in accordance with the Company's Act of 1875." Now the Act of Parliament was, he said, to this effect—that the maximum number of Directors should be nine, and the minimum seven, so that by the Act of Parliament they were not compelled to have seven directors only. He did not see by the report that by reducing the number to seven there was any reduction in the payment to the Directors. He was somewhat astonished that the report did not propose that Mr. Robert Jones should be taken on the Board, as had been done in the case of other companies in similar circumstances. It was a matter of extreme regret to him to think that the Company would lose the advantage of the matured experience of Mr. Jones, and he sincerely trusted the Directors would place him on the Board, if not on the present occasion, at some future time. As to the commutation of the retiring allowance, he was very glad to see this course was proposed.

A SHAREHOLDER asked whether, assuming that one of the seven Directors died, leaving six, it was competent for the six to act.

The CHAIRMAN: Yes, sir.

The SHAREHOLDER pointed out that the word objected to in the report as to the number of Directors was "henceforth"—inferring that the number in future would not be increased beyond the seven. He supposed, however, that if on the present occasion the Directors did not propose to fill up the vacancy caused by Mr. Baddeley's retirement, they might do so at some future period.

The CHAIRMAN: Quite so. I have now had for some years the privilege of presiding at meetings of the Commercial Gas Company, and I have never had a difference of opinion with the Shareholders. Speaking for myself and my colleagues, I say it is the wish and the intention of the Board of Directors that Mr. Robert Jones should be a member of the Board; but, gentlemen, we are bound by Acts of Parliament—we cannot override the law. I must tell you this—Mr. Jones cannot have his retiring pension or his commutation if he is a Director. You must do one thing at a time. You must get rid of the pension before Mr. Jones can be elected on the Board. Therefore it is that we do not mean at present to fill up the vacancy. The word "henceforth" does not tie us to anything. Mr. Runtz was good enough to refer to the remuneration of the Directors. I turn to the accounts, and I find that in the present balance-sheet, in the last half year the Directors' remuneration was £1250, and when I look to the previous half I find it was £1600. Need I say anything more about the the Directors' remuneration? I will now put the resolution.

Mr. G. LIVESEY suggested that the last sentence in the paragraph of the report relating to the retirement of Mr. Baddeley, and the number of Directors "henceforth," should be left out entirely, and that the Board should pay Mr. Jones his commutation the next day, and elect him on the Board next week.

The CHAIRMAN: That cannot be done.

Mr. LIVESEY observed that it had been done in many cases, and he was satisfied that it was the best course to pursue. The best course was to get the commutation paid off, and have done with it, so that it should not appear in future accounts.

The CHAIRMAN: If Mr. Jones is left to the Board he will be well taken care of.

The motion was carried unanimously, and the dividends recommended in the report were declared.

The CHAIRMAN then moved—"That the Board of Directors be, and they are hereby authorized to commute the retiring allowance granted to Mr. Robert Jones, the late Engineer of the Company, for his life, upon such terms and conditions as the Board of Directors may deem expedient, providing the same are not more onerous on the Company than the payment of the principal sum for which an annuity of this amount would be purchaseable under the table regulating the granting of annuities by the Postmaster-General."

Mr. RUNTZ having seconded the motion,

A SHAREHOLDER asked what would be the amount.

The CHAIRMAN: The amount will be so many years' purchase, according to a man's life. Mr. Jones will, I think, be 69 next birthday, and the amount will be about £9500.

The motion was then put, and carried *nem. con.*

The CHAIRMAN next moved the increase mentioned in the salary of the Secretary, to take effect from the 1st of January last.

The DEPUTY-CHAIRMAN seconded the motion, and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, Mr. Gill was re-elected a Director.

Mr. GILL having briefly acknowledged the compliment, the retiring Auditor (Mr. Edward Marsh) was re-elected.

Mr. POUND asked whether it was intended to fill up the vacancy in the auditorship.

The CHAIRMAN: The matter is in the hands of the meeting. You may have two or three Auditors. I have letters from two gentlemen offering themselves. One is from Mr. Charles T. Blackman and the other from Mr. Charles Moody.

Mr. BADDELEY moved the election of Mr. Blackman, who he stated had been a Shareholder in the Company for many years. He was well

acquainted with the duties of an auditor, having occupied that position in the old Ratcliff Company, and he did his duties in the most exemplary manner.

Mr. GOULD seconded the motion, and it was carried.

Mr. BLACKMAN having acknowledged his election,

A vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN having briefly acknowledged the vote,

Mr. CECIL moved a vote of thanks to the Engineer, Secretary, and other Officers.

The motion having been seconded,

The CHAIRMAN, in putting the resolution, said: I desire to bear my testimony to the zeal and efficiency which the officers of the Company have displayed. As to our friend Mr. H. E. Jones, I may allude to him at greater length than to the other officers, and I do so for the reason that he appears before you to-day for the first time as sole Engineer. I need not tell you that the Engineer of a Gas Company with three separate stations is exposed to some considerable anxiety. You have been pleased to say that the accounts to-day are very satisfactory, and Mr. Jones is mainly responsible for the character of the accounts.

The motion was carried unanimously.

Mr. JONES responded for himself and that part of the staff who were more particularly engaged in the manufacture and distribution of the gas, and bore testimony to the zealous manner in which these duties were discharged.

The SECRETARY also acknowledged the vote of thanks and the increase in his salary.

The proceedings then terminated.

SHEPPY GAS COMPANY.

The Annual General Meeting of this Company was held on Wednesday, the 23rd ult.—Mr. J. COLE in the chair.

The SECRETARY (Mr. A. W. Marks) read the Directors' report, which contained the following observations relative to the general progress of the Company during the past year:—

During the year, a considerable outlay has been made on necessary repairs and the renewal of retorts for the purpose of maintaining the efficiency of the works and plant. It is under consideration to carry out a re-arrangement of the works, and renewals of certain portions of the plant. The necessity for this has arisen from the insecurity of the present foundations, and other causes more or less incidental to the nature of the site, as well as from the increased requirements of the business. It is proposed to lay down a comprehensive plan for these renewals and improvements, and to carry out a portion of the works each year until they are completed.

The present residence of the Manager having been badly constructed and inconveniently placed, it has been decided to at once erect another residence upon a portion of the surplus land, and ultimately to remove the present one, so as to afford room for proposed extensions of the other buildings.

During the year the assessment of the works and plant in Minster Parish was increased by a new valuation from £222 10s. to £1196 rateable value. In the interests of the Shareholders and the consumers of gas, it was, after taking the best professional advice, deemed necessary to appeal against this valuation. As the Assessment Committee declined to entertain any proposals for a compromise, or to in any way reduce the amount, the appeal was carried to the Quarter Sessions. On the hearing, the matter was referred, by mutual consent, to J. Clutton, Esq., the question of costs being reserved for the future decision of the Court. Mr. Clutton has since made his report, by which he fixes the rateable value at £1263. This is a reduction of £233, and represents an annual saving to the Company of about £70 in the rates payable. The costs in the case have not yet been ascertained, but as the sum of £314 was paid in 1880, it was considered advisable to write off £150 of this amount against the profits of the year. The final adjustment must remain open until the April sessions.

In consequence of the increased assessment of the Company's works, the Directors regret that they are unable at present to entertain the idea of a further reduction in the price of gas.

The profits for 1880 warrant the Directors in recommending the declaration of the usual statutory dividends for the year—that is to say, a dividend after the rate of 4s. per share for the half year on each of the "A" shares, and a dividend after the rate of 10s. per share on each of the "B" shares, making, with the interim dividends paid in November last, 4 per cent. on the "A" shares and 10 per cent on the "B" shares respectively.

Dr.	Trade Account for the Year 1880.	Cr.
Coals	£3092 10 0	Gas-rental £7239 16 3
Purifying	29 16 1	Meter-rents 116 4 1
Wages on manufacture and distribution	880 2 9	Fittings and stove hire 89 19 9
Directors' fees	100 0 0	
Auditor's salary	18 0 0	Less discount 600 16 5
Secretary's commission	291 10 0	
Manager's salary	200 0 0	
Rent, rates, taxes, &c.	347 2 2	Coke, tar, and liquor produced £1622 0 11
Stationery, stamps, &c.	58 0 0	Less cartage paid 92 17 6
Repairs, renewals, &c.	542 4 1	
Retort account	306 0 0	
Bad debts	50 0 0	Coals sold at works 41 6 0
Legal expenses	150 0 0	Gas-fittings sold 227 0 9
Coals for sale	35 5 0	Transfer fees 4 16 6
Gas-fittings and labour thereon	199 5 0	Rent charges 11 10 0
Repair of roads, &c.	25 0 0	Rent of garden plots 17 4 8
Interest	137 3 1	Miscellaneous 38 19 1
Profit on first half year	1132 0 9	
Profit on second half year	1157 5 2	
	£8745 4 1	£8745 4 1

The CHAIRMAN, in moving the adoption of the report, said it so fully explained the business transactions of the Company during the past year that little was needed from him in the way of explanation. The Shareholders would observe that a considerable sum had been expended in repairs and renewals, and it was doubtless a matter of surprise to those who recollected the previous report, and compared it with the evidence given in the rating appeal case in which the Company had lately been concerned; but when the Directors made that report they believed it to be a true statement of the Company's position. It should be remembered that they were not professional men, and therefore could not be expected to look with a professional eye upon the works. He hoped, however, that the plant and buildings would now be put into an efficient condition, and it was the intention of the Directors to devote a sum of money for this purpose every year. There was no doubt that the foundation upon which the works were built was treacherous—in fact, a complete swamp—and would require the expenditure of a large amount of money to make it good. The desire of the Directors had always been to study economy, and although it had been said they ought to have spent more upon the works and divided less among the Shareholders, such a course would not, he believed, have been generally approved.

The SECRETARY said that in consequence of a decision recently given in the Court of Queen's Bench, in which it was held that the Gas-Works Clauses Act, 1871, had a retrospective action, the Company's balance sheet would in future have to be published in accordance with the statutory form, which, in his opinion, was not so clear and distinct as the form now adopted.

Mr. J. WALLACE seconded the motion.

Mr. JACOBS inquired how a saving of £70 a year would, as stated in the report, be effected by the reduction in the rating, when for the next four years this amount would be required to pay the legal expenses incurred in the appeal. He thought the Company would have been better off if they had not appealed.

The CHAIRMAN said from 1870 to 1880 the Company had been rated upon an assessment of £622 10s., for which they had to pay £186 17s. for rates. Mr. Castle's valuation raised the assessment to £1495, for which they would have had to pay £448 16s. annually; but by appealing against the valuation they had secured a reduction of £233, and they would now have to pay £378 18s., therefore a saving of about £70 a year had been effected. He thought they acted wisely in appealing, even if the advantage they had gained were to remain in abeyance for four or more years, for after the legal expenses had been paid, the £70 would clearly be saved, whereas if they had not appealed they would have still continued paying the full amount.

Mr. G. HARE called attention to the statement in the report with respect to the Assessment Committee refusing to compromise the question of the rating of the works, thereby necessitating an appeal to the Quarter Sessions. Speaking as a member of the Committee, he said he would willingly have consented to a reasonable reduction, but he understood that the Company would not agree to pay upon a gross rating of more than £1000. He did not think the Committee ought to be blamed for forcing the Company to go to the Quarter Sessions, for it was manifest, by the Arbitrator's award, that they were justified in refusing to accept the Company's offer.

The CHAIRMAN said that if the Committee were really desirous of compromising the matter, why did not Mr. Hare propose a sum for acceptance by the Company? The Committee had never made an offer to settle the question. If the Company's proposal was too low—and it might perhaps have been better if they had offered £1000 rateable instead of £1000 gross—Mr. Hare could have proposed a sum which the Committee would have accepted; but his (the Chairman's) impression of the meeting at which he attended was that the Committee were indisposed to make any reduction. On the 26th of May the Directors wrote to the Assessment Committee stating that they had engaged Mr. Spice to value the works, and asking that an interview might be arranged with that gentleman and Mr. Castle, with a view to coming to an arrangement respecting the latter's valuation. On the 21st of July, Mr. Castle wrote to the Assessment Committee, stating that he had not been able to arrange for a consultation with Mr. Spice, but recommending that the rating should be based upon the new valuation. This was at a time when negotiations were actually pending between the Committee and the Company. The argument used by members of the Committee indicated a determination on their part to abide by the decision of their valuer, and the Company were placed in a very awkward position. It was not for them to go a second time and make another offer, for if they had done so, and it eventually became necessary for them to carry the appeal to the sessions, it might have prejudiced their case, and, moreover, he believed that if they had offered to be rated upon an assessment of £1200 the Committee would not have consented to the proposal. He was desirous of avoiding litigation, but he felt certain that Mr. Castle's figures could not be maintained, and even when it was necessary to take legal proceedings he would have preferred the question to have been settled at the Quarter Sessions, for he believed the Company would then have come off better than they had.

Mr. HARE considered that he was precluded from making any proposal by the refusal of the Company to pay upon an assessment of over £1000.

The CHAIRMAN said that even if their Solicitor had made such a statement, it was not binding upon the Directors, for they might think differently. If the Committee had made an offer, they would have been exonerated from all blame. He called upon Mr. Stallon, the Company's Solicitor, to explain what took place at the meeting of the Assessment Committee which he attended on the 15th of September.

Mr. STALLON said, with respect to Mr. Hare's remarks, the Directors did not authorize him to name any particular sum upon which they would be willing to pay, and therefore he thought it highly improbable that he should have mentioned the £1000 in the form of an ultimatum. His recollection of what took place at the meeting was that a gentleman asked him upon what assessment the Company would be willing to pay, and he said about £1000. Allowing for a deduction of 9 per cent. upon the gross, which was the principle upon which the former rating was based, this would give a rateable value of about £900. No effort was made by the Assessment Committee to settle the question between the months of May and September.

The motion was carried unanimously.

A resolution authorizing the payment of the dividends recommended in the report was then agreed to *nem. con.*, and the retiring Directors (Messrs. Cole, Filmer, and Poole) and Auditor (Mr. E. W. Brightman) having been re-elected, votes of thanks were passed to the Secretary and Manager, and also to the Chairman for presiding, and the proceedings terminated.

BRISTOL WATER-WORKS COMPANY.

The Thirty-fifth Annual General Meeting of this Company was held on Saturday, the 26th ult.—Mr. F. Fry in the chair.

The SECRETARY (Mr. J. Alexander) having read the notice convening the meeting, the following report was presented:—

The revenue from water-rates for the year 1880 was £55,886 8s. 9d., being an increase of £3076 12s. 1d. over that of the previous year. The sum shown by the revenue account to be applicable for dividend is £18,668 11s. 7d., which includes £800 transferred from the reserve fund, and the Directors recommended that a dividend of 5 per cent. on the ordinary £25 and £20 shares be now declared, making, with the intermediate dividend of 5 per cent., the dividend for the year 10 per cent., and that a payment of 2s. 6d. per share be made to the proprietors of the ordinary £25 shares, on account of arrears of dividend, leaving £373 7s. 11d. to be carried forward.

The official trial of the new engines at Chelvey took place on the 9th of February, and they have since been handed over to the Company by the makers, Messrs. Simpson and Co., of London. During the dry season of last year an opportunity was taken to test the yield of the new works at Chelvey, and the results more than realized anticipations. The outlay upon the extension works at the Victoria pumping-station has been fully justified by the more economical working and the increased pumping power of the new engines.

The extraordinary frost in January last did not produce on the mains of the Company so severe an effect as in many other large towns. There were only 16 instances of broken mains within the Company's limits of supply—a number very far below that reported in other places. The Directors refer to this with satisfaction, as it affords proof of the sound condition of the mains generally.

The capital expended during the past year was £11,626 9s. 4d., and the length of mains laid about five miles. The Engineer reports that the works are in good condition. The retiring Directors are Mr. Fry and Mr. Abbot, who are eligible, and offer themselves for re-election. The retiring Auditor is Mr. Curtis, who offers himself for re-election.

The CHAIRMAN, in moving the adoption of the report, referred to the fact that the Directors had, as hitherto, been engaged in carrying out the various extensions rendered necessary by the increased demand upon the Company for supplies of water. The annual increase in the revenue, though varying in amount from year to year, showed, he said, that the Company was an absolute necessity, and these yearly additions were their mainstay for the future. The capital expended during the past year had not been so much as in the year 1879, and it was not likely that the expenditure on this account would be nearly so much during the current year. During the past year the Company had lost their Solicitor, Mr. Fussell, to the great regret of the Board, who had been appointed as his successor their friend Mr. Frichard. Mr. Fussell had been connected with the

Company from the commencement, and took very great interest in their affairs. On reading the report of the Registrar-General for 1880, he (the Chairman) particularly noticed the statement that "during the past year the health of Bristol was remarkably good. The deaths in each quarter yielded a rate which was equal to 1·2 below the mean of the twenty great English towns." This was very gratifying. Probably no one would doubt that the pure and abundant supply of water derived from the Company's works had largely contributed to this result. The more this fact was known, the more it should induce persons to reside in Bristol. By an unusual clause in the Company's Act of Incorporation, it devolved on the Shareholders to fix the salary of the Secretary. In consideration of Mr. Alexander's abilities devoted to the interests of the Company, his attention to the duties of his office, and his valuable services in promoting the prosperity of the undertaking, the Directors unanimously recommended that his salary should be increased by £200 per annum. A resolution to this effect would be proposed. He concluded by assuring the Shareholders of the constant attention of the Board to their interests, at the same time not forgetting the duty they owed to the consumers.

Mr. C. J. THOMAS seconded the motion, and it was carried unanimously. On the motion of the CHAIRMAN, seconded by Mr. THOMAS, it was then agreed that a dividend at the rate of 10 per cent. per annum be paid on the ordinary shares of the Company, and that a further dividend of 2s. 6d. per share be paid on the ordinary £25 shares, towards making up the deficiency of previous dividends. A motion—"That the salary of the Secretary be increased to £800 a year," was also unanimously agreed to.

The SECRETARY, in returning thanks, said he had seen very rapid progress made in the affairs of the Company. The revenue had increased from £35,000 to £65,000, and there had been important extensions of works, of which the last had only just been completed. The Company had now two independent systems of supply. They had the gravitation system, which brought them water from the Mendip Hills, and the pumping system, whereby they obtained water from the deep wells and the sandstone formation, from Chelvey. Either of these systems was capable of keeping up the supply of the whole district. The extensions had been made in accordance with the principle not to limit capital outlay with a view to inflate dividends, but to place the works in a sound and satisfactory condition—not merely with an eye to the immediate future, but for years to come. The first object of the Board had been to keep up a sufficient and even abundant supply of pure water to the whole district over which their system extended. This was a consideration before which, as far as his experience extended, all others were considered as of minor importance. That the Directors had succeeded in their policy there could be no doubt. He was acquainted with the circumstances of all the large towns as regarded water supply, and he had no hesitation in saying that in the matter of sufficiency and quality of supply, Bristol stood in the first rank.

The retiring Directors and Auditor were then re-elected, and the former gentlemen having briefly replied, a cordial vote of thanks was passed to the Chairman and Directors, for their successful conduct of the Company's business, and the proceedings terminated.

BRISTOL PUBLIC LIGHTING.

At the Meeting of the Bristol Town Council last Tuesday—the Mayor (Mr. J. D. Weston) presiding—a report in reference to the lighting of the city was presented by the Sanitary Committee. It contained the following statements:—

Your Committee report that in the month of February, 1880, the attention of the Lighting Committee having been called to the fact that the contract then in existence with the Bristol United Gaslight Company for lighting the public lamps would expire on the 29th of September, 1880, they took into consideration the subject of lighting, and being of opinion that the prices paid to the Company were greater than they ought to be, they instructed your Gas Inspector to continue experiments as to improved means of lighting, and also to report fully as to the lighting in Bath, and as to the cost of machinery for trying experiments of lighting by electric light; and on the 26th of February, 1880, they received a report from the Gas Inspector. This report goes fully into the subject of the lighting with gas of the public lamps.

[Certain extracts from the Inspector's report are given.] It was resolved that an extract from the report of the Inspector be forwarded to the Gas Company, and that they be requested to state what reduction they would be prepared to make from the prices in a new contract on terms similar to the then present one, to guide the Committee in their further deliberations.

[A correspondence with the Gas Company ensued, which is given at length in the report.]

The cost per lamp at 2s. 8d. per 1000 feet for gas, less 5 per cent., and 16s. per lamp for lighting, &c., would give for the various sized lamps about the following prices:—

For each lamp consuming	1 foot per hour	Per Annum.
2½ feet	"	£1 6 1
"	"	2 1 2½
"	"	2 16 3½
"	"	3 6 4½
"	"	4 6 6

being less than the amounts of the original tender of the 22nd of September, giving a total sum of £367 0s. 6½d. per annum less than that tender on the whole number of lamps.

The sum now in question is not a very large one, there being at present about 4316 lamps. One shilling per lamp would amount to £215 16s. per annum on the contract, but your Committee feel that inasmuch as the Company, when separate tenders were advertised for the expenses of lighting, extinguishing, &c., and there might be expected to be a competition for the same, tendered for 15s., they ought not now, when the question has been as to the price to be paid for gas, make a reduction in the price for gas, and seek to recoup themselves a portion of it by adding to the charge for lighting, &c.

Your Committee are advised that the price at which gas shall be supplied to the public lamps be not settled by agreement between the Company and the Authority, the same may be settled by arbitration under the provisions of the Gas-Works Clauses Act.

Your Committee having laid the whole of the above negotiations before the Council, and having used their best endeavours to obtain more favourable terms from the Company, express their regret that the Company have deemed it fit not to abide by their tender of 15s. per lamp per annum for lighting, extinguishing, painting, cleaning, and repair; but looking to the small money amount which is now in question, your Committee recommend that a contract be entered into with the Gas Company for three years, commencing from the 29th of September, 1880, the Company to be paid for the gas supplied a price equal to that charged from time to time to the lowest private consumer, not exceeding 2s. 8d. per 1000 feet, less 5 per cent. discount, and for lighting, extinguishing, cleaning, painting, and repairing, 16s. per lamp per annum, but subject to the price for gas being raised or lowered in the event of the price to the general consumers being raised or lowered.

Your Committee report that they have caused many inquiries to be made with reference to improved means of lighting the public streets, and have, under the direction of the Inspector of Gas-Meters, caused experiments to be tried in lighting with the electric light some of the streets in the centre of the city; but are not at the present moment prepared to make any report beyond the fact that those experiments, so far as regarded the light afforded, appeared to give great public satisfaction.

Mr. Low said the report was so exhaustive as to need little to be said concerning it. The Committee regretted very much that the Company could not see their way to lower the price of gas. The report showed that in very many large towns, less favourably situated than Bristol, the price charged for the public lamps was lower. He believed that if the Bristol Company had the benefit that several Companies had in London—that for every 1d. per 1000 feet they reduced the price of gas they should be able to pay ¼ per cent. more dividend—the city would soon be able to get gas cheaper. However, the Council were to be placed on the same terms as the largest consumer, and to have a discount of 5 per cent. in consideration of there being no risk of bad debts. This was an important principle

and he believed would prevent such difficulties as had arisen in the present contract again occurring. He moved that the contract now proposed to be entered into receive the sanction of the Council.

Mr. NAISH seconded the motion.

In answer to a question, Mr. Low said the reflector lamps used in the city burnt the same quantity of gas as the others.

Mr. G. WILLS having remarked that they were a great nuisance, The motion was adopted, and the other business of the Council was proceeded with.

THE APPLICATION OF HYDRAULIC MACHINERY TO GAS-WORKS.

By Mr. J. COATES, Assoc. M. Inst. C.E.

[Extract from a Paper on "The General Application of Hydraulic Machinery to Grain Warehouses, Gas-Works, and Mines," read before the Civil and Mechanical Engineers' Society, March 17, 1880.]

The general application of hydraulic machinery to gas-works is only of recent growth, Mr. C. Woodall, late of Vauxhall, and Mr. J. Steffox, of Belfast, being among the first to adopt it; the machinery there being used for discharging the ships and barges which supply the gas-works with coal. It is also in operation at Greenwich, Hull, Beckton, and is in course of erection at Portsea, for the same purpose. The application has been a great financial success, especially where the manufacturer has power to design the crane in the way which experience had taught him to be by far the best, and was not tied down to the plans and specifications of engineers with particular crotchets.

The author has seen the method of getting the coal from barges into coal stores at nearly every important gas-works in the United Kingdom, and has been concerned in the erection of steam hoists for that purpose, as well as hydraulic cranes, and can testify from experience that while the former gave great satisfaction, and continue to do so, yet they cannot compare with the latter, which are the most economical in every way, especially as regards wear and tear, and in a general way they are the best adapted for the discharge of coal. By the ordinary steam crane, 15 to 20 tons of coal per hour has been considered good work; but it is no uncommon thing for one hydraulic crane, where the lift is not extreme, to do 50 to 60 tons in the same time, and where the "Armstrong jib" (as it is often termed) is used, the crane works so smoothly and quietly, even at that pace, as to create great surprise.

Perhaps the quickest cranes seen by the author are those at Beckton. The lowering is particularly fast, the valves are of special construction, and provided with exhaust ports and pipes of considerably larger size than usual, which enables the water to escape freely back into the tank. These cranes are nine in number, and lift a total weight of 20 cwt. each. They were originally designed and constructed to discharge 40 tons per hour with a lift of 60 feet. To effect this, two horizontal high-pressure engines, equal to 75-horse power each, were erected, together with an accumulator 17 inches in diameter, and 17-foot stroke, worked at a pressure of 700 lbs. per square inch. Each engine could easily have performed its duty, and worked 10 cranes, as specified; but the lift of each crane was afterwards increased to 90 feet, consequently the two engines combined will now only keep 13 cranes going. The cranes are made to multiply ten to one. The chain travels at the rate of 60 feet in 10 seconds, but the ram only moves at the rate of 6 feet in the same time. Even with the 90-foot lift the cranes can easily do their specified duty of 40 tons per hour, and have been known to do considerably over this amount. The author might here mention that there are six steam cranes at the other end of the pier working at about the same speed. They are of the best type that can be made, and have two 30-horse power boilers to work the whole of the six cranes. In the case of the hydraulic machinery two 20-horse power Lancashire boilers will work one pumping-engine, which will keep six cranes going at the same speed, lift, and weight.

Many years ago a test was made at the St. Katharine's Docks, by Sir W. Armstrong and others, between steam and hydraulic cranes (the conditions being the same for each), and it was effectually decided in favour of the latter. Since that time experienced Dock and Railway Engineers have gone into the question of wear and tear and economy from time to time, the result being that steam cranes, especially in large docks and warehouses, have nearly gone out of use altogether, and become discarded. One of the beauties and advantages of the hydraulic system is that you can carry your pipes any length with a comparatively small loss of power as compared with steam.

Before leaving Beckton, the author might mention that in these large and important works many of the purifiers, both round and square, are lifted by hydraulic pressure; and should any members of the Society wish to see the various points of interest, they need only apply to Mr. G. C. Trewby, the able and courteous Chief Superintendent, who, notwithstanding his many engagements, is ever ready for services of that kind.

The great advantage of hydraulic plant on gas-works carbonizing, say, upwards of 30,000 tons of coal per annum (the larger the works the greater the advantage of the system) is that it can be utilized for so many purposes; for example, take works like those at Hull (the British Gas Company), which adjoin the river or creek. The number of tons of coal carbonized amounts to about 40,000 to 50,000 per annum. About three years ago Mr. A. Dougall, the Engineer, determined to abolish the slow and expensive system of manual labour, and erect three hydraulic cranes for discharging the coals from barges. A small hydraulic pumping-engine and accumulator was erected close to the exhausters, and placed under the charge of the same attendant. This was at a considerable distance from the cranes, but the loss of power was scarcely felt, and Mr. Dougall had the advantage of working a direct-acting 2-ton hoist by means of a 2-inch branch pipe from the main line of pipes, for reshipping the coke into barges. The saving is very great, and will be greater, when the system of cranes can be extended. In addition to this, the pressure can be utilized in lifting the purifier covers, in elevating the oxide to the floor above, and in working the Tower scrubber machinery.

It might here be mentioned that objections have been raised about the frost, but with ordinary caution there need not be the slightest apprehension. Should a very severe frost be anticipated during the night, the momentum valve should be lifted and the water allowed to circulate through the pipes. In some cases glycerine is put into the tank supplying the pumps. As is well known to most of you present, the water used in the cranes and hoists goes back into the tank, and is used over and over again.

A new feature in the application of hydraulics to gas apparatus may be seen at the new gas-works erected for the West Bromwich Improvement Commissioners by Mr. G. W. Stevenson. A very small three-cylinder oscillating engine is used for actuating one of Kirkham, Hulett, and Chandler's washer-scrubbers, and does its duty well and smoothly. This engine cost less than the one usually applied and worked by steam. Of course it would never pay to apply it in a case of this sort, where the pressure did not exist; but there are six large purifiers (about 30 feet square) lifted internally from the centre by means of a small-sized engine and accumulator, working at 700 lbs. pressure. The rams are 10 inches diameter, and have a stroke of 8 ft. 6 in., giving a clear lift of 5 ft. 6 in. from the top of the lute to the under side of the cover. The main pressure-

pipe from the accumulator is 8 inches in diameter, with 2-inch branches to each purifier. Provision is also made for six additional purifiers.

At Tunbridge Wells, where the railway is considerably above the works level, Mr. R. P. Spice has had erected a railway wagon hoist for coke, &c., capable of lifting from 15 to 20 tons, one 8-ton hydraulic crane, and he also utilizes the pressure in lifting the covers of the purifiers; but in this instance the apparatus is a traveller, and answers the purpose exceedingly well.

In the case of all large inland gas-works—those at Manchester, Birmingham, Salford, &c.—where the railway runs close to the works, and there is a siding, the use of hydraulic machinery is apparent. Very often the works are above the level of the railway; then a 20-ton wagon hoist is of immense service and advantage. They are safest and best if made direct-acting—i.e., the ram underneath the load, which prevents all fear of accidents. Objection has sometimes been made against them on account of foundations; but if an outer cylinder is used, in the form of a screw pile, this point can be, and has been, overcome. The ram should be made with sufficient stroke to lift the waggons high enough to command the full length of the coal stores, and deposit the coal in any part. This saves a vast amount of manual labour in trimming, wheeling, &c.

At the Rochdale Road works, Manchester, Mr. West, the energetic Chief Engineer, is making an extensive use of the hydraulic system, by adopting a series of hydraulic capstans for dispensing with all horse labour, which must be a great economy. One of these capstans costs from £110 to £120, and if we reckon £2 per week as the cost of the keep of a horse, the saving is obvious, apart from convenience, for the author has seen in a large gas-works in the South some six or eight men brought from the retort-house to move a railway truck or turn a turntable. With the aid of snatch heads they can be placed in such a position as to command four lines and a turntable at the same time. The working is quite simple. A man places his foot on the treddle lever connected with the valve, while his hands guide the rope round the head of capstan. One capstan will haul six waggons horizontally with the greatest ease. It might here be mentioned that they are now being erected at the Salford Corporation Gas-Works by Mr. S. Hunter, and they are being introduced in many other places.

One of the most modern applications of hydraulics is to be seen at Birmingham, where the present able President of the British Association of Gas Managers (Mr. Charles Hunt) has dispensed with the customary steam pumping-engine, and adopted gas-engines, which drive, by means of a belt, three-throw pumps to lift the accumulator. This appears to be a step in the right direction, for the simple reason that visitors to the gas-works will readily see one of the many uses of gas as a motive power. Now that we are to have another electric scare in the City, it behoves gas engineers to encourage to use of gas in many other ways, to make up for the loss of street lighting, and that of public buildings, which it is possible they will lose in time, although not yet.

There are many other instances and illustrations of the application of hydraulic machinery to gas-works, and one of them ought to be mentioned—viz., that of charging and drawing retorts; but this has not hitherto met with the success it deserves. It is hardly suitable for such light work, as it makes the machine cumbersome and complicated, and unnecessarily heavy. There can be little question that for apparatus of this sort compressed air, which can travel in a light receiver with the machine, will be the motive power of the future.

A discussion followed the reading of the paper.

DETERMINING THE COLOUR OF WATER.

In their last report—that for the month ending March 19—to the President of the Local Government Board, Drs. Odling and Meymott Tidy and Mr. Crookes say:

"For some time past we have been experimenting on methods of determining the colours of water, and we have this month adopted a process which, whilst it does not pretend to absolute accuracy, is a great improvement over the arbitrary 'degrees of tint depth' by which the colour of water has hitherto been estimated. The process briefly is as follows:—

"Two hollow wedges are filled, one with a brown and the other with a blue solution,* and these are made to slide across each other in front of a circular aperture in a sheet of metal. In this way any desired combination of brown and blue can be produced. Each prism is graduated along its length from 1 to 40, the figures representing millimètres in thickness of the solution at that particular part of the prism.

"On a level just below the prisms is a 2-foot tube containing the water under examination, and having in front of it a circular aperture of the same size as the one in front of the prisms.

"The stand supporting the prisms and tube is placed horizontally in front of a uniformly lighted window. The observer, standing a little distance off, sees two luminous discs, the lower one illuminated by light which has passed through 2 feet of the water, and the upper one illuminated by light which has passed through the respective thicknesses of the brown and blue solutions.

"By sliding the prisms sideways one way or the other, it is easy to imitate, with considerable accuracy, the depth and tint of the colour of the lower disc. A metal pointer affixed over the centre of the upper disc shows on the prism scales the number of millimètres in thickness through which the light has passed to produce a colour which corresponds to that of the water, and the results are recorded in the following way:—Brown: Blue. Thus—'February 21st (New River), 20: 21' means that on that date the colour of New River water seen through a 2-foot tube was represented by 20 millimètres of brown and 21 millimètres of blue solution."

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, April 2, 1881.

Tar, worth 40s. to 42s. per ton.
Ammonia liquor (sp. gr. 1.03), about 25s. per ton.
" sulphate (white), £20 5s. to £25 10s. per ton.
" (good grey), about £20 to £20 5s. per ton.
" muriate (white), about £36 per ton.
" (grey), £30 per ton.
Muriatic acid, £1 5s. to £1 10s. per ton.
Sulphuric acid (brown vitriol), about £3 per ton.

The report of the Directors of the Sheffield United Gas Company, to be presented at the half-yearly general meeting announced to be held yesterday, contained a recommendation that maximum dividends for the half year ending Dec. 31, 1880, should be declared, leaving a balance of £12,884 to be carried forward.

* The solutions are made in the following way:—

Brown solution.—Dissolve ferric chloride and cobalt chloride in distilled water in such proportion that one litre of the solution contains 0.7 gramme of metallic iron, and 0.3 gramme of metallic cobalt. A very slight excess of free hydrochloric acid must also be present.

Blue solution.—Dissolve 10 grammes of pure crystallized sulphate of copper in one litre of distilled water.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The efforts which are now being made over the whole country to awaken interest in the all-important question of sanitation cannot fail to be productive of much good. Hitherto these efforts have been isolated, and have been wanting in that power which almost always follows from combination; but this state of matters, it is evident, is no longer to prevail. Some four years ago, under the guidance and direction of Professor Fleeming Jenkin, of Edinburgh, a gentleman who has given much attention to the subject, a Sanitary Protection Association was organized in this city, and such has been its success here that it has already opened branches in London, and other parts in England. The main object of the Association is to provide competent engineers to inspect houses, and report upon their sanitary condition, showing wherein defects exist, if any, and pointing to the best mode of applying remedies. The payment of a small sum annually entitles any member to the benefit of this advice, which must prove to be invaluable, now that it has been definitely ascertained that many of the "ills that flesh is heir to," have their origin in the sewer gas that too frequently finds easy access to our dwellings. Edinburgh, it would appear from the report which was submitted to the fourth annual meeting of the Sanitary Protection Association, held on Tuesday last, under the presidency of Lord Craighill, is singularly free from the defects which are said to be observable on all hands in London, in respect of deficient plumber's work. And yet even in Edinburgh things are bad enough. Seven or eight years ago, when water was very scarce, the authorities, in order to make the distribution of this element as equable as possible, insisted that all new houses, which are here, as a rule, built in tenements of six, eight, or ten, as the case may be, should be provided with a cistern to contain at least 24 hours' supply, moderately computed; but while they made this order they did not state where the cistern should be situated. Architects and builders, at their wits' end to find room for this cistern in the limited space at their command, placed it sometimes in the water-closet, and effectually connected it with the system of drains; while others, apparently under the impression that such a course did not sufficiently impregnate the water with polluting matter, placed the cistern on the top of the coal-bunk, in order that the water might be made still more impure by the addition of insoluble matter arising from the coal, and finding its way through the chinks of a badly-constructed cover. To a certain extent, these defects are being reformed, but it will only be after the public have been made fully aware of the danger in presence of which they continually exist, that sweeping remedies will be introduced. When I say that reforms have already been partially introduced, I mean that the authorities now insist upon the introduction of ventilating shafts of such diameter as will effectually carry off all sewer gases, or at least will so relieve the pressure in the sewers that the ordinary trap will prove a perfect seal. In this way sewer gases, which have hitherto, like unseen enemies, stolen into our houses, and which have been productive of many diseases, will be allowed to escape into the outer atmosphere. This is certainly a step in the right direction, and if only powers could be obtained to compel the introduction of such ventilating shafts into the older houses in the city, the result would soon be apparent in the mortality returns. The Association which has materially aided in bringing about the state of affairs to which I have just alluded, has 485 members, and last year it expended something like £522 13s. It is interesting to note from the report submitted to the meeting that, out of 730 houses inspected for the first time, 75 per cent. were found to have the cistern overflows connected with the drainage system, and 22½ per cent. were found to have a passage provided for the admission of sewer gas into the house by leaking pipes or imperfectly made joints. In the supplement of the report, Professor Fleeming Jenkin said from the experience they had had in London, he might say they had good reason to congratulate themselves in Edinburgh on the excellent condition of their plumber work as compared with what they found it in the south. The work was much better designed here, much better executed, and it was in much better repair. In a very large number of the London houses examined, there was no trap between the common sewer and the house drain. The public sewers in London were in a very good state, well ventilated, and well looked after, and to this they attributed the fact that those defective house arrangements were not much more fatal than they were. He further said that what they had to struggle against was apathy, indifference, and ignorance; and it was to the absence of these three causes in Edinburgh that he attributed their success, although, as compared with the number of houses, there was only a small proportion as yet under the supervision of the Association. I think the Professor is, perhaps, just a little too flattering. In Edinburgh, as in almost every other city, there will be found "apathy, indifference, and ignorance," and these will only be effectually overcome when the strong arm of the law steps in. When an Association such as this has instituted a vigorous crusade against existing evils, much good may be anticipated, but when the pulpit lends assistance it may be expected that the good will be more speedily accomplished. Last week the Rev. J. Smith, minister, of Newhills, Aberdeenshire, lectured his hearers on some sanitary questions in connection with an outbreak of typhoid fever in the locality. Too long the pulpit has been prone to consider cleanliness in its secondary aspect, and if the example of Mr. Smith were more widely followed, I should be hopeful of a more thorough awakening on the question of sanitation.

The ancient town of Musselburgh has been in a lively condition during the week, in consequence of a resolution adopted by the Town Council to drain the town at an expense of £4500. The population are groaning under taxation, present and prospective, and on Wednesday last they assembled in public meeting, and although it was urged by several of the municipal authorities who were present, that the adoption of the scheme was necessary for the health and prosperity of the town, it was rejected by a majority of the meeting. The immediate result has been the resignation of three of the Town Councillors, who in their corporate capacity formed part of the majority in favour of the drainage scheme, their reason being that the resolution of the public meeting practically amounted to a vote of want of confidence.

In connection with the changes at Arbroath, I omitted to mention in my last week's "Notes" that an interesting ceremony took place upon the occasion of Mr. D. Terrace leaving the town for Dawsholm, Glasgow. A number of gentlemen, including Bailie Keith, Councillors James M'Whattie, John Munro, John Anderson, and George Fyffe, met in the board-room of the Gas Corporation, and Mr. George Wightman, collector, presented to Mr. Terrace an elegant dining-room clock, with figures, and a set of silver fruit knives and forks, in a mahogany case, for Mrs. Terrace. When making the presentation Mr. Wightman expressed the regret they all felt at Mr. Terrace leaving them, but they were at the same time gratified at his having received such an important appointment. Mr. Terrace suitably acknowledged the gift, and the manner in which it had been presented, and thereafter he introduced to the meeting Mr. R. S. Carlow, the newly appointed Manager, who expressed the pleasure it gave him to be present on such an occasion, and he hoped that the kindly feeling which he everywhere saw evinced towards Mr. Terrace would be

extended to him. Subsequently the *employés* at the works entertained the late and present Managers to supper.

The appearance of the awards of the Jurors on certain articles exhibited in Glasgow in October last has taken everybody by surprise, including some of the Jurors themselves; but now that the results have been published, perhaps those in authority will favour the readers of the JOURNAL with the data—namely, the various tests on which the awards have been founded. Something is really necessary to make the awards perfectly intelligible, and perhaps the publication of the tests might conduce to this end. If, as I am given to understand, the report is unauthorized by the Jurors, this may account for the inconsistency of some of the passages.*

At a meeting of the Dufftown Gaslight Company, held a few days ago, Mr. Donald M'Kay, builder, was appointed Gas Manager, in the room of Mr. Wm. Grant, resigned. In referring to changes, I may also state that the death of Mr. James Webster, for many years Gas and Water Manager at North Berwick, is recorded this week.

Perhaps one of the best indications of the growth of the city of St. Andrews is the manner in which the gas supply has increased. The Gas Company was formed in 1835, and since then various additions have been found requisite to meet the demands of consumers. In order further to increase the facilities for the supply of gas, workmen have during the past week been busily employed, under the direction of Mr. Hall, in laying an extra main-pipe, of 7-inch bore, along South Street, for the conveyance of an increased supply to the inhabitants.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Since the resignation by Mr. Carlow of the gas managership to the Port-Glasgow Corporation Gas Commissioners, in order to enter upon the duties of the similar office to which he has been appointed by the Gas Commissioners at Arbroath, several special meetings of the Town Council in committee have been held. At one of them it was resolved, on the motion of Bailie Hunter, that the Council record in their minutes an expression of their satisfaction with the faithful and energetic way in which Mr. Carlow had discharged his duties during the time he had served the Corporation, and the Town Clerk was instructed to send Mr. Carlow an excerpt from the minutes embodying the resolution. At another meeting the Council agreed that the offices of Manager and Collector should be separated, only two members—Bailie Hunter and the Provost—voting for allowing them to remain conjoined. Lastly, at a meeting held on the 28th ult., a report from a Special Committee was considered in regard to the advisability and practicability of conjoining the two offices of Gas Manager and Water Inspector. The Committee, by a majority, reported in favour of the two offices remaining separate, and the report was approved of. The Council will meet on the 8th inst. to make the appointment of Gas Manager. Mr. M'Creath, the Town Treasurer, has been formally appointed to the gas collectorship.

The Lighting Committee at Kilmacolm held a meeting last Tuesday, when it was reported that they had secured sufficient funds by voluntary assessment to pay for the street lighting during the past winter, and to provide a number of additional lamps for use next winter. It is very evident, however, that Kilmacolm, which is now certainly a "populous place" in the eyes of the law, will soon have to place itself under the provisions of the Lindsay Act, in order to legalize all future assessments for lighting, watching, and sanitary purposes.

It is rumoured that a gentleman of means and energy, who purposes to settle down in Oban as a resident, is thinking of starting a new system of gas supply for the town. He contemplates buying up the gas-works belonging to the Callander and Oban Railway Company, if they can be obtained on reasonable terms, and to extend them.

Dr. Lyon Playfair, Chairman of Committees in the House of Commons, presiding last Tuesday at a meeting of the Committee on the Irvine Burgh Bill, "put his foot down" rather firmly on the question of the price of gas which the promoters desired to have powers to charge. The maximum price fixed in the Bill was 7s. 6d. per 1000 cubic feet; but Dr. Playfair said that price was enormous, and that the Committee would not grant it. They would, he said, make it 6s. per 1000 feet, and eventually, at the suggestion of the Parliamentary Agent for the promoters, the Chairman said the Committee had no objection to 6s. 3d. per 1000 feet. He also directed attention to the length of time asked by the promoters for the repayment of the loan—namely, upwards of 79 years, which was, he said, much too long. The Committee would give 50 years for the gas loan, which was accepted by the promoters. The Bill passed on Friday as an unopposed measure.

Considering the fact that Coatbridge and Airdrie are so very close to each other, and that they have many points in common, it does seem rather strange the price of gas in the last-named town should still be charged at 4s. 2d. per 1000 cubic feet, while in Coatbridge the price is only 3s. 8d. per 1000 feet; and so far as an "outsider" can form an opinion upon the merits of the case, there seems to be good reason for complaints being published on the subject in the local papers. There are such complaints not only in reference to Airdrie, but also in reference to the price charged in Bathgate, which is now 5s. per 1000 cubic feet, and yet that town is in the very centre of an important canal coal district. Such a charge is well calculated to lead householders to give up the use of gas, and resort to the use of paraffin oil, the manufacture of which is a very marked feature in the industries of the Bathgate district.

The annual general meeting of the Denny Gas Consumers' Company Limited, was held on the evening of Friday, the 25th ult., and was attended by more than an ordinary representation of the Shareholders. Mr. John F. M'Queen, the Chairman of the Company, presided. The Secretary (Mr. A. R. Cousland) read the report of the Directors for the year ending Feb. 1, 1881, in which it was recommended that, besides the 6 per cent. falling to be paid on the £1000 preference shares, a dividend of 10 per cent., along with a bonus of 10s. per share, should be paid on the ordinary shares of the Company; and that they had also arranged to reduce the price of the gas from 5s. 10d. to 5s. 5d. per 1000 cubic feet. The Directors also reported that the £1000 6 per cent. 5 years' preference shares created Oct. 1, 1876, as then agreed upon, would become ordinary stock on and after Oct. 1, 1881, and that the preference Shareholders after that date would rank in the affairs of the Company as the ordinary or original Shareholders. The financial statement showed the following:—Income for the year, £1373; profit, £434 19s. 7d.; value of gas consumed, £1264 16s. 7d.; amount paid for coals, £359 18s. 8d.; wages, £223 8s. 9d. Amongst the assets there were—value of works, £2633 7s. 5d.; in Clydesdale Bank, £919; capital, £2500 in £1 shares. In the course of his speech moving the adoption of the report the Chairman said, as to the bonus mentioned in the report, it might at first sight seem large, but when the Shareholders took into consideration that a dividend had only been declared for 4 out of the 20 years of the Company's existence, it yielded but a very moderate return to the original Shareholders. Mr. John Edgar,

* In reference to this paragraph of our Correspondent's "Notes," we would direct attention to a statement on the subject in our Editorial columns this week. (See p. 563.) —E. J. G. L.

who supported the adoption of the report, spoke in very complimentary terms of the Directors for the manner in which they had managed the affair of the Company. He urged upon them to keep up the quality of the gas, as bad gas was void of economy. They were, he said, to satisfy the consumers, and keep in view the ingress of the electric and other lights. Messrs. McQueen, Adam, Anderson, and Luke were re-elected to the directorate. Special votes of thanks were accorded to the Directors, the Manager, and Secretary. It is interesting to note that Denny is one of the towns in Scotland where an opposition Gas Company was established through the agitation of Mr. Flintoff, the "Gas Reformer" of some 20 or 25 years ago. I think the only other Scotch town that yielded to Mr. Flintoff's advice and blandishments was Lanark, where, as in Denny, there is now only one Gas Company.

There is still a lack of substantial improvement in the Scotch iron trade. Speculative operations have been rather more numerous in the warrant market, and in the course of the week prices fluctuated between 48s. and 49s. 10d., closing flat at 49s. 1d. Warrants have thus gained about 1s. on the week, and there has been some expectation, hitherto unrealized to any extent, that such an advance would attract investors. The demand for the United States and Canada continues to be very quiet; but there appears to have been rather more inquiry from the Continent, for which, however, the orders are still below expectations. Malleable iron is only in very quiet request. A reduction of 5s. per ton in bars has been made by one Glasgow firm, and it is probable that the example will be followed by others.

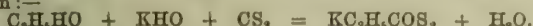
The coal market is less active than it was, and prices generally are a shade easier. Several colliery firms have sent out their lists, and in most cases a reduction of 6d. per ton is given.

ON THE ANALYSIS OF BISULPHIDE OF CARBON.

By H. MACAGNO.

[From the *Chemical News*.]

When carbon disulphide is gradually added to a solution of potash in absolute alcohol, potassium xanthate is formed, according to the following equation:—



This alcoholic solution saturated with acetic acid, and treated with a drop of cupric sulphate, gives a brownish precipitate of cupric xanthate, which quickly changes to bright yellow flocks of cuprous xanthate. This salt is insoluble in water, and in dilute acids.

The formation of cuprous xanthate has been employed for detecting carbon disulphide in coal gas, the gas being passed through alcoholic potash. The same reaction, I think, could be very useful to analyze commercial disulphide of carbon, or in estimating the quantity of this compound in soil air, when it is employed as a remedy for the *phylloxera*. To the end of obtaining a quantitative method, I endeavoured to determine in cuprous xanthate the quantity of copper, corresponding to carbon disulphide employed.

Four assays on 100 c.c. of an alcoholic solution, containing 1 grm. of carbon disulphide per litre, gave me the following quantity of cupric oxide (CuO), burnt in a platinum crucible:—

0.0526 grm.
0.0520 "
0.0516 "
0.0512 "

Mean result, CuO = 0.0518 grm. for 0.10 grm. disulphide.

Very troublesome would be analysis in this way, for which much time and many delicate manipulations are requisite. For it, I undertook some researches on a volumetric process.

A drop of potassium ferrocyanide spread on a clean white plate and touched by a small glass rod, moistened with neutral and alcoholic solution of potassium xanthate, gives a perfectly white compound; but if xanthic acid has been precipitated as cuprous xanthate, and a slight amount of cupric sulphate is present, the ferrocyanide drop becomes red-brown, for the well-known precipitate of cupric salts is produced.

This fact suggests a simple means of determining the whole of the xanthic acid, by decinormal solution of copper, that we can easily prepare by dissolving in a litre of water 12.47 grms. of crystallized cupric sulphate, previously powdered and pressed between blotting-paper. By this method I obtained the following results:—

Carbon Disulphide mixed with Alcoholic Potash Solution.	Decinormal Solution of Cupric Sulphate.
Grm.	C.c.
0.10	13.2
0.15	19.7
0.20	26.2
0.15	19.8
0.10	13.1
0.30	39.5
1.00	131.5

And from it we deduce that—

To 1 c.c. of $\frac{2}{10}$ copper solution corresponds 0.0076 grm. of carbon

disulphide—viz., 1.10,000th of its molecular weight.

I think this process would render no little service in commercial analysis of carbon disulphide, in order to discover its adulterations with other liquids, and also when we have to estimate the amount of its vapour in gaseous compounds.

Agricultural Station of Palermo, Italy, February, 1881.

REDUCTIONS IN PRICE.—The Arundel Gas Company have reduced the price charged for their gas, as from the 1st inst., from 4s. 7d. to 4s. 2d. per 1000 feet; thus bringing the price, it is stated, below that of any town in West Sussex. —At Stourport the price of gas, from Lady-day, is to be reduced from 5s. 6d. to 4s. 10d. per 1000 feet to small, and from 5s. to 4s. 6d. to large consumers.

TORQUAY GAS COMPANY.—The annual general meeting of this Company was held on the 23rd ult.—Mr. W. B. Benyon in the chair—when a report was presented showing that during the year 1880 the Company's total receipts had been £18,973, against which was placed expenditure amounting to £12,423, leaving a balance of £6550. The maximum dividend was declared, absorbing £5000, the balance being carried forward.

SUDBURY GAS SUPPLY.—The Directors of the Sudbury Gas Company have made arrangements to lease the works to Mr. C. W. Grimwood, who has been for several years their Manager. Extensive alterations are about to be carried out, including the erection of a new gasholder, 60 feet in diameter, new purifiers, condensers and scrubbers, so that a better and purer supply of gas may be ensured to consumers. We understand that the price of gas will be reduced by 8d. per 1000 cubic feet, on the 24th of June next, and no charge made for meters.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The demand for all descriptions of coal continues dull, and colliery proprietors are unable to get rid of their present production. There is not much stock as yet going down on the pit banks, but there is a good deal of coal held in waggons on the sidings, and a considerable number of the pits are not now being run full time. The principal colliery firms in the Manchester district are maintaining their prices, and, in accordance with the promise made to the men during the recent strike, they have this month granted an advance in wages. Throughout Lancashire generally, however, the tendency of prices continues downwards, and to secure orders for anything like quantities sellers are willing to accept very low figures. Best Wigan Arley could now be bought at the pit's mouth at from 9s. to 9s. 6d. per ton, inferior descriptions and Pemberton four-feet at from 7s. to 7s. 6d., whilst common Wigan mines are offered at from 5s. per ton upwards. For good burgy about 5s. per ton is quoted, and for slack from 3s. 6d. to 4s. 6d. per ton, according to quality.

Shipping is extremely quiet, and sellers are quoting exceeding low prices to secure cargoes.

Coke is in moderate demand at about the rates last quoted.

The action of the Manchester colliery proprietors in advancing the wages of their men will, no doubt, tend to renew the agitation amongst the miners in other districts, and at the Tyldesley collieries there is at present a very unsettled feeling amongst the men with regard to the wages question. In the present condition of trade it is scarcely probable that Lancashire colliery proprietors generally will concede an advance of wages which they refused during the strike, but whether there will be a renewal of the dispute on the part of the men remains to be seen.

In the iron trade business continues in a most depressed condition, and there are no orders in the market for anything like quantities either of pig or finished iron. Prices tend downwards, and Lancashire pig iron could, no doubt, if a good offer were made, be bought at from 44s. to 45s. per ton, less 2d., delivered equal to Manchester; whilst ordinary bars are to be bought at from £5 15s. to £5 17s. 6d. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The quantity of coal cleared at Cardiff during the past week presents a falling-off to the amount of 17,844 tons as compared with the previous week. Most shippers have been and still are fairly busy, and well supplied with orders. Prices of the best coal keep steady, but those of the second qualities show at the moment some inclination to weakness. The falling-off in the clearances this week is no doubt attributable to the prevalence of strong easterly winds for some days past, whereby a number of sailing vessels must have been prevented from entering the Bristol Channel. The absence of these, however, I may safely say, is scarcely noticeable now that a greater portion than ever of our carrying trade is done by steamers. It is, therefore, not astonishing to find that the aggregate carrying capacity of the vessels entered out for loading during the week is, in spite of the gales, nearly up to the usual figure. The shipments for the week are as follows:—Coal, 100,473 tons; patent fuel, 3450 tons; iron, 2250 tons. Coming to Swansea, I have only to note that the trade here is very dull, and much worse than it was in the previous week. Taking into consideration the severe weather of the last few days, trade at Newport this week has been brisk as a rule. There is no doubt, however, that in exceptional cases the supply of coal is more than equal to the demand. This is more particularly the case in respect of house qualities. The steam coal trade, with very few exceptions, is all that can be desired. The iron trade continues steady, and there seems no lack of orders. Whether prices leave any great margin for profit it is difficult to say. The ironmasters who have no contracts running for ore at the price that article cost six months ago, ought to be able to make a profit in buying at the price ore is offering at just now.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade throughout the country varies a good deal, but generally speaking it is in a very quiet state. There is no improvement to note with respect to the foundries, which are doing but a limited business in general castings. Engineers and fitters are only partly employed, and the same may be said with regard to waggon builders and repairers. The Bessemer steel works are rather quieter than they were a short time ago. Owing to the small production of local ironstone large supplies are being received from North Lincolnshire.

The South Yorkshire coal trade is remarkably quiet in all branches. Household qualities are in very moderate request, so that the quantity of both Silkstones and Barnsley thick-seam coal collected by the Manchester, Sheffield, and Lincolnshire Railway Company, and forwarded to Doncaster for the Great Northern, is very moderate. To such an extent has the recent strike affected the trade of the district, that several collieries only made three days last week. There is also a small demand for the Eastern Counties as well as for other markets, although prices are lower than they were before the pits were set down. The house coal trade at the West Yorkshire pits is also only moderate, although the weather during the past week has been very favourable for consumption.

Steam coal, which forms a very considerable portion of the production of the Barnsley thick-seam pits, continues in very moderate request, notwithstanding the low price at which it is quoted. Since my last notice only a moderate tonnage has been sent by both rail and water to Hull and Grimsby, at both of which ports the shipments are very moderate. The West Riding collieries are similarly situated with respect to Goole, the demand there being also limited, owing to the principal Baltic ports being still closed. The business doing in locomotive coal is about an average one, most of what is supplied being sent in accordance with existing contracts, which have in some cases three, six, and nine months to run.

The supplies of gas coal, now that the pits are again all at work, is plentiful, and a good tonnage is being raised and supplied on account of existing contracts. Complaints are still rife with regard to the increase in the tonnage rates for coal sent over the Manchester, Sheffield, and Lincolnshire line, which in some cases seriously interferes with the small profits coalowners are now getting.

The demand for the best qualities of coke for smelting purposes continues to be very fair. Taken as a whole, the output is, however, not so large as it was before the colliers struck work, so that makers have been able to keep up the rates, which at best are not over remunerative. The quantity sent to North Lincolnshire by rail holds well up, there being about 15 out of 18 furnaces erected in blast. Owing to the revised railway tonnage rates placing from 3d. to 4d. per ton on the carriage of coke from South Yorkshire, a good deal of inconvenience is experienced. In several instances the new contracts entered into are only for a quarter instead of half yearly and yearly, as is generally the case.

The whole of the pits, or nearly so, are again at work, and the labour market is quieter, but overstocked. An effort is again being made to federate the South and West Yorkshire Miners Association, but much will have to be done before this can be accomplished.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade is less brisk in this district owing to the depressed condition of the iron markets. Household qualities are in fair demand, consequent upon the continuance of cold weather; but with this exception requirements are not of an increasing character. The Earl of Dudley has issued circulars announcing a reduction of 1s. per ton in furnace coal, and 6d. in forge. The reduction commenced on the 1st inst. The prices at his collieries now being—furnace coal, 9s.; forge, 8s.; steam, 8s.; and slack, 4s. 6d. Thick coal is now 12s. for household qualities, 7s. steam, and 7s. for screenings. The Earl of Dudley's prices being those on which the sliding scale is based, wages will be reduced in proportion—namely, 3d. per ton for thick, 1½d. on thin seams.

The iron trade maintains a sluggish aspect, and prices in both finished and raw departments are weak and unremunerative. Orders are scarce, and with the exception of those firms who secured large contracts at the beginning of the quarter, there is not much doing at the mills and forges. The unfinished business also holds a declining tendency. Two additional furnaces in the neighbourhood of Dudley have been blown out, whilst at many others in various parts of the districts operations are curtailed. One leading firm of finished iron makers have announced a drop of 10s. per ton. The recent markets were thinly attended, and but few orders booked. Best marked bars are still quoted at £7 10s., but there is a diversity of opinion as to whether this basis will be maintained at the quarterly meeting a week hence. A few kinds required for consumption in the district—viz., sheets for galvanizing, boiler and girder plates, hoops, strips, and tube-making iron, are in request at recently quoted rates. Unbranded bars continue weak in price, and sales are few. The call for pig iron is of a very limited nature, and only the first-class makes are receiving much attention. In this, as well as in the finished branch, customers are withholding orders until the turn of quarter-day. On the whole, it cannot be said that prospects for the commencement of the coming quarter are of an encouraging nature; but, on the other hand, contrast badly with the opening of the quarter now closing. Ironstone raised in the district is scarce, but the productions of the neighbouring localities are plentiful. The returns of prices of marked bars made from the books of the selected firms for the months of December, January, and February show the average transacting prices to have been £6 12s. 11½d. per ton. Wages will rule for the next quarter accordingly—viz., 7s. 3d. per ton for puddling, and millmen's wages in proportion. A special meeting of the South Staffordshire Mill and Forge Wages Board was held in Birmingham on Wednesday last, to discuss the question of alteration in the wages basis.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The shipments of the best qualities of gas coals abroad increase, but as the days lengthen the home business is not so pressing. The first-class pits do very well; but second-class collieries have not full work in every instance. In confirmation of the statement I made in the first month of the year, that no advance in contract prices were made, or could be expected, as regulated by the sliding scale, pitmen's wages have been reduced 2½ per cent. upon calculations made of the average of prices in the first quarter of the year. The Baltic trade is opening rapidly, and the gas-works in the principal towns on that sea are taking in supplies to make up stocks which have got back through the long winter, and stoppage of navigation thereby. There is a better business done in steam coals; but the inquiry for house and manufacturing coals is somewhat moderate. The price of all sorts of coals is unchanged, and the same may be said of coke.

Coasting rates paid to steamers to load gas coals are down. The latest transactions with London are represented by 3s. 9d. per ton from the Tyne and Wear. The very smallest amount of business is done by sailing vessels of twenty keels and upwards in this trade. At the same time, more from the scarcity of vessels through the great losses of the winter than from any abundance of business in the market, small craft, of from six to ten keels, undoubtedly command better rates; especially to load general cargoes. The shipments of fire-bricks and fire-clay goods are enlarging, the leading works on the Tyne are now busy; but second-class bricks, like second-class goods of all kinds, drag in the market, and the prices of the latter are very irregular and unquotable as a price current. The cement business of the Tyne is extremely quiet, and prices give no appearance of improvement.

The pig iron trade of the district showed a decided improvement last week. But there is no change for the better to report in the iron-founding business. The finished iron trade has been slack, and the difficulty of getting business, forces manufacturers to accept specifications to keep their establishments going. Lead and other metals continue in quiet demand.

The season is drawing on when considerable arrivals of timber may be anticipated. The wood trade of the northern district is not at all vigorous, and prices, if anything, have a tendency to weakness. At any rate there is no immediate prospect of an advance in prices. Most of the towns have been overbuilt, and there is a good deal of house property unlet in consequence, which discourages building enterprise.

The chemical market is better all round, prices are stronger, and the general tone and tendency of trade is towards improvement.

AYLSHAM GAS COMPANY.—At the annual general meeting of this Company, held on Thursday last, a dividend of 5 per cent. and a bonus of 2s. per share were declared for the year ending the 6th of January last.

HARTLEPOOL GAS AND WATER COMPANY.—A special meeting of this Company, as required by Act of Parliament, was held last Thursday, to authorize a further exercise of the Company's borrowing powers in connection with the manufacture of gas. Mr. W. H. Fisher occupied the chair, and stated that the amount required was £5000, and it was cheaper to borrow than make a call upon the Shareholders or sell additional shares, as the dividend was generally at the rate of 6½ per cent., whilst borrowed money could be had for 4½ to 4¾. The resolution authorizing this step to be taken, on mortgage either of the works, unpaid calls, rents, or bond, was carried unanimously.

THE SANITARY CONDITION OF OXFORD.—In accordance with the resolution of Congregation a short time since, the delegates of lodging-houses empowered to inquire into the sanitary condition of the dwellings have, through the Rev. G. A. Ward, M.A., of Hertford College, one of their body, issued to the whole body of lodging-house keepers an important communication, to the effect that the delegacy had secured the services of Mr. F. E. G. Griffith, Consulting Engineer, who was recommended by the Local Government Board, to visit the houses and make a thorough examination, at the cost of the University. The lodging-house keepers are asked to give the Engineer every assistance, and the delegacy announce their intention of granting certificates for those dwellings found to be in a satisfactory state.

STEALING GAS AT LEEDS.—Last Wednesday, at the Leeds Police Court, John Willans, a plumber and glazier, was summoned for fraudulently using gas belonging to the Corporation, by disconnecting the pipe attached to the meter at his house, and inserting a pipe of his own to the inlet, tap, by which means he obtained gas direct from the service-pipe without passing through the meter. An Inspector, named Senior, visited the defendant's premises, and found that the alteration of the pipes had apparently been made shortly before his visit. The defendant contended that the pipe in question was not connected with the main, and called a boy as a witness in support of his statement. Mr. Bruce characterized the case as a very bad one, and ordered the defendant to pay £7—£5 as a fine, and £2, being the full amount allowed by the Act for each day that the pipe had been connected.

LOCAL GOVERNMENT BOARD INQUIRY AT HEYWOOD.—Mr. C. N. Dalton, one of the Inspectors under the Local Government Board, held an inquiry at Heywood, on Saturday, the 26th ult., into an application by the Local Board for powers to borrow a sum of money, not exceeding £20,000, to be used in carrying out improvements at their gas-works. The necessity for the inquiry arose from the ruling of the Auditor in regard to the borrowing powers of the Board, to the effect that loans once repaid cannot be again borrowed without fresh parliamentary sanction. The Board have, according to this ruling, exhausted their borrowing powers, and fresh works being required to be undertaken, application for the requisite Provisional Order was applied for to the Local Government Board. The Inspector raised no objection to the application made on account of the gas-works, but said he did not think that the public works loans could be consolidated except under a private Act of Parliament, and it was a question whether this would be advantageous to the town. The matter would, however, be best left in the hands of the new Town Council, and it would not be right to prejudice the new governing body in any sense.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 1331.—LIVSEY, J., Westminster, "Improvements in apparatus for enriching gas by admixture of hydro-carbon vapour." March 25, 1881.
 1363.—BICKERTON, S. and H. N., Ashton-under-Lyne, Lancs., "Improvements in gas motor engines." March 28, 1881.
 1368.—ALEXANDER, E. P., Southampton Buildings, London, "Improvements in apparatus for the manufacture of gas for lighting and heating purposes." A communication. March 28, 1881.
 1388.—EWINS, J. A., and NEWMAN, H., Birmingham, "Certain improvements in gas-engines." March 29, 1881.
 1389.—BOULTON, M. P. W., Tew Park, Oxford, "Improvements in caloric engines, wherein the working fluid is heated by internal combustion of gas or other fuel." March 29, 1881.
 1409.—GWYNNE, J. E. A., and ELLIS, W. I., Strand, London, "Improvements in gas motor engines." March 31, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 4075.—CLAYTON, S., Bradford, Yorks., "Improvements in motor engines worked by gas or combustible vapour and air." Oct. 7, 1880.
 4098.—DICK, G. A., Cannon Street, London, "Improvements in the construction of furnaces for the manufacture of coke, distillation of gas, and for similar purposes." Oct. 9, 1880.
 4100.—WOODWARD, J., Manchester, "Improvements in valves for gas and other fluids." Oct. 9, 1880.

Return to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending March 30, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.1	16.4	16.9	9.4	6.1	8.1	0.1	0.0	0.0	None.	In excess.
	Camden Town	17.6	16.7	17.1	11.0	7.8	10.0	0.0	0.0	0.0	"	"
	Dalston	17.7	16.8	17.3	12.6	9.7	11.3	0.0	0.0	0.0	"	"
	Bow	17.3	16.5	16.8	12.1	9.4	10.4	0.7	0.2	0.5	"	"
	Chelsea	17.3	16.7	16.9	16.2	13.1	14.7	0.0	0.0	0.0	"	"
	Kingsland Road	17.2	16.6	16.9	17.4	10.9	16.1	0.2	0.0	0.1	"	"
	Westminster (cannel gas). . .	21.7	21.1	21.4	Appa ratus under repair							
South Metropolitan Gas Company . . .	Peckham	17.4	16.6	16.9	13.6	10.4	12.1	0.5	0.0	0.3	"	"
Commercial Gas Company	Old Ford	17.4	16.6	17.1	13.3	8.9	11.1	0.4	0.3	0.4	"	"
	St. George-in-the-East . . .	17.1	16.3	16.8	9.5	6.0	7.1	0.3	0.1	0.2	"	"

(Signed) T. W. KRATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolitan is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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SPECIAL NOTICE TO SUBSCRIBERS AND OTHERS.

In consequence of the EASTER HOLIDAYS, the next number of the JOURNAL will not be published until WEDNESDAY, the 20th inst.

TO CORRESPONDENTS.

T. F. (Warrington).—Received.
 SUBSCRIBER.—The makers of the apparatus you refer to are, we believe, Messrs. Guest and Chimes, of Rotherham.
 ERRATA.—In the "Current Sales of Gas Products" in the last number of the JOURNAL, the quotation for white sulphate of ammonia should have been £20 5s. to £20 10s.—In Mr. Alfred Penny's evidence in the South Metropolitan Company's appeal case reported last week (p. 569), the figures 3,546,132,000, in the 16th line from the end of the examination-in-chief, were, of course, intended to denote cubic feet.

THE JOURNAL OF GAS LIGHTING,
 WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 12, 1881.

THE PRESENT VALUE OF GAS PROPERTY.

THE great event of the past fortnight in the civic history of London, and perhaps also in regard to the private interests of a wider circle of anxious observers, has been the inauguration of the great experiment of lighting some of the principal City thoroughfares and bridges by electricity. We have already sufficiently described the affair itself, and speculated on the import of the fact of its existence with reference to the question of street lighting; but so far we have dealt solely with the simpler and more direct aspects of this notable experiment. It is, however, scarcely necessary to remark, by way of justifying a reversion to the topic, that the more obvious effects of admitting electric lighting to the heart of the City,

from which at the same time gas lighting is banished, may well be trifling and superficial, in comparison with the deeper influences that may be thereby originated, to spread over all the land. Expressed in the simplest form, what would be the reflection of an observer, with a turn speculative for inquiry, upon witnessing the fact to which we have just referred? Naturally, his first and continual thought, so long as the subject remained in his mind, would be on the possible effect upon gas property of what he had seen. If the same observer were to have the facility and desire of turning his convictions to practical account, we can very well imagine such a man determining to take part in operations on the Stock Exchange, which should have the immediate effect of sending gas shares up or down in the quotations. There must have been many persons in the position here sketched out, some time about the first of this month, and their combined action we are now in a position to appreciate by its results. Without going into details of the nominal prices of different gas stocks, it will be safe to state that the influence of the commencement of the City electric lighting experiment, upon the value of gas property generally, has been quite insignificant, and much under what was expected or hoped for by friends and foes of gas respectively. It is true that there has been a slight fall in the prices of gas shares, if the ruling quotations at the beginning of April and March are compared; but it is not serious, and most of it is due to a so-called "bearing" campaign opened by sanguine speculators just before the electric lighting in question was inaugurated. In fact, throughout the City the failure of the campaign designed to ruin gas proprietors is openly confessed, and at least one financial journal exclaims loudly against the iniquity of its originators, and, while wishing there were some power of punishing at law such unprincipled schemers, our contemporary opines that, in default of other correction, the operators for the fall will have so seriously burnt their fingers on the present occasion, that they will be disposed to let gas alone for some considerable time to come. We heartily join in the righteous indignation of our City contemporary, but with the conviction that where the prey is, there will the jackals of finance continue to congregate. The gas interest is too well worth wrecking to warrant the indulgence of a hope that the sacrifice of a few assailants will long serve as a deterrent to others.

The reasons for expecting a sudden drop in the prices of gas shares in the first and few succeeding days of the present month lie on the surface; but—reasoning, it must be admitted, after the event—the counteracting influences are not much deeper. The general expectation of a heavy fall was due to a similarly widespread belief in the philosophical observation, that the influence upon the human mind of facts which lie close at hand, far exceeds that producible by the same, or even more important facts, when not so brought home to the meanest comprehension. It was to have been expected that in London as elsewhere, and with reference to the progress of the electric light as to other facts, an optical demonstration before the Bank of England itself would have more effect upon timid gas proprietors than any amount of lecturers' predictions or newspaper articles. The expectation need not have been wholly unwarranted in order to account for the existing state of things as they are left after the now historical proceedings of the first week of this month. We know now how a slight fall was followed by a sharp recovery, and we believe that the present small daily oscillations are no more than the tremblings of the balance in regaining its equilibrium after having been roughly used. Some sales have doubtless been effected, but evidently not to the extent for which buyers were prepared, and therefore the hopes of those who would have liked to see a lasting depression of from seven to ten per cent. in all gas stocks have been fortunately disappointed. It must be remembered that London is not England, neither is the London daily press of such universal power as it perhaps fondly believes. Of the thousands of spectators who remained in the City on the last evening of March to see the wonderful spectacle respecting which the newspapers had been and were still prepared to indulge in limitless glorification, probably not one in a thousand had gas stock to sell cheap on the morrow. And of all the powerful leading articles which were then about to be written for the benefit of those who were perforce absent on that auspicious occasion, it may be said that their force had been prematurely sapped by the many preliminary announcements that had appeared respecting the same topic. But of all the causes tending to give gas proprietors confidence, perhaps the most effectual was the last that might be thought of. Paradoxical as it may

appear, we believe that the excessive glorification lavished on the affair, and its own conspicuous character, lending itself as it necessarily did to the valuation and comparison of all spectators, prevented much of the evil influence which might have been exerted by a more mysterious transaction. We know how frequently hints, innuendos, dark sayings, and mysterious head-shakings are more terrible in their effect upon the "bubble reputation" than straightforward accusations of which any one can see the importance. Stocks and shares exist by reputation only; a breath exalts their value, as a whisper can diminish it. The last attack has been conducted in a sledge-hammer fashion which has defeated itself, and it is not necessary to require the defeat to be final in order to rejoice in the immediate peace which it confers.

THE REPORT AND ACCOUNTS OF THE LONDON GASLIGHT COMPANY.

THE report of the Directors of the London Gaslight Company has been issued in view of the half-yearly general meeting, announced for to-morrow. There is, of course, no change to be made in the rate of dividend, which remains at the old maximum of ten per cent. The Company have not been able to maintain their increased revenue for gas, which was such a remarkable feature of the accounts for the corresponding period of 1879. They, too, appear to have suffered from the fine weather of the early winter—at least, a falling-off of £1698 in the rental is indicated as being due to this cause. A corresponding economy has been secured in the cost of coal, yet the residual products realized nearly £4000 more. It is very gratifying to see how the general increase in the value of what were formerly called "bye-products" benefits every gas undertaking, and none more than the Metropolitan Companies. As announced last autumn, the price of gas has been reduced to 3s. per thousand cubic feet over the Company's district from the commencement of the present year, the effect of which has yet to be seen. In view of this circumstance, it might have been wished that the Company's rental had showed continued elasticity. The policy of the reduction, however, is by no means imperilled by the figures of the present accounts. The report is even more laconic than usual, containing nothing further of general interest.

THE MEETING OF THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

THE Alliance and Dublin Consumers' Gas Company had their half-yearly meeting on the 31st ult., and the accounts then presented show a very good result, although, in consequence of the last reduction in price, they have had to record a diminished revenue. The Company, however, are in a very good position, and while paying full dividends they are steadily strengthening their financial resources. While this course is being pursued, it cannot be said that the Company do not derive so much benefit from their prosperity as the consumers. Of course, under the sliding scale, the advantages to the Shareholders of selling cheap gas would be more direct and apparent, but at the same time they should not forget that they cannot eat their cake and have it, and while a good proportion of surplus revenue goes to reserve and contingency funds the Shareholders should be very well content with such an order of things—at least until another era supervenes. The Company have a solid, if not particularly elastic property; but with care and foresight it will probably be found possible to materially increase the normal rate of extension, and also the profits of the undertaking.

THE AFFAIRS OF THE SHEFFIELD UNITED GAS COMPANY.

THE half-yearly meeting of the Sheffield United Gas Company was held on the 4th inst., when, as will be seen by the report of the proceedings given in another column, the full dividends were declared. It was stated that the Company are now selling gas of practically 18-candle power for from 2s. to 2s. 4d. per thousand cubic feet, and of this fact the Directors are pardonably proud. In many respects the Company are favourably situated for selling cheap gas; but the fact that, without any legislative inducements to lower the price, they act as though imbued with the principles, if destitute of the advantages of modern enactments, is very creditable to all concerned. We sympathize with the Chairman's remark that gas at about 2s. per thousand feet is cheap enough for all practical purposes, and that, having attained this minimum, the efforts of the Company should, for the time, be directed to improving and extending the use of the gas supplied by them at this low rate. With such a price, it would be of the greatest interest to learn by experience what could be done in these two respects, and when the charge is so low it may be argued with considerable force that twopence per thousand spent in

improving the quality of the gas or facilitating its use in every household, would be better employed than if an equal amount were taken off the consumers' bills.

THE SHEPPY GAS COMPANY'S ASSESSMENT.

THE curious Sheppy valuation case has at length terminated. It will be remembered, from the reports and comments which have from time to time appeared in our columns, that the Sheppy Gas Company—the assessment of whose works had been raised, by the rating authorities of the parish of Minster, from £752 gross and £622 10s. rateable value, to £1898 gross and £1496 rateable value—appealed against the assessment to the Court of Quarter Sessions, whence the matter was referred to Mr. J. Clutton for arbitration. The Arbitrator has reported in favour of an alteration of the assessment to £2531 gross and £1263 rateable value, the Company therefore gaining on the point of actual rating, although the gross value was given greatly in excess of the original assessment. The question of costs was left for the Court to decide, and on the 5th inst. the matter was again brought forward for this purpose when, of course, as shown by the report which appears elsewhere, both sides claimed the victory. The Court, however, came to the rational conclusion that as there had been a considerable increase in the original rating, although neither party could be said to have gained all they wished, the expense of the appeal and reference should be divided, both sides bearing their own costs and a moiety of the Arbitrator's charges. Thus ends a case which has been throughout of a most unsatisfactory character. It possesses a more than local interest, although it may be hoped that in many respects its peculiarities are not likely to be abundantly repeated.

A DIFFICULTY WITH THE GAS-WORKS CLAUSES ACT, 1871.

THE recent judicial decision with reference to the interpretation of the Gas-Works Clauses Act, 1871, in a retrospective sense, is stirring up not a few localities to a renewed study of the rights and obligations of Gas Companies and Local Authorities under this Act. The latter, if we may judge from the example of the Ormskirk Local Board, have hitherto, when the Act seemed to be out of their reach, nourished the idea that it is a measure calculated to confer numerous and mysterious benefits upon them without in any way requiring the smallest sacrifices on their own part. The Ormskirk Gas Company have accepted the inevitable revolution, and have addressed themselves to fulfil the requirements of the Act; among others, notifying to the Local Board their willingness to comply with the provisions respecting the establishment of a testing station, and requesting the Board to appoint a gas examiner. At a recent meeting of the Local Board this notice from the Company was discussed, and it then appeared that while the Local Authority wished to use the Act to compel the Company to publish their accounts in due form, the payment of a gas examiner was not so much to the taste of that liberal body, and they therefore replied to the Company's request to the effect that they would appoint the examiner if the Company would undertake to pay him! It will be a curious commentary on the general applicability of the Act if, at such a place as Ormskirk, the only parties to contravene it should prove to be the Local Authority, in whose assumed interest so many of the clauses are drawn.

A STUDY ON A GASHOLDER.

WE commend to the attention of those of our readers who are interested in gasholder construction the work of MM. Monnier and Thibaudet on this subject, an annotated translation of which was commenced in our last issue, and is continued in another column. The joint authors appear to have taken the opportunity afforded by their being engaged in the construction of a telescopic gasholder at Marseilles, to open up, to the best of their ability, the whole question of gasholder design in theory and practice—at least, so far as appropriate to the occasion. It will be interesting to note, when all the Marseilles designs are before us, how far the practical sense with which English engineers are accustomed to regard such work may be held to approve of a structure so elaborately worked out. We may expect to be struck with some distinct peculiarities of design of an unusual appearance to us, for French and English engineers and contractors naturally differ in many points of custom. We must, however, in order to fairly appreciate MM. Monnier and Thibaudet's work, endeavour to shut our eyes to such immaterial divergencies from our own practice, and to consider carefully all differences in principle which may be detected in their design as compared with the manner in which we should ourselves set about a similar work. Gasholder building, especially in small holders under 150 feet in diameter, has

grown from very small beginnings and with a total absence of all rule, one example merely following another, good or bad. The consequence has been the execution, in different parts of the country, of many fearful and wonderful examples of the art, which, for lack of general knowledge of the true principles of design, have been liable to be copied as freely, or as slavishly, according to the calibre of the copyist, as the best models. English gas engineers who would think nothing of sketching out a design for a 140-feet holder and tank in a very short time, may be disposed to smile or look contemptuously upon the laborious disquisitions of our French brethren; but it must not be forgotten that the so-called "practical man" is as often wrong as right, while a strict adherence to a well-grounded principle, admitting at the same time of much latitude in detail, will always prevent a man from going very far wrong. Whatever may be thought of MM. Monnier and Thibaudet's work and method, we must commend their principle, and express the wish that it were generally followed.

THE Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has made his usual report on the quality of the gas supplied during the quarter ending the 31st of March by The Gaslight and Coke, the Commercial, and the South Metropolitan Gas Companies. From it we learn that at every testing station the illuminating power of the gas has been maintained well above the requirements of the Acts of Parliament; the honours of the highest average in this respect having been earned by the Commercial Company. As regards purity, it is satisfactory to notice that sulphuretted hydrogen has nowhere been detected in the gas, and the average amount of sulphur per hundred cubic feet has been generally low, all three Companies being favourably mentioned for keeping it down. Ammonia impurity was, as usual, insignificant, and it is stated that at one station for The Gaslight and Coke Company's gas it never so much as appeared during the quarter. The report altogether is one upon which all the Companies concerned must certainly be congratulated.

Water and Sanitary Affairs.

THE first stage of the parliamentary session has passed without any steps being taken by the Government for the introduction of the Bill which was to constitute a public Authority with power to deal with the Metropolitan Water Question. As the Directors of the East London Company state in the half-yearly report which they have just presented to their proprietary, "no further information can be given respecting the intentions of the Government as to the London Water Supply Bill;" but it is discreetly added that such a measure "may," nevertheless, "be introduced, without further notice, at any time during the present session of Parliament." Of course, the circumstances of the session thus far have been such as to afford a fair excuse for the neglect of this subject on the part of the Government; but the possibility is that the circumstances will continue much the same until it becomes obviously too late to attempt any legislation relative to the general question of the London Water Supply. In the meantime, the public will perhaps be encouraged to believe that a year's delay can somehow be prevented from adding to the value at which the undertakings will have to be purchased. It is a curious fact that amid all the attacks which are made on the Water Companies, the inhabitants of the Metropolis, together with Parliament and the Government, seem to think that the water supply had better remain where it is, than be transferred to any existing authority. There is an ideal municipality floating in the public mind, to which alone the water supply is to be entrusted. The Government—first under the Conservative régime, and now under the Liberal—have sought to throw a bridge across the gulf, by the creation of an Authority *pro tem.*, to administer the affairs connected with the water supply, until a permanent power is created. Sir W. Harcourt makes the bridge of extra length, by proposing to create an Authority which shall first of all consider what is to be done, thus performing the functions of a Select Committee or a Royal Commission. If the government of London is really to undergo a change, it will be the wisest policy, in the interest of the public, to let the water supply remain where it is until the new order of things is finally settled. As for any increase in the cost of purchasing the undertakings of the Water Companies, the advance in the price will only correspond to the augmented value, and the buyer will still receive his *quid pro quo*.

The Parochial Authorities of the Metropolis, who profess such indignation on the public behalf at the conduct of the Water Companies in raising their charges according to the assessment, see nothing wrong in increasing the rates which they levy on the Companies. The latter are expected to pay on the new scale, but to receive on the old. Thus the East London Company, in their report for the last half year, which appears in another column, state that the increased expenditure for maintenance, amounting to £913 as compared with the corresponding period of 1879, "is to be attributed entirely to the increase of rates imposed by the Parochial Authorities." An instance somewhat analogous to this occurs in the charges for management. These are increased by nearly £1500—an augmentation "caused by the heavy law and Surveyor's charges, including those consequent upon the proposed purchase of the Companies during the last session of Parliament." The Company have been to considerable expense in reconstructing their filter-beds—an outlay to which even Lord Camperdown ought not to object. The consumption of water shows a great increase, amounting to an advance of fifteen per cent. over the quantity supplied in the corresponding period of 1879. We presume that this is an "increment" to which even the most inveterate economist will not demur. The concise and business-like report of the East London Directors contains facts which ought to be carefully weighed by parties who think that the Metropolitan Water Companies have no claim on the goodwill of the public, but ought to be harassed and hunted down according as opportunity presents itself. The dividend for the half year is at the rate of seven per cent. per annum, and the revenue from water-rates shows an increase of upwards of £8000 over the corresponding period in the previous year. Reference is made to the Company's Bill in Parliament, and the state in which it passed the House of Lords.

The action of the Local Government Board in promoting measures of sanitary improvement throughout the country has a twofold aspect. On the one hand, the central power appears as urging the Local Authorities to the due performance of their duties; while, on the other, it may be represented as superseding local institutions by a species of Imperialism. If the Local Authorities are wise, they will discern alike their peril and their duty, exercising their functions with loyalty and energy, so as to preclude any interference from head-quarters. The inefficiency of the Local Authorities at once furnishes a plea for the transfer of power from their hands to those of a Government department. The appointment of Medical Officers of Health is a matter which is closely watched by the Local Government Board, and a case in point has just arisen in reference to North Wales. The reports made to the Government by the Medical Officers of Health in certain districts in that part of the kingdom have been, as Mr. Dodson expressed it the other day, "meagre and unsatisfactory." It also seems that they have not been "up to time." It is not alleged that the districts exhibit any excess of zymotic or other mortality. But there are doubts at Whitehall whether the sanitary arrangements are "the best" that could be devised. The result has been that the Local Government Board have proposed to consolidate certain districts in the counties of Flint, Denbigh, and Merioneth, into one sanitary area, under a Medical Officer of Health, who shall supersede the present twelve or thirteen medical officers, and who shall devote his whole time to the discharge of the duties of his post. Against this proposal the Local Authorities have uttered a protest, and a large and influential deputation have waited upon the President of the Local Government Board to urge that the districts shall be left as they are. Mr. Dodson has promised to give the most careful attention to the representations thus made to him, but he has pretty clearly intimated that unless the Local Authorities concerned display a little more zeal in regard to sanitary matters, the Board will certainly carry out the proposed consolidation.

The sanitary condition of Ipswich once more invites our attention. Mr. G. S. Elliston, the Medical Officer of Health for the borough, has just issued an able and extensive report, containing a large amount of information as to the health of the inhabitants and the progress of sanitary works. The vital statistics are not encouraging, the deaths from zymotic diseases being 185 during the past year, as against 89 in the year preceding. The death-rate from these diseases is in excess of that for England and Wales, and is also much above the local average of the last ten years, the cause being "the unprecedented fatality of summer diarrhoea." There were eleven deaths from diphtheria, as against five the year

before. But, on the whole, there has been a marked decrease in the fever-rate, the zymotic mortality being swollen by the extraordinary number of 126 deaths from diarrhoea. Ipswich may take credit for having demolished 210 unhealthy dwellings since 1874, including "thirteen courts and yards" which contained the most wretched description of house "property." A statement recently made in the *Engineer*, that the high mortality of Ipswich during last summer might possibly be due to the little fall that was given to the new intercepting sewer, is controverted by the statement that "the sewer was not then in operation." But it is allowed that the public health was unfavourably affected during the summer months in those localities through which the sewerage works passed. Old drains were broken open, and a large volume of stagnant sewage was allowed to collect—"obliged to be allowed," the Medical Officer says—at the temporary outfalls. The "foul emanations from these two 'ponds of stagnant filth,' it is stated, 'were carried to a considerable distance, polluting the air to a dangerous extent.' It seems a pity that something was not done to disinfect these filthy reservoirs. Now that the intercepting sewer is finished, Mr. Elliston declares it to be "of the utmost importance that the arterial system of sewerage should be 'pushed forward,' the necessity for this 'becoming more pressing in some localities,' these latter being specified. The water supply is good, so far as that furnished by the Company is concerned, and there are now but few private surface wells used for drinking purposes. With respect to the execution of the drainage works, we notice that in one instance there was an "interception" of the sewage not altogether desirable. One portion of the new sewer was finished last May, and it is stated that shortly afterwards the contiguous streets and courts "began to experience difficulty with their 'drainage.' The reason was simply that the old river Gipping, into which the houses had formerly drained, was "done away with" by the act of the engineer, and the sewer took its place; but nobody had thought it necessary to establish any connection between the sewer and the house drains. Consequently, as the houses "had now no outfall for their 'drains, the sewage began to back up into the yards and 'houses.' Fever broke out, the Health Committee were called in, 'great promptitude' was displayed, the drains were connected with the sewer, and 'the whole character of 'the locality became changed.' Happy Ipswich!

THE Executive Committee of the Glasgow Philosophical Society appear to be much exercised in regard to what we published, in the JOURNAL of the 29th ult., as the report of the Jurors in Class III. at the recent Exhibition of Gas Apparatus held under their auspices. After the publication of the report, we received certain information that led to the insertion of the paragraph on page 563 of our last week's issue. However, before this appeared—viz., on Monday afternoon—the following telegram was received from Mr. John Mann, the Secretary of the Society:—

"Please insert as follows, in to-morrow's JOURNAL:—'We are requested to state that the report which appeared, in last week's JOURNAL, of the results of testings of exhibits in Section III. of the Glasgow Gas Exhibition, was published without the knowledge or authority of the Executive Committee.'"

Thinking that the paragraph already in type better explained the "situation," we did not comply with the request; and hence the following letter from Mr. Mann, dated the 8th inst.:—

"I beg to annex copy of telegram I have been instructed to despatch to you, and which was despatched at 2:30 p.m. on the 4th inst. I do not find that you have complied with the request in your publication of the 5th inst.

"May I ask that you will insert it in the next issue, with the necessary variation as to the date of the JOURNAL in which the report appeared.

"I have observed the paragraph in your Edinburgh Correspondent's 'Notes,' on p. 576, with the foot-note relating to it, and also the paragraph on p. 563; but these do not seem to me to meet the case."

It would be interesting to know just what is meant by all this circumlocution; for, it will be observed, it is not stated that the report, as we published it, is a false or unfounded one. If it is so, who is responsible for giving it to our correspondent? On the other hand, why should the Executive Committee be anxious to disown a report made by Jurors specially appointed by them for the purpose? The explanation in regard to these matters must come from Glasgow; and we decidedly hold it to be due to our readers that some *explicit statement of the facts* should be sent to us for publication.

THE annual general meeting of the Paris Gas Company was held on the 29th ult., when a dividend of 74 frs. per share was declared for the year ending the 31st of December last.

THE sixteenth annual general meeting of the Rio de Janeiro Gas Company was held at the Cannon Street Hotel yesterday, when a dividend at the rate of 10 per cent. per annum was declared. A report of the proceedings will appear next week.

WE are asked to state that Mr. D. D. Macpherson has become a partner in the firm of Messrs. J. E. Williams and Co., of the Victoria Paint Works, near Manchester, with which he has long been connected, and that the style of the firm is now Williams, Macpherson, and Co.

A STUDY ON GASHOLDER CONSTRUCTION.

(Continued from p. 563.)

IN the last number of the JOURNAL we brought the study of the conditions affecting the stability of a gasholder-tank to a close, so far as determining the formulæ to be used for ascertaining the value of the various practical coefficients involved. We will now resume the inquiry, taking up the more practical considerations of the case.

Application of the Formulæ.—The value of P_0 at a point in the internal face is equal to the pressure of the atmosphere added to the head of water at that point.

Value of P_0 and P_1 for the Cylinder.—The internal pressure attains its maximum at the bottom of the tank, when it equals 18,700 kilos., thus accounted for—

Atmospheric pressure	10,300 kilos.
Head of water corresponding to the gas-holder pressure	200 "
Head of water in tank	8,200 "

Total 18,700 kilos.

This pressure diminishes commensurately as we rise above the bottom.

The value of P_1 , at a point external to the wall, is equal to the atmospheric pressure added to the resistance of the earth at that point. For a part of the tank built in rock it would be possible, by careful ramming, to materially help the resistance of the backing; but when we pass to the surroundings of earth, more or less shifting, we can only count upon the natural pressure of the ground round the tank, which is shown in the general expression—

$$P = \pi H t g^2 \left(45^\circ - \frac{\phi}{2} \right) \quad (6)$$

wherein—

π = the pressure of the earth (in kilogrammes per square mètre).

π = the weight of a cubic foot of the earth.

H = the distance of the point below the surface level.

ϕ = the angle of natural slope of the earth with the horizontal.

In order to be within the limits of great stability, we may make $\pi = 1550$ kilos.; $\phi = 45^\circ$; whence the equation (6) becomes—

$$P = 265 H \quad (7)$$

As to the resistance of compressed backing, it is shown by the experiments of the Paris Gas Company that for various kinds of backing, carefully watered and rammed in layers of 2 inches, the following coefficients of resistance may safely be assumed:—

River sand	10,000 kilos. per square mètre.
White marl, or tufa	8,000 " " "
Vegetable mould	4,400 " " "

The last coefficient is the one applicable to the backing available at the Marseilles works, and in the calculation of the project it has been admitted that above a height of 2.5 mètres from the bottom a constant resistance of 4000 kilos. per square mètre might be calculated upon. The rest of the backing resistance has been calculated by formula (7).

Value of P_0 and P_1 for the Spherical Dome.—The bottom must have sufficient thickness to resist the pressure of the subsoil waters when the tank is empty. The value of P_0 for a point of the dome will, therefore, be equal to the atmospheric pressure added to the head corresponding to the ordinary height of the water in the land above the point in question, less the pressure due to the weight of the flooring. P_1 is equal to the pressure of the atmosphere.

Value of A .—The complete study of the project included the examination of three different types of construction for the tank; it was therefore necessary to find the value of A in every case.

Hydraulic Lime Concrete.—It follows from many experiments made at Marseilles and Toulon, in connection with the great marine works which have there been built, that mortar composed of 350 kilos. of Teil hydraulic lime powder, and 1 cubic mètre of sand, gave a mean tensile strength of 6.67 kilos. per square centimètre after six months, and of 8.50 kilos. after a year. The resistance to tension of masonry depends upon the cohesion of the mortar which is spread through the mass; therefore this figure of 8.50 kilos. per square centimètre has been adopted as representing the ultimate tensile strain that will produce rupture in masonry with a basis of Teil lime mortar. What, then, is the practical coefficient? It is known that materials showing great differences between the breaking strain and the limit of elasticity possess great tenacity. On the contrary, for those materials having feeble tenacity, a coefficient of practical resistance may be adopted which approaches the breaking strain, for in such cases there is no permanent distortion to be feared. From this consideration there has been adopted as the practical coefficient of resistance to tension for mortar with a basis of Teil lime, one-fourth of the breaking strain, or 2.125 kilos. per square centimètre, or 21,250 kilos. per square mètre. This coefficient is applicable to the cylindrical wall. For the bottom, which is only called upon to resist the bursting pressure of the subterranean water on accidental occasions, there will be no inconvenience in taking double this amount—say 42,500 kilos. per square mètre.

Bricks in Portland Cement.—From many experiments made in England and France it appears that mortar composed of one part of Portland cement and two parts of sand gives, at the end of six months, a tensile strength of between 16 and 21 kilos. per square centimètre. Taking the lowest figure, 16 kilos., it follows, from what has been already said, that the masonry of the wall thus constituted might be expected to bear a working strain of 4 kilos. per square centimètre, or 8 kilos. from the bottom.

Sheet Iron.—The limit of elasticity of wrought iron being 14 kilos. per square millimètre, the general practice is to take 6 or 7 kilos. per square millimètre as the working tensile strain.

Calculation of the Thickness of the Cylindrical Wall.—After having indicated the considerations on which rest the determination of the various elements to be regarded in finding the necessary thickness of the wall, we may now proceed to summarize the results to which the preceding formulæ may lead. The internal and external pressures being different for two points in the same vertical line, it is evident that if the cylinder were to have a wall uniform for the whole height, it would be necessary to adjust the thickness of the whole wall to the zone under the greatest stress. It is therefore reasonable, from the point of view of the economy of materials, to vary the thickness of the wall proportionately to the strain it is called upon to withstand at various points. In this way, supposing the tank wall to be composed of a certain number of superimposed rings, all these rings can be calculated to bear their due strain, and we should thus obtain for the vertical section of the tank wall a form of equal resistance. These determinations are summarized in the following table, which is based upon the supposition of the water in the tank being graduated to depths of 0.5 metre, the thicknesses of wall being calculated to the bottom of the respective layers of water:—

Nos. of Layers.	Depth beneath the Surface.	Value of		Calculated Thickness, A =		
		P ₀	P ₁	21,250 Lime.	40,000 Portland Cement.	4,320,000 Sheet Iron.
	Mètres.			Mètres.	Mètres.	Millim.
1	8.200	18700	14300	2.650	1.692	20.28
2	7.700	18200	14300	2.329	1.491	17.98
3	7.200	17700	14300	2.014	1.294	15.68
4	6.700	17200	14300	1.704	1.098	13.37
5	6.200	16700	14300	1.399	0.904	11.07
6	5.700	16200	14300	1.099	0.713	8.76
7	5.200	15700	11731	2.571	1.598	18.31
8	4.700	15200	11598	2.328	1.449	16.62
9	4.200	14700	11466	2.085	1.229	14.92
10	3.700	14200	11333	1.845	1.150	13.23
11	3.200	13700	11201	1.604	1.001	11.53
12	2.700	13200	11068	1.366	0.853	9.84
13	2.200	12700	10936	1.128	0.705	8.14
14	1.700	12200	10803	0.892	0.558	6.45
15	1.200	11700	10671	0.655	0.410	4.75
16	0.700	11200	10538	0.421	0.264	3.06
17	0.200	10700	10406	0.187	0.117	1.36

Proceeding on these calculated results, we are led to adopt for the cylindrical wall one of the profiles a, b, c, d, shown in the annexed

figure, according to the method of construction to be followed. In order to make this study complete, the following table has been compiled giving the value of the tensile strain T₀ to which the cylindrical wall would be subjected at all points in the hypothetical case where the resistance of the soil being nil, P₁ becomes reduced to the atmospheric pressure alone, the values of P₀ being as before.*

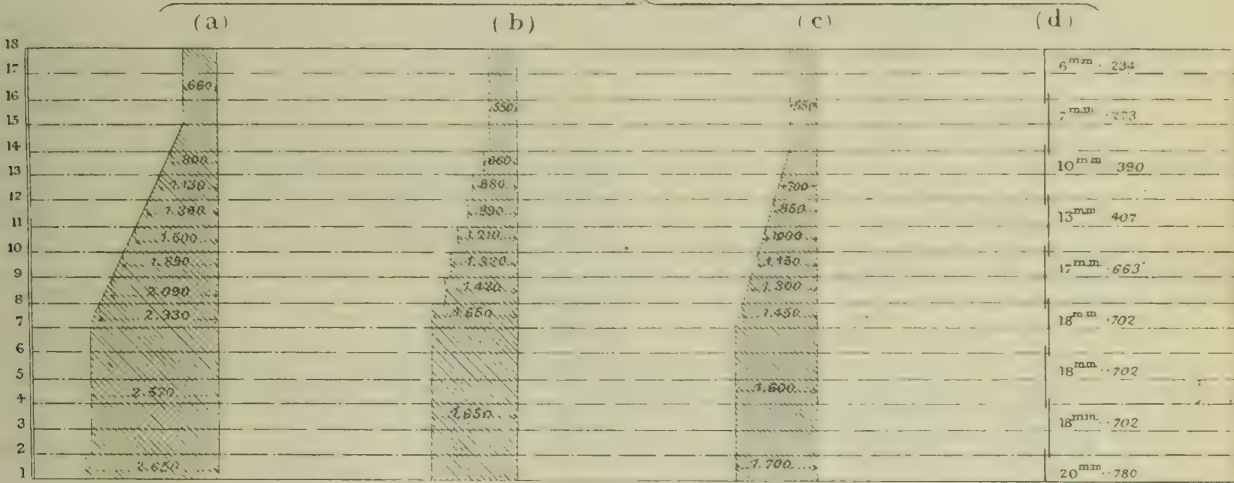
Nos. of Points	Concrete Hydraulic Lime.		Bricks in Cement.		Concrete with Cement.		Wrought Iron.	
	Thickness Adopted.	Value of T ₀ per Square Centimetre.	Thickness Adopted.	Value of T ₀ per Square Centimetre.	Thickness adopted.	Value of T ₀ per Square Centimetre.	Thickness adopted.	Value of T ₀ per Square Centimetre.
	Mètres.	Kilos.	Mètres.	Kilos.	Mètres.	Kilos.	Millim.	Kilos.
1	2.65	5.76	1.65	9.59	1.70	9.29	20	8.38
2	2.57	5.54	1.65	8.96	1.60	9.25	18	8.76
3	2.57	5.12	1.65	8.33	1.60	8.60	18	8.20
4	2.57	4.71	1.65	7.69	1.60	7.90	18	7.65
5	2.57	4.29	1.65	7.06	1.60	7.30	18	7.09
6	2.57	3.88	1.65	6.43	1.60	6.65	18	6.54
7	2.57	3.46	1.65	5.80	1.60	6.06	18	5.98
8	2.33	3.32	1.42	6.08	1.45	5.98	17	5.75
9	2.09	3.41	1.32	5.86	1.30	5.96	17	5.16
10	1.85	3.40	1.21	5.40	1.15	5.95	13	5.99
11	1.60	3.40	0.99	6.01	1.00	5.94	13	5.22
12	1.36	3.38	0.88	5.70	0.85	5.94	10	5.79
13	1.13	3.39	0.66	6.37	0.75	5.95	10	4.79
14	0.89	3.34	0.55	5.97	0.55	5.97	7	5.42
15	0.66	3.29	0.55	4.13	0.55	4.13	7	3.99
16	0.66	1.75	0.55	2.28	0.55	2.28	6	2.99
17	0.66	0.20	0.55	0.45	0.55	0.45	6	1.16

It will therefore be seen that the thicknesses adopted give ample security, since they would be sufficient to maintain the solidity of the tank by itself without the assistance of the backing, if this should accidentally fail at several points.

Calculation of the Thickness of the Bottom.—We have already seen that the bottom has to fulfil the double conditions of strength and tightness. Consequently, its thickness will be calculated by the two formulæ (3) and (4), and we will take in each case the higher figure of the two.

Flooring of Masonry.—Formula (3) s = 0.30 m. + 0.05 H indicates for the lower portion of the flooring a thickness of 0.75 metre, and for the top of the spherical segments a thickness of 0.55 metre.

Fig. 1.



Calculating the thickness with reference to the strain of the subterranean water, we find $\epsilon = 0.59$ metre for $A = 80,000$; that is, for Portland cement concrete.

Thus, in the case of Portland cement concrete being employed, the thickness of 0.75 metre deduced from formula (3) is more than sufficient to resist the force of the land water. With Teil lime the necessary thickness would be 1.05 metre at the lowest part.

Flooring in Sheet Iron.—The vertical resultant of the power of the water underneath the bottom is thus expressed for the spherical portion—

$$\pi a^2 \left[H - \left(\frac{f}{2} + \frac{f^3}{6a^2} \right) - \left(1 + \frac{f^2}{a^2} \right) K \epsilon \right] \times 1000 \text{ kilos.,}$$

where—

- H = 5.0 m. (height of the column of water tending to raise up the floor).
- f = 3.5 m. (rise of dome).
- a = 19.0 m. (radius of circular base of dome).
- K = 7.8 kilos. (density of material composing the dome).
- ϵ = a mean of 12 mm. (mean thickness of floor).

For the plane circular portion the rupturing force of water is—

$$\frac{\pi}{4} [(40)^2 - (38)^2] \times (5 \text{ m.} - K \epsilon) 1000 \text{ kilos.}$$

$\epsilon = 20 \text{ mm.}$

The resultant of the two forces is equal to 4165 metric tonnes, over and above the weight of the floor, and consequently the resistance which it is able to offer to vertical displacement.

From these considerations results the necessity of providing a

safety-pipe through the floor, permitting a means of entry for the water, so that the pressure under the flooring can never pass a certain limit. Under these conditions it is possible to give the flooring a rather feeble thickness, sufficient to maintain tightness; but this solution would not be satisfactory in regard to the strength or durability of the bottom, and it appears reasonable to adopt for the bottom of the tank the following thickness, which is deduced from the formula (5):—

$$\epsilon = \frac{1}{2} P_0 \frac{P_0 - P_1}{A + P_0}$$

as though the bottom is to be made to resist the pressure of the land water, but only by taking as its coefficient of resistance to tension the figure corresponding to the limit of elasticity of the iron, or 12 kilos. per square millimetre. In adopting the system of single rivetting, we have to take—

$$A = 12 \text{ k.} \times 0.56 = 6.72 \text{ k.}$$

Whence we take for the thickness of the several rings of the dome, counting from the outside—

No. 1 ring of plates, thickness 18 mm.	= '702 in.
" 2 "	" 16 " = '624 "
" 3 "	" 14 " = '546 "
" 4 "	" 12 " = '468 "
" 5 "	" 10 " = '390 "
" 6 "	" 8 " = '312 "
" 7 "	" 7 " = '273 "
" 8 "	" 6 " = '234 "

* This would be the case of a tank built above the surface of the ground.—ED. J. G. L.

As to the annular part of the bottom, this is made 20 mm. (0.780 inch) thick, like the lowest ring of the cylindrical wall.

The trials made in consequence of the preceding study have shown that there is economic advantage in building the tank walls of Portland cement concrete, and the bottom of hydraulic lime concrete, and this construction has therefore been adopted by the Marseilles Gas Company.

(To be continued.)

Notes.

A READY TEST FOR FURNACE DRAUGHT.

In a recent number of the *Journal für Gasbeleuchtung*, Herr F. Eitner describes a device which has been in use for some time at the Heidelberg Gas-Works, for showing the constitution of the spent combustion gases from the retort-settings. When gas generator furnaces are in use, it is particularly essential, in order to obtain the greatest useful effect that such furnaces are capable of yielding, that the quantity of air admitted to them should be carefully watched. This is, of course, also of importance with all furnaces, but it is only with gas generators that anything approaching regularity in the composition of the products of combustion can be obtained. With good generators, it is possible to keep down the rate of admission of air to not more than 10 per cent. in excess of the calculated quantity; but that this rule shall be observed, it is necessary to have a simple method of examining the contents of the flues, and so detecting any excess or insufficiency of air. Herr Eitner claims to have met the requirements of the case by the simple expedient of inserting a gas-pipe into the flue, at any convenient point where all the carbonic oxide should have been consumed or converted into carbonic acid. This pipe delivers a small jet of common gas, which, when freely burning in the flue in consequence of there being a superabundance of oxygen, may be observed through a sight-hole covered with a sealed mica plate. When there is nothing but carbonic acid and nitrogen in the flue, the gas-flame is, of course, extinguished; and between these two extremes the behaviour of the flame is said to be so characteristic, that after a little practice a very serviceable estimate can be formed, from a glance at it, of the state of the generator working.

THE STRENGTH OF CYLINDERS.

A contribution to the theory of the strength of boilers, gasholders, and similar cylindrical structures, has been published by M. Bach in the *Zeitschrift der Vereiner Deutsches Ingenieure*, who gives the following formulæ for finding the internal and external pressure which a cylindrical vessel is able to sustain. For the internal or bursting strain, p ,

$$R = r \sqrt{\frac{K + 0.4 p}{K - 1.3 p}}$$

For the external pressure, p_0 ,

$$R = r \sqrt{\frac{K}{K - 1.7 p_0}}$$

Where R and r represent the external and internal radii, and K represents the coefficient of the practical limit of elasticity of the metal of which the cylinder is composed.

AMMONIA AS A FIRE EXTINGUISHER.

A correspondent of *Science* describes a proposal originating with M. Ichlumberger for dealing with explosions and fires of petroleum, marsh gas, tar, or other highly inflammable liquid or gaseous compound. As applied to petroleum, the proposal is to the effect that a moderately large jar filled with aqua ammoniæ should be placed on every keg or barrel of petroleum in store. In case of explosion, the bottle would be broken, thus setting free the ammoniacal gas, which, it is said, would produce an automatic and infallible extinction of the flames. In places where such inflammable hydrocarbons as petroleum are distilled, and where destructive fires are not uncommon, all that is necessary, according to M. Ichlumberger, to give complete security to persons and property engaged in such dangerous work, is to have a supply of aqua ammoniæ at hand, which, if scattered over the flaming material as soon as it catches fire, will instantly extinguish it. In mines where explosions are frequent, it is proposed to place reservoirs of ammonia in such positions that they would be overturned in case of accident of the kind to be provided against. It is not stated what kind of atmosphere might be expected in a mine, after an explosion which would have the effect of mixing the fumes of marsh gas, ammonia, and carbonic acid together. Neither is the fact noticed that gaseous ammonia is commonly believed to be itself inflammable, and likewise, under certain conditions, highly explosive.

AN IMPROVED STREET FITTING.

A combination system of public service, including street lighting among other objects, has been invented by Mr. T. G. Ellsworth, of New York. The multiplicity of overhead telegraph and telephone wires in large cities being a growing evil, and no system of laying such wires underground being quite satisfactory, in view of the obstruction to traffic caused when a wire has to be taken up or touched in any way, it has occurred to Mr. Ellsworth that the distribution of wires carrying electrical currents for various purposes may be made a permanent part of the street fittings in towns. Briefly, as he proposes, a line of standards ranged along the kerb, like lamp-posts, support at their upper ends a rectangular tube, the

interior of which is provided with shelves and compartments for carrying the different conducting cables. At every street crossing there is to be an electric light mounted on this long box, the support and service of such lights being, of course, part of the advantages of the design. Pneumatic letter-boxes are also arranged in connection with this tubular box of wires, and electric clocks are to be displayed where desired. Police time detectors form part of the system, every man to signal his whereabouts at stated times. Fire alarms, ambulance boxes, and drinking fountains are likewise suggested as subsidiary fittings to the proposed structure, which, however, does not appear to have been as yet erected anywhere.

THE SEWAGE CONTAMINATION OF DRINKING WATER.

In view of the perennial agitation on the subject of the Thames water supplied to London for dietetic purposes, it will be interesting to note the opinion of American sanitarians on the subject, as compared with the water supply of the principal towns in the Eastern States. Some suspicion having arisen respecting the quality of the water supply of Cincinnati, an analysis of the source of that supply has been made, and the result tabulated for comparison with other places. It is remarked in the Report of the Sanitary Committee of the Board of Health of Cincinnati, that water exposed for any length of time to the atmosphere contains naturally about 1 lb. to 1½ lbs. of so-called sewage per million gallons. The report gives the following table of the degree of contamination of the water supply of the places named, the source of supply being also mentioned:—

Croton water, New York City . . .	0.98 lb. sewage to the million gallons.
Loch Katrine, Glasgow	0.66 " " " "
Thames, London supply	0.50 " " " "
Mystic River, Boston, Mass. . . .	1.83 " " " "
Fresh Pond, Cambridge, Mass. . . .	1.50 " " " "
Fairmount, Philadelphia	1.58 " " " "
Cincinnati	3.53 " " " "

From this statement it appears that Thames water as supplied to London is actually more free from sewage pollution than the Glasgow supply derived from Loch Katrine! The *Scientific American* is our authority for this information. It is proposed to obtain a naturally filtered water for Cincinnati, by boring in a sand-bank on the river side, whence the water is to be drawn by a collecting main, and delivered into the city without further treatment.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

EXPRESSING THE PURIFYING CAPACITY OF GAS-WORKS.

SIR,—I have to thank Mr. Vernon Harcourt for his letter on the above subject, which appeared in the last issue of the JOURNAL. He is quite correct in pointing out, in allusion to my article, that the actual contact time of the gas with the purifying material is regulated by the area of the pores or interstices of the material itself, and not solely by the area of the vessel. It is impossible to lay down any practical rule by which the actual area for the passage of gas through any particular purifying material can be calculated, although the area could be determined experimentally for any particular sample. This being the case, it is often customary to calculate the velocity of the gas in a rough practical way on the basis of make of gas and area of vessel, without reference to the volume occupied by material; and I used the same method in my article. As it certainly is not scientifically correct, this method had better be discarded.

Mr. Harcourt's suggestion of adopting the make per minute as the standard of comparison would be very useful, of course taking the ratio of bulk of material to volume of gas as the expression of purifying capacity. The method of calculation I have already given would express this in the following way:—

$$\frac{A \times B}{C \div 1440} = \text{Ratio between bulk of purifying material and volume of gas.}$$

Although it appears advisable, on the grounds of scientific accuracy, to discard the expression "contact time" in my formula, my general observations on contact time and its relation to bulk of material, make of gas, and area of purifying vessels, remain unimpaired.

Stepney, April 7, 1881.

H. LEICESTER GREVILLE.

SIR,—Please allow me to correct an expression in my letter on "Expressing the Purifying Capacity of Gas-Works," published in today's JOURNAL. "Each minute's make of gas," in the second paragraph, should have been "each layer of gas."

April 5, 1881.

A. VERNON HARCOURT.

INQUIRER writes: "Would any of the readers of the JOURNAL give their opinion as to how many cubic feet of gas two purifiers, each having an area of 35 square feet, will purify in 24 hours, with a total depth of lime of, say, 30 inches; the coal used containing 15 lbs. of sulphur?"

THE DRAINAGE OF NEWBURY.—The Newbury Urban Sanitary Authority having offered premiums of £100 for the best, and £50 for the second best scheme for the drainage of their district, they met on Tuesday, the 5th inst., for the purpose of considering a report on the merits of the plans sent in. The reporters (Messrs. Law and Chatterton) recommended that the first premium should be awarded to the author of the plan marked "Westminster," and the second to the author of that marked "Final." The recommendation was approved of, and on the respective envelopes bearing these mottoes being opened, it was found that the first premium had fallen to the lot of Mr. H. O. Baldry; the second to Messrs. Gotto and Beesley, of Great George Street, Westminster. After some discussion as to the course to be taken, it was resolved that the matter should be referred to the Drainage Committee, who should be empowered to call in Mr. Law, or some other competent Engineer, to advise them, and that the Committee should then report to the whole Board the result of their deliberations.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION, 1881.

PROGRESS MADE TO SATURDAY, APRIL 9.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Commons Bill	March 29	April 7	..	..	..
Alnwick "Gas Bill"	Commons	Jan. 27	Jan. 28	Feb. 2	March 8	March 28	..
Barrow-in-Furness Corporation Bill.	Lords	Jan. 27	Jan. 28	Feb. 7	April 5	..	..
Beverley "Water Bill"	Commons	Jan. 27	Jan. 28	Feb. 2	April 8	..	..
Bingley "Water and Improvement	Lords	Commons Bill	April 8	Feb. 15	March 22	April 7	..
Bill	Commons	Feb. 4	Feb. 7	Feb. 2	March 11	March 24	..
Birkenhead Corporation (Gas and	Lords	Commons Bill	April 8	Feb. 7	March 24	April 7	..
Water) Bill	Commons	Jan. 31	Feb. 2	Feb. 4	March 18	April 8	..
Bradford Water and Improvement	Lords	Commons Bill	April 8	Feb. 4	March 18	April 8	..
Bill	Commons	Jan. 27	Jan. 28	Feb. 25	..	..	..
Bray Township Bill	Lords	Feb. 18	Feb. 18	..	..	..	..
Brighton and Hove Gas Bill	Commons	Commons Bill	March 15	Feb. 14	March 3	March 14	..
Cambridge University and Town	Lords	Jan. 27	Jan. 28	March 21	March 22	March 25	..
Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
Cheltenham Corporation Water Bill.	Lords	Jan. 27	Jan. 28	Feb. 2	April 5	..	..
Cleator "Moor Local Board Bill"	Commons	Jan. 27	Feb. 7	Feb. 14	March 15	..	..
Colne and Marsden Local Board Bill.	Lords	Jan. 28	Jan. 28	Feb. 8	March 15	March 21	..
Dudley "Gas Bill"	Commons	Lords Bill.	March 28	..	..	..	..
Dundalk Water Bill	Lords	Commons Bill	April 1	April 8	March 22	March 31	..
Eastbourne Water Bill	Commons	Feb. 2	Feb. 3	Feb. 15	..	..	..
East London Water Bill	Lords	Jan. 28	Jan. 31	Put off for	six months	..	..
Egremont Local Board Bill	Commons	Commons Bill	April 5	Feb. 15	March 18	April 4	..
Fylde Water Bill	Lords	Jan. 27	Jan. 28	Feb. 8	March 7	March 11	..
Goole and District Gas and Water	Commons	Lords Bill	March 14	March 23	..	..	..
Bill	Commons	Commons Bill	April 5	Feb. 2	March 11	April 4	..
Hexham Gas Bill	Lords	Jan. 27	Jan. 28	April 8	March 18	March 29	..
Holland (Parts of) and Sutton	Commons	Commons Bill	March 31	March 2	March 18	March 29	..
Bridge Water Bill	Lords	Jan. 27	Jan. 28	Feb. 9	March 18	March 29	..
Hyde Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 8	March 18	..	..
Irvine Burgh Bill	Lords	Commons Bill	March 31	April 8	March 18	March 29	..
Kirkcaldy and Dysart Water Bill	Commons	Jan. 27	Jan. 28	Feb. 9	March 18	March 29	..
London Sea Water Supply Bill	Lords	Jan. 27	Jan. 28	Feb. 8	March 18	..	..
Lower Thames Valley Main Sewer-	Commons	Commons Bill	March 31	April 8	March 18	March 29	..
age Board Bill	Lords	Jan. 28	Jan. 31	March 2	March 18	March 29	..
Matlock Water Bill	Commons	Commons Bill	April 7	Feb. 14	March 25	April 5	..
Oban Burgh Bill	Lords	Jan. 28	Jan. 31	Feb. 7	March 22	March 31	..
Paisley "Water Bill"	Commons	Commons Bill	Jan. 31	Feb. 2	April 1	..	..
Reading Corporation Bill	Lords	Commons Bill	Feb. 2	Feb. 7	April 1	..	..
Richmond Gas Bill	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Ryton Local Board (Water) Bill	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Sevenoaks Gas Bill	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Sheffield Water Bill	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
South Metropolitan Gas Bill	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Stalybridge Extension and Improve-	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
ment Bill	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Stirling Water Bill	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Westbury-upon-Trym Gas (No. 1)	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Bill	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Westbury-upon-Trym Gas (No. 2)	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Bill	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Westgate and Birchington Gas Bill.	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
Woking "Water and Gas Bill"	Lords	Jan. 28	Jan. 31	Feb. 7	April 1	..	..
" "							

HOUSE OF LORDS.

FRIDAY, APRIL 8.

Petitions against the following Bills were presented :—

Dudley Gas Bill, from (1) Corporation of Dudley and consumers of gas

(2) Upper Sedgley Local Board.

Holland (Parts of) and Sutton Bridge Water Bill, from Samuel Chatterton.

HOUSE OF COMMONS.

TUESDAY, APRIL 5.

A petition against the Oban Burgh Bill (Lords) was presented from Alexander William MacDougall.

HOUSE OF COMMONS COMMITTEES.

TUESDAY, MARCH 15.

(Before Mr. ABEL SMITH, Chairman; Lord LYMINGTON, Mr. PHIPPS, and Mr. ARNOLD; Sir JOHN DUCKWORTH, Referee.)

BEVERLEY WATER BILL.

Sir EDMUND BECKETT, Q.C., Mr. HUME WILLIAMS, and Mr. ALLISON appeared for the promoters; Mr. POPE, Q.C., and Mr. SAUNDERS for the Corporation of Beverley, who opposed the Bill.

Sir E. BECKETT, in opening the case for the promoters, said the object of the Bill was to furnish a better supply of water to the town of Beverley, in the East Riding of Yorkshire. Beverley had a population of about 14,000 persons, who, under present circumstances, were altogether dependent upon existing wells for their water. So far back as the year 1874, a Bill, having the same object in view as the present, had been promoted; but it was opposed by the Beverley Corporation, and eventually thrown out. The Corporation opposed the present Bill, the measures proposed in which were considered to be absolutely necessary for the health and convenience of the inhabitants. By the scheme put forward by the promoters, a supply of water would be furnished from a high reservoir, and the pressure would be sufficiently great to enable the water to be delivered to the highest houses in the town—in fact, to be thrown over the roof of Beverley Minster. In their petition the Corporation asked Parliament not to allow a private Company, who were the promoters of the Bill, to supply the town with water, as it was desirable that such supply should be in the hands of the corporate authorities. He (Sir E. Beckett) could only say, in reply to this, that if the present Bill were rejected, the Corporation would not do anything towards supplying the town with pure water.

The following evidence was then given:—

Mr. T. Marshall, a chemist and druggist, residing at Beverley, said the inhabitants were supplied with water from bore and "syke" wells, the water obtained from the latter being inferior in quality. Of these wells there was a larger number than of bore wells; but the town generally was in great want of water. In his opinion a gravitation system of water supply was much needed for the sanitary welfare of the inhabitants.

Mr. J. Barnes, a builder at Beverley, said that during the last 15 years he had built a good many houses, which were mostly supplied with bore-wells, the water being pumped into cisterns. The supply thus obtained was very costly and laborious. He had lost several tenants on account of the defective water supply. A bore-well was often the only means of supplying 12 or 14 houses. The supply of water was very insufficient, and consequently people had to stint themselves. For 15 years there had been general dissatisfaction in Beverley on account of the deficient water supply.

Mr. J. R. Pease said he had been a promoter of a similar Bill to the present, and was also one of the promoters of this Bill. The water in his own well was not good, although it was a bore-well. Beverley was not in a very healthy state, people in the town constantly suffering from typhoid fever. The Corporation had not taken any steps to carry out their pledge given in 1874 to do something to improve the water supply. He believed the Corporation would have redeemed their pledge if it had not been for the persons elected by the ratepayers opposing a water scheme.

Dr. T. J. Thompson, Medical Officer to the Beverley Rural Sanitary Authority and to the Poor Law Union Workhouse, said Beverley was not a healthy town, although the death-rate was a low one—19 in 1000. Diarrhoea was prevalent among the poorer classes, in consequence of the drains not being properly flushed. He had known 1200 or 1300 people to be suffering from diseases arising from the impure water supply. The poor people had, in some cases, to go 300 or 400 yards for water. They had been told that a 2s. 6d. rate would be imposed if the Water Bill were passed, and so they opposed the Bill. There was a low form of disease prevalent among the people in consequence of the defective drainage, and there being no flushing worth speaking of. There were not 1000 bore-wells going into the chalk at Beverley. Witness was Medical Officer only to the Rural Sanitary District under the Guardians. The death-rate was not low, considering the lungs of the town. The Medical Officer of Health for Beverley had reported that the town was one of the healthiest in the kingdom.

Mr. Fisher, a chemical manure manufacturer, said he was a member of the Beverley Corporation when the Water Bill was promoted in 1874. The water supply was very insufficient. The people had to carry their water 200 and 300 yards, and sometimes farther, in the outskirts of the town. Witness had had analyzed a sample of water from his well, and it had been found to be impregnated with sewage. When he left his house he told his successor in the tenancy not to use the water. He knew a case of eight persons being ill with typhoid fever through the bad water. It was not for this fact the merchants of Hull would reside near the place. The working men of Beverley and his own men complained of the want of water.

WEDNESDAY, MARCH 16.

Mr. R. C. Appleton, M.R.C.S., said that in consequence of the bad sanitary arrangements Beverley was a very unhealthy town. There were six doctors in the town, all in full practice. He saw on an average 32 persons a day. Diseases arising from malaria, such as neuralgia, rheumatism, sore throat, and diarrhoea, were frequent. The houses, as a rule, had small yards, and the privies were near the dwellings, and generated offensive gases. The poor people had to go great distances for their water. There were 42 or 43 public pumps, from which the people obtained water. There was no arrangement for carrying away the sewage. The stagnant condition of the atmosphere rendered the place favourable for the spreading of contagious diseases. There were low fevers prevalent, which he attributed to the defective sanitary condition of the town. The death-rate of 19 per 1000 was fair, but small towns had a lower death-rate than large ones. The death-rate was not so low as it ought to be in a pastoral town. There was great complaint about the water supply and the condition of the sewerage, especially in summer time.

Mr. F. S. Brodrick, an architect, practising at Hull and Beverley, said that as a designer of buildings at Beverley the water supply had come under his observation. There was no means of flushing drains, watering streets, or coping with outbreaks of fire. There was usually a great stench in the streets of Beverley, and he was surprised the town was as healthy as it was reported to be. He was in favour of a private company doing the work of improving the water supply, which would also improve the sanitary condition of the town. The Bill, if passed, would not injuriously affect private wells. The existing cesspools polluted the water, and the people really had to drink dilute sewage.

Mr. R. R. Stephenson, a brewer and maltster of Beverley, said the proposed water-works would be a great advantage to the town, and the people generally were in favour of a better supply than they had at present.

Mr. H. E. Silvester said he was Mayor of Beverley in 1874, when he opposed a Bill promoted by some private speculators for supplying Beverley and several neighbouring townships with water. He left the House of Lords Committee pledging that the Corporation would take steps to provide water-works of their own, and orders had been given to water engineers to make a report on the probable water supply; but the result was that nothing had practically been done to supply water to the town. In 1874 he thought that better water than he was then using could not be obtained in Beverley, but he had since altered his opinion. He had also changed his opinion as to the relative cost of private pumps and a public water supply. Private bores cost about £7 10s. to £10, and he thought a company could supply water at a cheaper rate. In January, 1875, he had stated that he strongly objected to any company that would supply an out-district. He was of the same opinion now, and the clause in the Bill which had provided for a water supply to an out-district had been struck out. In order to fulfil the pledge he had given to the Select Committee in 1874, he went fully into the subject of the cost of supplying different sorts of houses, baths, slaughter-houses, &c., provided for in the old Bill, and found those charges to be most exorbitant.

Mr. J. Beaumont said the water supply was deficient and unsatisfactory alike for domestic and flushing purposes. Before his appointment as Borough Surveyor he was of opinion that the foul water would not percolate through the bores; but he had since had reason to modify his opinion. He believed that on an average the bore-wells would be injured by percolation in ten years. The Local Government Board insisted upon a water supply of 12 gallons per head per day. There was a great difficulty in letting good houses in Beverley on account of the bad water supply. He knew a case where an expenditure of £40 was necessary on water supply and closet arrangements before a house could be let. As to the sewage of the town, there was no system whatever of flushing it. There were eight miles of streets in the town, and only one mile could be watered in a day. It would require 20 loads of water for the purpose. There was a cistern from which the water for the streets was taken. In the case of fire

breaking out, there was one small hand-engine available. He had seen buildings burnt down for want of water to put out the fires. In 1874 he, in conjunction with Mr. Fairbank, prepared a water scheme for the town of Beverley. He (witness) knew the proposed site, and believed the works would not injuriously affect the bore-wells. The fall of water in the chalk would pass the town before reaching the site of the works. The proposed water supply, in case of fire, would save the roof of Beverley Minster. He believed the tradesmen and all the better class of people would regard the passing of this Bill as a great boon. The opposition to the Bill was purely a party one. The leader of the opposition came into power and influence by opposing the scheme of 1874. The cry at election times was—"No water-works, no drainage, and no half-crown rate." He had somewhat altered his opinion since he gave up the appointment of Borough Surveyor. To have mentioned water-works when he was in office would have been suicidal. The Deputy Town Clerk (Mr. Mills) had asked him who formed the Water Company, and he said he did not know, but added that he was in favour of the town having water-works. Some 250 persons belonging to a ratepayers' association made the noise against the scheme; but he thought there was a growing feeling in favour of the proposed water-works.

Mr. Spencer, Water Analyst, stated that the water of the proposed supply at Beverley, like that at Hull, was from the chalk, and of excellent quality, though a little hard.

Mr. J. Fairbank, Water Engineer, said he had been engaged by the Corporation of Beverley to draw up a scheme of water-works for the town after the promotion of the Bill of 1874. The site he suggested would have been a suitable one, and given satisfaction if the scheme had been carried out.

THURSDAY, MARCH 17.

Mr. Fairbank, in continuance of his evidence in favour of the Bill, said he was the originator of the scheme now before Parliament, he having heard that the Bill of 1874 had been abandoned. The present water-fittings at Beverley could be easily adapted for a supply from the proposed water-works. They were quite strong enough to take a gravitation supply. The level of the proposed reservoir was very suitable; if it had been higher it would not have been necessary. If it were not for the roof of the Minster, which was about 110 feet, a less height would do for the reservoir. He believed the height of the reservoir—120 feet—would be sufficient to protect the roof of the Minster. There were 2000 houses in Beverley let at under £10 a year, and they would all be supplied by this scheme. The houses need not have a cistern at all; a tap would give the occupants all the water they required, and this would be done at a cheap rate. There was a very large area to supply the water-works. He had no apprehension that the proposed works could interfere with the bore-wells in the borough. He had the co-operation of the townspeople in the scheme. Many of them had applied for shares in the Company, but they were not granted yet, pending the fate of the Bill.

Mr. C. Hawksley, C.E., said he had examined the deposited plans in this case, and thought that they would provide for Beverley, on the gravitation system, a constant supply of good and pure water. The water was very suitable for domestic purposes, being a little hard. The quantity proposed to be pumped daily—namely, 250,000 gallons—would not interfere with the source of the supply of the existing bore-wells. The pumping at Hull bore no analogy to this case; 5 million gallons of water were pumped there daily. The water was hard at Beverley, but it was good for domestic purposes. Soft water was better than hard for manufacturers. He did not think the result of the pumping would affect the water-line for more than half a mile. The inhabitants would, perhaps, at first take the water sparingly; but ultimately all would find it to their advantage to take a supply. Cisterns were not necessary for a constant supply; they were only necessary for water-closets. The poorer houses in Beverley would not require cisterns. He and his father prepared the plans for the 1874 scheme, and there had been no alteration in the water supply since he inspected the place for the previous scheme. There had since been bores put down instead of "syke" wells. Soft water could be brought from a distance, but it would not pay. The present scheme was simple, and the charges were the usual ones; and he was confident that if it were carried out the people of Beverley would find very considerable advantage in using the water.

Mr. WILLIAMS said this was the case for the promoters, and he was willing that the Committee should insert a clause providing for a constant supply of water.

In answer to Sir JOHN DUCKWORTH, Mr. Hawksley said there was provision for two engines, one of which was capable of pumping the whole supply in 12 hours in case the other were out of order.

The following evidence was given against the Bill:—

Mr. J. Villiers, a well-sinker, said he was acquainted with the water supply of Beverley. He assisted in making a well for the Asylum, and it was not far from the site of the proposed pumping-station—about 300 yards. The Asylum bore-shaft was 346 feet deep. He had assisted to sink wells at Leeds, Lymington, and Hornsea, 13 miles from Beverley, and was well acquainted with the nature of the strata. He believed the present supply of water at Beverley was pure and sufficient. In sinking a well there they passed through yellow earth, clay, &c., until they got to the chalk. [Witness produced specimens of the strata above the chalk, and indicated their different depths.] There was a heavy clay over the chalk, which protected the water from surface drainage. The clay overlying the chalk was from 3 feet to 5 ft. 6 in. in depth. It was 30 feet before the chalk was reached, and 500 feet through the chalk to what was known as the blue clay. In boring they inserted 45-foot iron tubes. They bored for about 15 feet into the water, and generally an abundant supply was found, which, for all practical purposes, was inexhaustible. The present scheme would deprive the public pumps in Beverley of water. The people could take water gratuitously from these pumps. In boring, the tubes were protected with an outer lining of clay. The bores were kept in good order and repair by the local authorities. He assisted in sinking a well at Newington, a suburb of Hull, and the pumping there dried the wells in a circle. He believed a similar result would follow at Beverley if the proposed water-works were carried out—the public wells would be dried. He did not believe it was possible for the bore-wells to let sewage into the water; and it had never been proved that there was any sewage in the water. He had repaired the tubing of about six bore-wells, and had not seen any evidence that the water had been contaminated. Since 1874 he had put in 194 bores communicating with the chalk.

Mr. H. Walker, a medical man practising at Beverley, said the rate of zymotic disease in the town was very low, being 0.8. There was no more healthy town in the kingdom. The death-rate was increased by the numbers of elderly people who went to Beverley, and died. He believed the Corporation were willing to pay the extra cost of bores. His water was good, and he did not see why he should pay for an article he was at present getting for nothing. The cesspools were valuable for agricultural purposes. There was no epidemic in the town, but there was a mortality of 1 per cent. arising from infectious diseases. He had not had a case of typhoid fever that he knew of this year. It was the fashion to call low

fevers typhoid fever. The privies were mostly 80 yards distant from the houses, and were deodorized with ashes.

Mr. T. Green said he was a trainer and owner of racehorses, and a member of the Town Council of Beverley. His stables required a large and constant supply of pure water, and this he obtained from two pumps on his premises. He had been an opponent of the water-works because he did not believe they were required. The feeling against the Bill was all the stronger because no townsman's name was attached to it. If his supply were exhausted, the proposed Company could charge him what they pleased for his water. He had had no stoppage of water during the recent frost, but if he had been dependent upon water-works he should not have had any water while the frost lasted. At present his water cost him comparatively nothing.

Mr. E. Crosskill, Mayor of Beverley, said he was of opinion that the scheme of the promoters of the Bill would, in time, tap the present supply, and it would be to their interest to do so. At a meeting held recently at the Guildhall, the feeling of those present was almost unanimous in opposition to the scheme, only two persons holding their hands up in favour of the Bill. A poll was demanded, and 1614 persons were against the Bill, and only 422 in its favour.

Mr. J. Baynes, Public Analyst for the East Riding of Yorkshire, and for Beverley and other towns, said he had analyzed the water supplied to Beverley on several occasions during the last few years, and had never found it unfit for public or domestic use. He had analyzed the water from the public pumps, and it did not show the slightest trace of contamination by sewage. He did not believe there was any sewage at all in the Beverley water. A better water there could not be. He had never heard any complaints of deficiency of supply.

FRIDAY, MARCH 18.

Mr. G. H. Knight, Superintendent of the Beverley Police and Fire Brigade, said the town had the means of grappling with any fire that occurred, there being two public fire-engines and two belonging to private firms available in cases of necessity. The largest fire out of eleven that had happened in ten years in Beverley only involved damage amounting to £120.

Dr. Park said he had been practising in Beverley for five years, and was Medical Officer to the Beverley Board of Health. In discharging his duty he had visited all parts of the town, and regarded the water supply generally as good and ample. The water was certainly somewhat hard, and in some respects not well adapted for washing purposes. The average rate of mortality in the town during the last five years had been 19 per 1000. He made his ordinary report on the health of the town for the year 1880. In that year there were 220 deaths, the zymotic death-rate being only 1 per 1000. He reported that no death arose from a bad water supply. He had heard Mr. Walker give his evidence, and agreed with him that the water-works would not be an advantage to the town. There would have to be water-closets if the water-works were carried out. The drainage at present was sufficient; it ran into the beck, and was cleared out periodically. There had been two Local Government Board Inspectors down at Beverley, but he did not know that one of them said the drainage was in a disgraceful state. He was not aware that the townspeople are in a low state of health in consequence of defective drainage. The town was quite as healthy as any similar town. He would not be in favour of water-closets as there was no system of drainage, and the sewage would have to go into the cesspools. If there was a water-closet system, he should like to see the sewage carried beyond the town. The Beverley Board of Health employed a Public Analyst, as directed under the Public Health Act, and witness had nothing to do with testing the quality of the water.

Mr. J. Thirsk, a member of the Town Council of Beverley, said he considered the water supply of the town ample and good. Mr. J. T. Harrison, one of the Local Government Board Inspectors, visited the town previous to 1874, when the Council applied for a loan, and he was surprised to see the canal, into which the sewage ran, so clear. Mr. Arnold Taylor, another of the Board's Inspectors, also came down, but did not complain of the drainage.

Mr. A. Holt, Borough Surveyor of Beverley, said the water supply of the town was abundant and of good quality. The promoters of the Bill at first proposed to supply the district surrounding Beverley with water, but now they had abandoned their original intention, and would confine themselves to supplying the borough proper. They had to go to a depth of 75 feet to get a good supply of pure water. The water rose to 6 or 8 feet in the bore, and fell about 10 feet in the summer. The cost of a bore was about £6 6s. 6d. For this expenditure a person could have water in perpetuity. There were 203 common bore-holes and 48 pumps provided by the Corporation. The streets were well watered. More than a mile of streets could be watered in one day. The drains or sewers were well flushed by the overflow from the bores and the breweries, and also by springs in the drains themselves. They did not allow water or fluids to go into the cesspools, which were regularly examined. The fluids were carried off by gulleys into the drains.

Mr. D. Maxwell, C.E., Engineer to the Hull Corporation Water-Works, said Hull was supplied with water by pumping from the same bed as that proposed by the present Bill. The pumping works were at Springhead, four miles from Hull. He thought the Corporation of Beverley were justified in opposing the Bill, because he had never seen a town naturally better supplied with water. He believed the majority of the inhabitants of Beverley were opposed to the water-works scheme. Beverley was a quiet market town, where the people were workers of a secondary grade as regards wages. Tradesmen's profits and labourers' wages were therefore low. The gross rental was about £10 per house on an average. There was £8000 of capital invested in pumps at Beverley. When dry seasons returned, as they would, the rainfall cycle having nearly come to an end, there would be an interference with the present water supply of Beverley. He regarded the pumping-station proposed as too high; it would cost too much for pumping. The water would not flow out at the end of a hose at the Minster, after travelling in pipes a mile and a quarter from the pumping-station. If a person stood on the ground at the Minster, with a hose-pipe, the water would not rise to more than 60 or 70 feet from the nozzle of the hose. He thought the natural supply of good water, protected well with clay against pollution, was all that was required for Beverley. The pumping at Hull had reduced the yield of the wells for three miles round. They pumped 5 million gallons of water daily at Hull. Pumping 800,000 gallons a day at Beverley would affect the wells for a mile and a quarter round. The chalk strata was of a very close description. On the whole, the pumping of water by steam would not be cheaper than the present plan.

Mr. J. Brierley, C.E., said he believed the pumping under the present scheme would affect the present water supply. "Syph" wells were abominations, and ought to be done away with. The means of flushing the sewers were satisfactory, and the appliances for dealing with fires sufficient. The proposed pumping-station would be costly and inconvenient.

Mr. W. H. Wellsted, Engineer to the Newington Local Board of Health, said he knew Beverley very well, and could say that the water supply was ample, and all that was required. When a fresh bore was put down at

Newington, most of the wells in the neighbourhood were dried; the whole area of the pumps, for about a mile, was rendered dry. The proposed scheme would, in his opinion, destroy the present water supply of Beverley.

Mr. Pops then addressed the Committee against the Bill. He said he hoped he had shown enough to justify them in refusing to allow the promoters to engage in a speculative water scheme. He admitted that it would be an advantage to certain gentlemen to have water brought into cisterns in their houses for the purposes of baths and water-closets, but this was not a thing Parliament would sanction. This was simply a scheme promoted in the hope that the Beverley Corporation would some day be compelled to purchase the water-works if carried out. The question of baths and water-closets involved a disposition of sewage. Beverley was not a water-closet town; nevertheless, it was free from those diseases generated by bad drainage. Parliament had long laid down the rule that it was desirable that the water supply of a town should not be in the hands of a private company, especially where there was a corporation. Such companies had always to be bought out, and the prospective value of their undertakings had to be paid by the ratepayers, who felt the burden very severely. If the Corporation did not do their duty, Mr. Silvester and other gentlemen in Beverley could have compelled the Corporation, by taking certain action, to move in the matter, and the Local Government Board could make an order compelling the Corporation to supply water, should they deem such a work necessary for the public health. The object of this legislation was simply to place the remedy against grievances in the hands of the people themselves, the Local Government Board having the right by *mandamus* to enforce their orders in sanitary matters. If the promoters of the Bill had felt that the town was in an unsanitary condition, they should have applied to the Local Government Board, and had an inspector sent down to make a report; but this would not suit the purpose of the promoters of the Bill, whose sole object was to form a company, and to make a profit out of the very water for which the people at present paid nothing. The Corporation did not believe that the proposed gravitation scheme was required for the people generally, and therefore they opposed it.

Sir E. BECKETT then replied for the promoters of the Bill. He said that his friend Mr. Pope had not pointed to a single case where a Bill of this kind had been thrown out if it had been shown that a corporation did not do its duty. Numerous Bills had been passed where corporations were remiss, and refused to do their duty. The whole objection to this Bill was the cry of an alleged "half-crown rate," got up by persons who were much opposed to water in any shape.

The CHAIRMAN intimated the Committee had decided to pass the preamble of the Bill, but thought clauses should be inserted giving the Corporation the right to purchase the water-works when constructed, and provide for a constant supply of water.

MONDAY, MARCH 21.

The Select Committee met again to-day for the consideration of clauses. It was stated that there were no differences of opinion between the promoters and the petitioners as to the new clauses, and the Committee having considered them, the Chairman was directed to report the Bill, as amended, to the House.

The Committee then proceeded to hear parties in reference to the

MATLOCK WATER BILL.

The object of this Bill is to enable the Matlock Water-Works Company to construct additional works and raise further capital, and for other purposes.

Mr. DUGDALE and Mr. PHIPPS appeared for the promoters; Mr. BALFOUR BROWN for Mr. Lucas's trustees, petitioners against the Bill.

Mr. DUGDALE, in opening the case for the promoters, said he was happy to inform the Committee that one out of the two petitioners had withdrawn opposition. On Mr. Lucas's estate there were numerous springs, but the Company only desired to possess themselves of one of them. Mr. Lucas's trustees grounded their opposition on the fact that one day they might wish to construct a hydropathic establishment, but up to this hour it had not been attempted.

The following evidence was then given:—

Mr. Lindsay Hodgkinson said he lived at Matlock Bridge, and had been Secretary to the Matlock Water Company for eleven years. The Company was established in 1860, and by the Act of that year they had been authorized to raise £4000 by shares. Under the 7th section of this Act they also took power to borrow £1000. They took the water from the Wold spring. In summer, when the supply of water was at its best, it would not reach the tops of the houses. At this season the Company had to divide the water as well as they could. Since 1860, when they were incorporated, there had been in Matlock a very large increase in population, and this was increased in summer, when a large number of visitors came to the hydropathic establishments. Those establishments were of the greatest importance to Matlock. At the present time the Company only charged three-quarters of their maximum rate.

In cross-examination by Mr. BALFOUR BROWN, witness said the size of the reservoir was 12 yards square. The Wold spring was sufficient in winter, but not in summer. He did not know how much water was required for domestic purposes.

Mr. Pilkington, Engineer of the Matlock Water Company, said the plans were prepared by him. There were three streams on Mr. Lucas's estate, and of them the Company proposed to take one. The flow in Mr. Young's land was 40,000 gallons per day. The present flow from the Wold spring was 112,325 gallons per day. He took this estimate on the 12th of March; the former one two days before. The abnormal flow was 90,000 gallons. The reduction of the flow in summer was about one-third, bringing it to 59,000 gallons; so that, allowing 25 gallons per head per day, there was a deficit of 20,000 gallons. He estimated that the works would cost £430. In his estimate he had allowed £570 for compensation.

Cross-examined by Mr. BROWN: He thought this estimate would cover everything, though he did not include people down the river. He should think 20 to 30 gallons per day sufficient for one person; 25 gallons was a fair amount. There were not many water-closets in Matlock, the sewage being done to a great extent by cesspools, middens, &c. Out of the Wold spring the Company had to give 40,000 gallons as compensation.

Mr. Benjamin Swift, Bailiff of the Water Company, said there were three mains connected with the reservoir. When their water was low in summer, they had to keep the mains shut except for two or three hours a day. A 3-inch or 4-inch pipe would be sufficient to carry the water away in winter.

Cross-examined by Mr. BROWN: His duties were to do the pumping work, and turn the water on and off. He could not state the amount of water used by the hydropathic establishment, some of them being supplied by wells of their own.

This closed the case for the promoters.

The first witness called by Mr. BROWN in opposition to the Bill was Mr. Elce, an estate agent and engineer, who stated that he had lived for many years at Matlock, and was acquainted with the springs of water

on Mr. Lucas's estate. All circumstances combined would make the estate favourable for a sanatorium.

Mr. Wiville and other witnesses corroborated the statements of Mr. Elce. Mr. Fowler, engineer land and surveyor, said he had had much experience in matters of this description, and had inspected the plans of the promoters of the Bill. He had visited the estate of the late Mr. Lucas on two occasions. The distance of the surface reservoir from the spring was about 2000 yards. The hydropathic establishments were used most in summer.

Cross-examined by Mr. DUGDALE: He thought it was not only possible, but very probable, that another hydropathic establishment would be made. He had gauged the three springs on the 8th of January, with the following result—viz., No. 1 produced 106,000 gallons per day; No. 2, 30,000 gallons per day; and No. 3, 27,000 gallons per day. He should imagine that 15 or 18 gallons were enough for one individual.

Re-examined by Mr. BROWN: He thought the first duty of a Water Company was to supply water for domestic purposes. By the present Bill the Company could, if they wished, take all the three springs.

Mr. BROWN, in addressing the Committee on behalf of the opponents of the Bill, said this was a proposal to take three springs, although the Company said they would only take one. The Committee had not had a single inhabitant of Matlock examined before them. Was there one of the witnesses the promoters had called who had said the Bill would be expedient or necessary? It might be for a trade purpose, but it certainly was not for a sanitary one. The promoters said they wanted 20,000 gallons more water per day, but he did not see how they had made out their case. Under the peculiar circumstances he had laid before the Committee, he should ask them to declare the preamble of the Bill not proved.

Mr. DUGDALE said the duty of his clients was to furnish to every one, at their request, a supply of water, and they were also bound to supply the hydropathic establishments. It had been proved by evidence that many of the houses which they had to supply were above the level at which they could do so. They only wished to take one of the three springs.

The room was then cleared; and, on the re-admission of the public,

The CHAIRMAN said the Committee had decided to report the preamble not proved.

On an application by Mr. DUGDALE, that that part of the preamble relating to the raising of capital should be passed, the Committee, after a short consultation, agreed to authorize the raising of the capital.

TUESDAY, MARCH 22.

Before Mr. J. W. PEASE, Chairman; Sir ROWLAND BLENNERHASSETT, Mr. C. SYKES, and Baron DE WORMS.)

BIRKENHEAD CORPORATION GAS AND WATER BILL.

This Bill, which is to enable the Birkenhead Corporation to construct new gas and water works, extend their limits of supply, and make provision for the establishment of the electric light, came before the Select Committee to-day for consideration.

Mr. FITZGERALD and Mr. SQUAREY appeared for the Corporation; Mr. POPE, Q.C., and Mr. LITTLER, Q.C., for the London and North-Western and Great Western Railway Companies, petitioners against the Bill.

Mr. FITZGERALD, in opening the case for the Corporation, said they asked for power to construct additional water-works and to extend their gas-works. By an Act passed in 1841, the Birkenhead and Claughton Gas and Water Company were incorporated, and powers were conferred upon them for supplying water within the limits of the township of Birkenhead, and gas within the limits of that township and the townships of Tranmere, Bebington, Neston, Seacombe, Wallasey, &c. Under the Birkenhead Commissioners' Gas and Water Act, 1858, the Improvement Commissioners acquired the undertaking of the Company, and by the Act of 1867 they were empowered to make the water-works. These had not been made, and the powers for making them had lapsed. The Commissioners were restricted from charging a higher price for the gas they supplied in the township of Tranmere than they charged to consumers within their own district. By the Charter of Incorporation several of the townships surrounding Birkenhead were constituted portions of the borough, and it was now considered expedient that the Corporation should be empowered to acquire all or part of the undertaking of the Wirral Water-Works Company, and to construct other works. For this purpose they would have to appropriate and acquire certain lands adjoining the site of their existing works for the manufacture and storing of gas. The Corporation, among other things, sought power to introduce the electric or any other system of lighting that might be subsequently found to be advantageous. The only petition against the Bill was a joint one from the London and North-Western and Great Western Railway Companies. The Companies alleged that they would be injuriously affected by the provisions of the Bill, and contended that as certain portions of their lines adjoined the proposed site, they were apprehensive that the railway might be in danger. They also urged that the price charged for gas—3s. 6d. per 1000 cubic feet—was excessive, and ought to be reduced. They also submitted that the £125,000 sought to be raised on the borough funds for the purposes of the new works, ought to be charged to the general district rate. Taken altogether, the objections of the Railway Companies were not very substantial, the chief one being an alleged structural injury to their property.

The following evidence was then taken:—

Mr. H. Rawcliffe, Chairman of the Gas and Water Committee of the Birkenhead Town Council, said the ground upon which the existing gas-works stood was fully occupied, and it was absolutely necessary that the Corporation should be empowered to secure sufficient land to extend their works. The site proposed was most eligible. It was on the lowest level in the borough, and on the western side of the river, so that all westerly winds, which chiefly prevailed in this part of the country, would carry any effluvia away from the inhabitants. The price of gas was 3s. 6d. per 1000 feet to ordinary consumers, and 3s. 3d. per 1000 feet, by special arrangement, to large consumers.

Mr. T. O. Paterson, Gas Engineer to the Corporation, said the present population of Birkenhead was rather over 100,000, and he estimated the number of gas consumers at 6000. The total consumption of gas in 1880 was 248,600,000 cubic feet, against 144,900,000 in 1870, being an increase of 66 per cent. The estimated expenditure on the gas-works was put down at £93,000, and it was proposed to spread the outlay over a period of 15 years. He did not think the railway companies would be affected in any way by the proposed works.

Mr. Richardson, the Water Engineer, said the cost of the water-works extension was estimated at £32,000.

Mr. T. Hawksley, C.E., said he had inspected the site of the proposed water-works, and regarded it as suitable in all respects. He considered the estimates both for the gas and water works as very moderate. He did not think the interests of the Railway Companies would be in any way affected.

Mr. POLLOCK (in the absence of Mr. Pope) asked for the insertion in the Bill of a clause for protecting the Railway Companies from any injury that might ensue if the gas-works were carried out as proposed. With regard to the question of water, the Companies had an agreement entered

into in 1858 with the Birkenhead Commissioners, and subsequently with the Corporation, to the effect that if they took a certain quantity of water yearly they should only pay 6d. per 1000 gallons therefor. The North-Western Railway Company had works at Birkenhead, and were large consumers of water, and therefore asked for a maximum price to be permanently fixed.

Mr. JOHNSON, Engineer to the Joint Companies, said he believed the excavations that would be necessary for the proposed gas-works would be a source of danger to the railway, which was some distance below the ground.

Mr. WADE, Secretary to the Joint Companies, considered that 5d. per 1000 gallons would be a reasonable price to pay for water.

The Committee thought there was practically no opposition to the preamble of the Bill, which they considered had been proved. They decided that any works made upon the Railway Companies' land must be approved by their representatives. A clause must be inserted in the Bill providing that nothing in the Act should prejudice the Companies' rights with regard to water. With regard to the question of gas, verbal arrangements seemed to have been carried on between the Companies and the Corporation, and the Committee thought these should be continued.

WEDNESDAY, MARCH 23.

The Bill again came before the Committee to-day for the settlement of clauses. This having been done, the Chairman intimated that he would report the Bill to the House.

Legal Intelligence.

EAST KENT QUARTER SESSIONS.—TUESDAY, APRIL 5.

(Before Lord BRABOURNE, Chairman, and a Bench of Justices.)

SHEPPY GAS COMPANY, APPELLANTS, v. THE GUARDIANS OF THE SHEPPY UNION, AND THE CHURCHWARDENS AND OVERSEERS OF MINSTER, RESPONDENTS.

This was a case in which the Sheppy Gas Company appealed against the rating of their works and plant, the Sheppy Board of Guardians, acting as the Assessment Committee, having, upon a new valuation made by Messrs. Castle and Son, Surveyors, of London, raised the amount of their assessment from £752 gross and £622 10s. rateable value, to £1898 gross and £1496 rateable value. In preference to appealing, the Company offered to submit to their assessment being based upon a gross annual value of £1000; but the proposed compromise was not favourably entertained by the Assessment Committee. The case came on for hearing at the October Sessions,* when, after the opening speech of Mr. W. H. Michael, Q.C., the Counsel for the Appellants, and the evidence of Mr. A. W. Marks, the Secretary of the Company, it was decided to refer the case to arbitration; Lord Brabourne, the Chairman, being of opinion that it was a case for an expert to decide. With the consent of both parties, Mr. John Clutton was appointed Arbitrator, the jurisdiction of the Court, both as to the costs of appeal and reference, being reserved. After hearing the evidence, and making a personal inspection of the works and plant, the Arbitrator reported to the Court as follows:—

That in my opinion the said appellants should be rated and assessed as the owners and occupiers of the said land, buildings, and fixed plant and machinery, dwelling-house, and land occupied by mains and services, the same being gas-works in West Minister, and throughout the said parish, at a gross estimated rental of £2531, and at a rateable value of £1263.

From the rateable value an agreed sum of £50 has been deducted, in respect of the Company's premises in the parish of Queenborough. The question for the consideration of the Court was whether the Arbitrator's award should be confirmed, and what order should be made as to costs.

Mr. F. P. CRUMP appeared for the appellants; Mr. CASTLE and Mr. H. F. DICKENS, as before, represented the respondents.

Mr. CRUMP, in opening the case, said the question for the Court to decide was merely one as to costs. The original rating of the Company's works was £622 10s., but Mr. Castle's valuation increased this amount to £1496, which the Company appealed against, on the ground that it was excessive. The matter was referred to Mr. Clutton for arbitration, and the result had clearly shown that the appeal was successful, for the rating had been reduced to the extent of £233.

The CHAIRMAN: You say the appeal has been successful, when the original rating has been increased about double.

Mr. CRUMP said he did not dispute the fact, but submitted that it did not follow, because the Company had refused to pay upon an assessment of £1496, that they would have appealed against an assessment of £1263.

The CHAIRMAN: You might have said so if the Arbitrator had fixed the amount at £1495.

Mr. CRUMP said the Company had appealed because they considered Mr. Castle's valuation was excessive, and the result had shown that they had succeeded in their appeal, for the Arbitrator had reduced the amount by £233. They were perfectly justified in the course they had taken, and he applied for the appellants' costs.

Mr. CASTLE alluded to the ingenious way in which his learned friend had stated his case, and called attention to what he considered was the real finding of the Arbitrator. The gross valuation of Mr. Castle (the Surveyor) was, he said, only £1898; but Mr. Clutton, who had visited the works, had fixed the amount at £2531.

The CHAIRMAN (interposing) said that as there had been a considerable increase in the original rating, the Court were emphatically of opinion that both parties should pay their own costs.

Mr. CRUMP said the Company had already paid the entire costs of the arbitration, and applied that a moiety of the expenses should be borne by the respondents.

The CHAIRMAN made the order in accordance with Mr. Crump's application.

Mr. Clutton's valuation of £1263 was therefore confirmed.

CHESHIRE QUARTER SESSIONS.—TUESDAY, APRIL 5.

(Before Mr. H. LLOYD, Deputy-Chairman, and a Bench of Justices.)

GAS COMPANIES AND THEIR PROFITS.

Mr. TAYLOR, on a petition from a number of gas consumers in Altrincham, applied to the Court for an order appointing an auditor to examine the accounts of the Altrincham Gas Company, it being alleged by the petitioners that this body had not dealt with the profits accruing from gas-making operations in the manner prescribed by Act of Parliament.

Mr. MARSHALL opposed the application on behalf of the Company.

After a short argument,

The CHAIRMAN granted the order asked for, appointing Mr. W. Aldred, of Manchester, as the Auditor.

A similar application was made in respect of the Stalybridge Gas Company, and Mr. Aldred was appointed to examine the accounts, such examination, however, not to begin for six weeks. He was requested to report in both cases to the next Quarter Sessions.

* See JOURNAL, Vol. XXXVI., p. 650; also p. 970 *et seq.*

Miscellaneous News.

METROPOLIS GAS SUPPLY.

The Chief Gas Examiner for the Metropolis (Dr. Williamson, F.R.S.) has just presented his report on the quality of the gas supplied by The Gaslight and Coke, Commercial, and South Metropolitan Gas Companies, during the quarter ending March 31, 1881:—

I. With respect to Illuminating Power.—The average for the quarter at each of the testing stations of the three Companies was as follows:—

The Gaslight and Coke Company—	Average.
Jewry Street (common gas)	16.4 candles.
King Street "	16.8 "
Dorset Buildings "	16.9 "
Millbank Street (cannel gas)	21.1 "
Ladbroke Grove (common gas)	17.0 "
Devon's Road "	16.9 "
Carlyle Square "	16.8 "
Camden Street "	17.1 "
Graham Road "	17.0 "
Kingsland Road "	16.9 "
Commercial Gas Company—	
Wellclose Square (common gas)	17.1 "
Parnell Road "	17.2 "
South Metropolitan Gas Company—	
Hill Street (common gas)	16.9 "

It will be seen from these results that, with regard to illuminating power the average at all the stations above mentioned has been above the requirements of the Acts of Parliament, especially at the Millbank Street, Ladbroke Grove, Camden Street, and Graham Road stations, and the two stations of the Commercial Gas Company.

II. As regards Purity.—Sulphuretted hydrogen has not been present in the gas. The average amount of sulphur per 100 cubic feet in other forms than this was as follows:—

The Gaslight and Coke Company—	Average.
Jewry Street	10.7 grains.
King Street	8.2 "
Dorset Buildings	9.3 "
Millbank Street	11.5 "
Ladbroke Grove	7.3 "
Devon's Road	11.4 "
Carlyle Square	15.0 "
Camden Street	13.5 "
Graham Road	13.1 "
Kingsland Road	15.0 "
Commercial Gas Company—	
Wellclose Square	10.1 "
Parnell Road	14.0 "
South Metropolitan Gas Company—	
Hill Street, Peckham	11.5 "

It will be seen from these results that the average amount of sulphur at all the stations has been below the limits fixed by the Acts of Parliament, especially at Ladbroke Grove and Millbank Street, of The Gaslight and Coke Company; Wellclose Square, of the Commercial Gas Company; and Hill Street, Peckham, of the South Metropolitan Gas Company.

With regard to ammonia, the maximum amount permitted was not reached at any of the testing stations. At the Dorset Buildings (City of London) testing-place it did not once appear during the quarter. The Ladbroke Grove station was re-opened on the 4th of March.

A deficiency in illuminating power having been returned during the quarter at the Jewry Street and Carlyle Square stations of The Gaslight and Coke Company, the Chief Examiner reported that it was due to depositions of naphthaline in the pipes, and not to the quality of the gas.

AUSTRALIAN GASLIGHT COMPANY, SYDNEY, NEW SOUTH WALES.

The report of the Directors of this Company for the half year ended Dec. 31, 1880 (the 90th half year), stated that the profits, after deducting for bad debts, interest on borrowed money, cost of repairs and renewals, depreciation of plant, working expenses, and all other charges, amount, with the balance brought from the previous account (£2610 7s. 9d.), to £31,624 11s. 2d. From this the Directors recommended a dividend of 7½ per cent. for the period covered by the report, amounting to £18,750, and an addition to the reserve fund of £6000, leaving a balance of £6874 11s. 2d. to be carried forward. The Directors reported that the works of extension and main-laying, necessitated by the increase in the Company's business, were making satisfactory progress, and also that during the past year a reduction had been made in the price of gas supplied to the city and suburban public lamps and to the consumers by meter.

Dr.	Net Revenue Account, for the Half Year ended Dec. 31, 1880.	Cr.
Dividend payable on July 27, 1880	£18,740 16 4	Balance at June 30, 1880 £24,351 4 1
Reserve fund	3,000 0 0	The half year's profit 29,014 3 5
Balance to next account	31,624 11 2	
	£53,365 7 6	£53,365 7 6

Liabilities and Assets, Dec. 31, 1880.

Sundry creditors—tempo-	Fixed investment:—Land,
rary loans	buildings, and machinery,
Suspense accounts	main and service pipes laid,
Capital paid up	implements, and furniture £366,686 1 2
Reserve fund	Stores investment:—Coals,
Reserve for replacement of	residuals, apparatus, me-
eters	ters, lamps, and pillars 62,434 5 6
Dividends unclaimed	Sundry debtors 31,990 9 11
Unappropriated profits	Suspense accounts 3,032 6 4
	Cash 261 2 11
	£464,404 5 10
	£464,404 5 10

THE WATER SUPPLY OF IDLE.—At the meeting of the Idle Local Board on Monday, the 4th inst.—Mr. Turner in the chair—the arrangements necessary for obtaining water directly from the mains of the Bradford Corporation, and for taking over the plant of the Calverley Water Company existing in Idle, were under consideration. The latter will pass into the hands of the Board on the 25th of June, prior to which a reference has been agreed upon to settle the price to be paid by the Board. The district has hitherto been supplied by the Calverley Water Company upon a 14 years' lease, renewable, of which about two years of the second term has expired. Unfortunately, the mains of the Company were unable to supply the higher portion of the district, which was therefore in great need, while the low-lying portions, which were beyond the reach of the Company's service-pipes, have been supplied from wells and other sources. By obtaining a supply from the Bradford Corporation, and utilizing and extending the Calverley Company's mains, the Board will be in the more satisfactory position of having absolute control of the water supply in their own district, and the new arrangement will be considerably facilitated by the completion of the Corporation's reservoir at Idle, which will also be available for the service of the surrounding district.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Thursday, the 31st ult.—EDWARD FORTRELL, Esq., J.P., in the chair.

The SECRETARY (Mr. W. F. Cotton) read the Directors' report, as follows:—

The Directors in presenting the report for the half year ended the 31st of December last, have the pleasure of congratulating the Proprietors on the continued prosperity of the Company.

The statement of account annexed shows a gross revenue of £124,153 5s. 6d., the expenditure (inclusive of bond and debenture interests, &c.) being £87,034 5s. 4d., leaving a balance of £37,119 0s. 2d. From this sum the Directors have deducted £3289 12s. 9d. to augment the contingent fund, thus leaving a net gain on the half year's working of £33,829 7s. 5d., from which they recommend the payment of dividend at the rate of 10 and 7 per cent. per annum on the respective shares, free of income-tax. The payment of dividend will absorb a sum of £29,350, leaving a balance of £3979 7s. 5d.

From the £51,467 2s. 6d. carried from last account, £10,868 17s. has been invested in a reserve fund (in City and other debentures), leaving a sum of £40,598 5s. 6d.; this with the balance of the half year, £3979 7s. 5d., gives a total to be carried to the current half year's account of £44,577 12s. 11d.

The Directors submitted to public competition the residue of new shares remaining after allotment to the Shareholders. Tenders were received for a number far in excess of those on hand. The sale of the latter realized a premium of £1722 7s. 6d. This sum the Directors resolved to give capital expenditure the benefit of, and accordingly they have placed the amount to the credit of that account.

The Directors have succeeded in purchasing for the sum of £2000, the fee-farm title of a most valuable property in possession of the Company, the lease of which would have expired in 14 years. It includes the entrance to the Company's premises on Sir John Rogerson's Quay, with the large yard extending from the quays to the lane at the back of the works, also the stores and houses situated at each side of the entrance referred to, and which were covered by the lease.

Three Directors retire by rotation—David Drummond, Esq., J.P., John R. Wigham, Esq., and Charles Lawler, Esq. Being eligible, they offer themselves for re-election. Edward Kevans, Esq., one of the Company's Auditors, also retires, but will offer himself for re-election.

[The capital account of the Company shows that there had been expended up to the 30th of June last £737,753 15s. 11d. Crediting the amount received as premium on the issue of new shares £1722 7s. 6d., brings this down to £736,031 8s. 5d. During the half year to Dec. 31 there was expended on manufacturing plant, &c., £411 8s. 5d.; new mains and service-pipes, £2707 17s. 10d.; new meters, including fitting, £1615 3s. 8d.; purchase of premises referred to in the report, £2660 total, £7334 9s. 11d.—making a total expenditure on capital account to Dec. 31 last of £743,365 18s. 4d. The amount received to June 30, 1880, was £397,642 10s. on shares; on bonds and debentures, £17,500—total, £745,142 10s. In the half year to Dec. 31, £11,304 was added to the capital by the issue of new shares, making the total amount paid up at that date, £756,446 10s., leaving a balance of £13,080 11s. 8d. of unexpended capital. The Company have still unissued share capital to the amount of £30,000, and borrowing powers to the extent of £12,500, granted under their Act of 1874.]

Dr.	Revenue Account, for the Half Year ended Dec. 31, 1880.	Cr.
Coals	£48,071 1 4	Sale of gas—
Purifying materials	642 1 4	451,387,000 cub. feet, from
Salaries of Engineers and		3s. 11d. to 5s. per 1000
Officers	1,617 18 6	feet £93,939 12 2
Wages	7,709 16 6	Public lighting and under
Repairs and maintenance of		contracts 4,666 10 2
works and plant	8,694 11 4	
	£66,735 12 0	Rental of meters 2,781 2 3
Less old materials sold	37 6 5	
	£66,698 5 7	Residual products—
Salaries of Surveyor, In-		Coke, &c., less labour and
spectors, and Clerks	1,211 13 10	cartage £13,286 2 6
Repair, &c., of mains and		Brown 790 16 8
service-pipes	3,273 6 9	Tar 5,448 4 4
Repairing, &c., meters	1,608 2 0	Ammoniacal liquor 2,437 12 8
Lighting & repairing public		Rents 207 18 11
lamps	407 14 4	Transfer fees 33 0 0
Rents	774 11 0	Dispatch money received 562 5 10
Rates and taxes	3,680 5 1	
Directors' allowances	675 0 0	
Salaries of Secretary, Ac-		
countant, Clerks, &c.	1,315 19 6	
Collectors' commission	953 10 9	
Stationery and printing	234 3 5	
Genl. establishment charges		
Auditors	991 13 6	
Law and partly. charges	50 0 0	
Bad debts	225 3 6	
Abatements, &c.	648 2 4	
Annuity account	489 14 4	
Carried to credit of contin-		
gent fund	500 0 0	
	3,289 12 9	
Total expenditure	£87,026 18 8	
Balance	37,126 6 10	
	£124,153 5 6	Total receipts £124,153 5 6

The CHAIRMAN, in moving the adoption of the report, said the Directors had the pleasure of congratulating the Proprietors on the continued prosperity of the Company. The satisfactory character of the report would, he remarked, almost justify him in sitting down without saying another word, were it not advisable that he should, for the benefit of those Proprietors who had not troubled to go into the accounts, refer to some of the principal items. In the first place, all the plant and the works generally were in excellent order. The Company had sent out during the past half year, in contradistinction to the corresponding period of the previous twelve months, 7 million cubic feet of gas more, but the revenue showed a falling-off of £3500. This was accounted for by the reduction in the price of gas which had been made during the last quarter, and it showed that in proportion as the price of gas was reduced, the consumption increased. Of course, by having £3500 less income, the expenses were increased; but by paying less for coals—the Directors having made some very good contracts—they were able to keep themselves right. The taxes for the past half year were £500 in excess of those for the half year ending Dec. 31, 1879; but this was owing to the increased income-tax. The Directors had converted £10,000 of the 4½ per cent. bonds into £10,000 of 4 per cent. debenture stock, and he looked upon this as an uncommonly good feature in the Company, for it showed that the public were willing to surrender the 4½, and take up the 4 per cent. This the Directors would continue to do every year. The Proprietors were aware that at the time of the issue of the new shares these shares were allotted in the proportion of one for every twelve held by the old Proprietors. This left on hand a balance of 1040 shares unallotted. The Directors could, if they thought proper, have put into the profit and loss account the premium that would be gained on these shares; but on mature consideration they decided to have tenders for them, and gave them to those tendering highest. The £1722 that was realized by the premiums on these shares the Directors had (to his mind very wisely) applied in the reduction of capital expenses, as it was an exceptional thing, and not produced from the sale of gas; and he was sure the Proprietors would all approve of this having been done. The report mentioned that the Directors had purchased some premises on Sir John Rogerson's Quay. This was a very valuable purchase, as the Company's lease of the premises had only 14 years to run. The Company were in the fortunate position that in their original Act these premises were described as gas lands, which gave the Company an amount of control which they would not otherwise have had.

without obtaining a special Act of Parliament. The berth opposite these premises was now being deepened by the Port and Docks Board, so that ships of any size could come up to discharge coal, and this would make everything more economical for the Company. There was an item in the accounts this half year which had not appeared there before—namely, a reserve fund. This fund was created by Act of Parliament, and it was for the purpose of enabling the Company to put by for any sudden emergency which might happen—such as an explosion or any other untoward event, or a coal famine, as they had experienced, when the price of coals rose to such an extent that it was impossible to supply gas at the usual price and make any profit. This fund would prevent the Company from being obliged to raise the price of gas in consequence of a rise in the price of coals. It would likewise be available in the event of the dividends falling short of the stipulated amounts. The contingent fund was another matter the Directors had thought it well to look to, believing it would put the Company in a position from which it could not fall back; and they would thus be able to gratify not only the Shareholders with full dividends on their shares, but also, by economic working, reduce the price of gas.

Mr. DOCKRELL seconded the motion, but remarked that while the report showed the Company to be in a prosperous condition, the Shareholders were no better off for it. The consumers had, he said, been considered, by having the price of gas reduced on two or three occasions, and he thought some consideration should likewise be shown to the Shareholders. He wished to know whether there was anything in the Company's Act of Parliament prohibiting the giving of a bonus, and if there was not, he considered the Proprietors were entitled to have one, if only on account of arrears of back dividends.

The CHAIRMAN said it was impossible for the Company to divide more than 10 per cent. Their Act of Parliament specified clearly what was to be done in the event of any further profit being made; it was to be applied in the reduction of the price of gas.

The motion was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. CROSTHWAITE, dividends at the rate of 10 and 7 per cent. were declared.

The retiring Directors and Auditor having been re-elected,

Dr. WALLER said he wished to propose a resolution which he had founded mainly upon the prosperity of the Company. When the Company was established in 1867, there were 13 Directors, receiving together a salary of £1950. Under the Act there were now only nine Directors. Even if the business of the Company had not increased, the duties being now discharged by nine must necessarily have added very largely to the responsibilities of the individual Directors; but in addition to this the Company's profits had greatly increased. In 1867 their income was only £146,560, and it was now £243,120. He believed that they were in a state of settled prosperity, and as this prosperity was due to the industry and ability of the Directors, he thought they should participate in it. He therefore moved—"That the remuneration of the Directors be increased to the sum of £2000 per annum, to be distributed amongst them as the Directors think fit themselves." This was only £50 a year more than was given to the Directors when the concern was in a less flourishing condition.

Mr. CROSTHWAITE seconded the motion, which was carried.

The CHAIRMAN having briefly acknowledged the resolution, votes of thanks were passed to the Chairman and Directors for their services, and to the Secretary and officials, for their attention to the Company's business, and the proceedings terminated.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on the 4th inst.—Mr. J. HOBSON (Deputy-Chairman) presiding, in the absence, through illness, of Mr. F. T. Mappin.

The CLERK (Mr. W. Wake) having read the notice convening the meeting, the following report and accounts were presented:—

The accounts show that, by paying the usual maximum dividend, the balance to carry forward will be £12,884 2s. 11d., as against £15,051 10s. 6d. which was carried forward from the accounts for the half ending June 30, 1880.

The Directors, during the present month, have made a further call of £2 per share on the new ordinary £10 shares. This was rendered necessary in consequence of there being, during the present time, a considerable outlay on capital account, in preparing to erect further plant at the various stations, and in the enlargement of the capacity of the Company's mains in several parts of their lighting district; more especially an additional 30-inch supply main from Neepsend to the centre of the town.

As previously mentioned, unexpected difficulties were met with in the construction of the large new tank at Effingham Street; but your Board are glad to report that the Engineer considers they have now all been overcome, and it is confidently anticipated that such tank will shortly be completed, ready to receive the gasholder, which is already delivered.

Your Board recommend that there shall be paid a dividend for the half year after the rate of £10 per cent. per annum on all the Company's paid-up capital, which will be as under, viz.:

On £135,000 class "A" stock	£6,750 0 0
On £209,053 10s. class "B" stock	10,452 13 6
On £99,700 class "C" stock	4,985 0 0
On 12,937 new ordinary £10 shares (second issue), £4 per share paid up, being 4s. per share, or	2,587 8 0
On 11,462 "E" shares of £8 10s. each, £2 per share paid up, being 2s. per share, or	1,146 4 0
	<hr/>
	£25,921 5 6

This will leave a balance to carry forward of £12,844 2s. 11d.; the reserve fund—£67,055 1s.—being at its maximum, and independent of the above balance.

[The capital account of the Company shows receipts on the several classes of stock and shares amounting to £518,425 10s., and the Company have on mortgage £17,700; adding to these £6459, the amount paid in anticipation of the call due on Jan. 1, 1881, makes the total amount on the debit side of the capital account on Dec. 31 last £542,584 10s. On the credit side the items are—Expended on lands, buildings, works, &c., to June 30, 1880 (less depreciation), £408,493 4s. 2½d.; half year to Dec. 31, 1880, £15,337 9s. 6d.—total, £423,830 13s. 8½d. Mains to June 30, 1880 (do.), £78,700 11s. 4d.; half year to Dec. 31, 1880, £5940 10s. 11d.—total, £82,641 2s. 3d. Meters to June 30, 1880 (do.), £20,230 15s. 11d.; half year to Dec. 31, 1880, £933 2s. 9d.—total, £31,163 18s. 8d. Total expenditure to the end of last year, £537,635 14s. 7½d., leaving an unexpended balance of £1948 15s. 4½d.]

Revenue Account, for the Half Year ending Dec. 31, 1880.		Cr.	
Balance from last account	£15,051 10 6	Expended in the production of gas and residuals	£70,950 7 11
Gas and meter rents	62,076 0 10	Paid mortgages for interest during half year, less received from Bankers and others	261 14 5
Sale of coke, tar, &c.	24,888 2 0	Balance	38,805 8 5
Manufacture of sulphate of ammonia, sale of gas-fittings, &c.	4,597 17 3		
Interest on investments of reserve fund	1,326 16 2		
Sale of 517 "E" shares	2,077 4 0		
	<hr/>		<hr/>
£110,017 10 9		£110,017 10 9	

General Balance.

Balance of revenue account. £38,805 8 5	Ledger balances, and accounts owing to Company £65,751 13 6
Ledger balances, and accounts owing by the Company	Stores in hand 17,990 0 6
Balance of capital account 43,535 14 11½	Balance due from Bankers 3,546 12 9
	Balance due from Cashier 1 12 0
	<hr/>
£87,289 18 9	£87,289 18 9

Reserve fund invested Dec. 31, 1880 £67,055 1 0

The CHAIRMAN, in moving the adoption of the report, remarked that the Shareholders would observe that the expenditure on capital account had increased during the past half year by £20,211 8s. 2d. This, he said, had arisen from various causes. One was the increased outlay incurred for additional mains, which were now only partially completed, and the work upon which would be continued during the current half year. Some districts of Sheffield had grown much faster than others, and in these there was now quite a town, where there was only country not very long since. This had necessitated a considerable increase in the mains. The Directors were sorry that during the depth of winter complaints had to be made of there being an insufficient supply of gas. As the Company had undertaken to supply gas, the Directors were anxious that the consumers should have as much as they required; and on complaints coming to them they took immediate measures to remove the cause. In consequence of the severity of the past winter, they could not lay the mains as quickly as they desired; but as soon as the weather would enable the work to be proceeded with, it would be carried on with vigour, and it was hoped that next winter there would be no more complaints of defective supply. He then referred to the new gas-tank and holder, the work upon which, he said, had been a very heavy business. The Directors had been compelled to change the contractor, and the work was now being carried on with considerable rapidity. The tank was already completed, and the gasholder was being put in. The want of this holder had been a very serious drawback during the past winter. It would be capable of holding 1,250,000 cubic feet of gas; and the Shareholders would see how important it was that the Company should have this additional storage room. The Shareholders would notice that the balance brought forward from the last account was £15,051, whilst this half year the balance was reduced to £12,884. At first sight this did not look very favourable to the Company, but he regarded it as a matter of little importance. They had a balance of £12,884, and in addition to this there was a reserve fund amounting to £67,055, the whole of which was untouched. Thus they had £80,000 to fall back upon; and he thought the Shareholders would agree with him in thinking that it placed the Company in a very strong position indeed. The last reduction in the price of gas, making it now 2s. 4d. per 1000 feet, had been in operation during the whole of the past half year, and this difference in price more than accounted for the difference of £2000 in the balance to be carried forward. At the time the reduction was decided upon, the Directors were aware that it would affect the revenue for a couple of years or so; but inasmuch as they had a reserve fund of £67,000, they considered it was only right to give the public the benefit of the reduction from 2s. 7d. to 2s. 4d. per 1000 feet. This reduction had been the means of saving the Sheffield Corporation £1000 per annum in the cost of lighting the public lamps alone. In the carrying on of the Company's business during the past half year there had been £12,713 additional expenditure. This sum was made up thus:—Extra coals, £2000; stokers' wages, £804; smiths and fitters, £714; repairs of retorts, £4722; repairs of works, £482; renewal of exhauster, £431; renewal of meters, £795; alteration of scrubbers, £1668; repairing of chimney, £336; salaries, £369; repairs of tanks, £392. On the other and more favourable side of the account there was £1648 additional received for gas; for coke, £2687; tar, £416; ammoniacal liquor, £1852; sulphate of ammonia, £375; premium on gas shares sold by auction, £2077—total, £8955. By the alteration of the scrubbers, the Company had succeeded in increasing their income during the first three months of the present year by no less than £1100 from sulphate of ammonia alone. He had special pleasure in referring to this fact, because it showed that the alteration would pay for itself in less than a year. But it showed more than this. The Shareholders must not regard themselves as simply a gas-making Company. They were really becoming a company for the extensive manufacture of chemicals, or residuals; and it was possible that these residuals would some day be more valuable than gas itself—at any rate, they were considerably increasing in value. Coming to another and a much more delicate matter, the Shareholders would perhaps like to know the views he entertained with regard to the electric light. On the previous Friday night, he walked along Parliament Street and Whitehall, where one of the London Gas Companies had lighted up the whole of the street with patent burners, similar to those which were being used in the Haymarket at Sheffield; though in Parliament Street the experiment was carried out on a much larger scale than at Sheffield. While the street was several times longer than the Haymarket, there were perhaps ten times as many lamps. There was, in fact, a wonderful display of the power of gas; indeed, it seemed to be almost overdone in the number of lamps, inasmuch as they were only from 20 to 22 yards apart. Some of the lamps had four burners, and others five. The light was exceedingly brilliant and pleasant, and in every way satisfactory. He then went to the Charing Cross Railway Station, which was now lighted by electricity both in front and inside. He had previously seen the Great Eastern Station, which was also lighted by electricity, and he understood that the Cannon Street and Great Western Stations were lighted in a similar way. The light was remarkably powerful, but to him it was very unpleasant. If they asked him his honest opinion as to the electric light, he would answer that he had recently increased his gas stock to a moderate amount; and therefore they would see that he was not frightened. Where corporations were liberal, like the Corporation of the City of London, there was no doubt that the electric light would be adopted for lighting the large squares and more important thoroughfares of great cities. It would in addition be used by railway companies for the lighting of their stations. Shareholders in gas companies must expect that the electric light would be used for such purposes as these; but he was not afraid of the light ever coming into extensive and general use at Sheffield. In this town there were many weighty advantages connected with gas manufacture; one being that the Shareholders were limited to 10 per cent. This was a considerable advantage; because, as there was no necessity to aim at making more than 10 per cent., the Company could devote their energies to producing gas of a better quality and at a lower price than was possible in London. The average price of gas in London was 3s. per 1000 cubic feet. At Sheffield it was supplied to the public lamps at 2s. per 1000 feet. This he considered a very strong point in favour of the Company. Another thing in their favour was that they had made sulphate of ammonia for many years, whilst the London Companies had scarcely more than commenced its manufacture. Thus the latter were only just beginning to realize a profit in this direction; whereas the Sheffield Company, having extended its chemical manufacture, and having long enjoyed profits therefrom, could sell gas at 2s. instead of 3s. per 1000 feet, and could moreover give gas of two candles better quality. Then the Sheffield Company had another advantage which was not possessed by the London Companies. At Sheffield coke could be used for many purposes and in a variety of ways, and the result was that it was sold at prices that were remunerative to the Company. Thus, from all these circumstances combined, good and cheap gas could be manufactured at Sheffield; and the residuals were so valuable that rather more had been obtained therefrom during the last half year than was necessary to pay the dividend. He was justified in saying that the Shareholders had a very valuable property for many years to come; that gas would be used, and used largely in the future by Sheffield; and that instead of there being an annually decreasing consumption, the consumption would be in-

creased. Gas companies must expect competition in great centres; but the Shareholders in the Sheffield Company might safely be at rest. In conclusion, the Chairman showed that the quality of the gas supplied by the Company during the past six months was much higher than was required to meet the tests of the public tester, and that its illuminating power was two candles more than the Company were bound to give.

Mr. T. WATERHOUSE, in seconding the motion, said he fully endorsed what the Chairman had said respecting the electric light. There was no doubt a sphere for the electric light, as there was for gas; and he was surprised that it had not been brought more extensively into use. Probably in course of time the electric light would be more generally adopted than gas for street lighting in large towns; but the sphere of the electric light would always be controlled by its cost; and if the Company could sell gas at 2s. 4d. per 1000 feet, he thought they might confidently look forward, for a long time at all events, to the electric light not superseding gas in price. But there was a use for gas which was not possible for the electric light, and he considered the Directors would do well if they put it more prominently before the public; he referred to the properties of gas for heating and cooking. He could, he said, testify to the comfort he had experienced during the winter by having a gas-stove in his bed-room, and to the advantages obtainable from a gas kitchen-stove. He was surprised that such stoves were not brought more generally into use, and that one was not found in every cottage home. The use of gas-stoves for heating and warming was an important matter for gas companies; and he suggested that such companies should join in offering a premium of £500 for a cooking-stove superior to any now in the market—a stove capable of cooking a dinner for from 10 to 30 persons. Included in the competition should be a stove suitable for a cottage. This should not cost more than 30s., should boil water quickly, be able to toast, cook a chop or steak, and roast 5 lbs. or 6 lbs. of meat. As an illustration of what could be done with gas as a heating power, he referred to the London and North-Western Railway Company's works at Crewe. These works, he said, employed about 6000 hands. Many hundreds tons of rails were rolled, and at least three locomotives made there every week, yet the whole of the steel was melted and heated by gas. The huge chimneys, which at one time formed part of the works, were now all removed, the shops were almost as clean as the room in which the Shareholders had then met, and on the banks of the railway, near the works, trees, and even flowers, were growing—evidence of the purity of the atmosphere. What had been accomplished at Crewe showed that gas was more economical and more effective than coal.

Mr. T. ROBERTS, the General Manager, said the Company were experiencing the extended use of gas-stoves, and sold many dozens every half year. The demand for such stoves was still on the increase. Besides this the use of gas in the daytime was much greater than was the case a few years back. Within the last few months a gas-engine of 16-horse power had been erected in the town, and at the present time the Company had an order to supply gas to a gas-engine of 12-horse power. There could be no doubt that in the course of time gas-engines would be much more extensively used than was now the case. He endorsed what Mr. Waterhouse had said as to the desirability of pushing the use of gas-stoves; and he could assure him that inventors were fully alive to the importance of introducing improved stoves. There were, in fact, so many new inventions of the kind that it was impossible to deal with all of them, and, moreover, the Company's show-room would soon be filled if he were to order every new stove that came out. He could assure Mr. Waterhouse and the other Shareholders that the Directors were fully alive to the matter, and personally he should assist in the introduction of gas-stoves in every way he possibly could.

Mr. J. WILSON observed that the tenor of some of the Chairman's remarks was that certain chemicals which the Company made were going up, whilst gas was going down. It had been going down for some time, but whilst the price had been reduced, the quality had been improved. He should like the Chairman to say whether he thought, as far as the manufacture of gas was concerned, they had now arrived at perfection, or whether the price was likely to go down lower still.

The CHAIRMAN said his opinion was that the price of gas was not likely to go down much below 2s. 4d. per 1000 feet; that was to say, 2s. to the town, 2s. 2d. to manufacturers, and 2s. 4d. to small consumers. He had frequently heard it said, "We don't quarrel with the price—it's cheap enough; let us have as good a quality as you can." This was what the Company were endeavouring to do. The tests during the last six months were uniformly better than at any previous time, and showed that the Company were giving something like 2½ candles higher illuminating power than Parliament required. In the tests made at Sheffield, however, a test burner was adopted which had been in use for 20 or 30 years, and this did not bring out the quality of the gas to the best advantage; whereas in London and Manchester, and at Leeds, Sugg's "London" Argand burner was used. In consequence of this, the Sheffield gas was made to appear less good than it really was, as an illuminating power of 16½ candles in Sheffield really meant 18 candles.

The motion was then put, and carried unanimously.

The CHAIRMAN then formally moved the declaration of a dividend of 10 per cent. on the various classes of shares.

Mr. W. G. ROPER seconded the motion, and it was carried.

A vote of thanks was then passed to the Chairman, and the proceedings terminated.

EAST LONDON WATER-WORKS COMPANY.

The following is the report of the Directors, presented to the Proprietors at the Half-Yearly General Assembly held on Thursday last:—

The half year's accounts to Christmas last are herewith submitted to the Proprietors. The revenue from water-rates shows an increase of upwards of £8000 over the accounts to Christmas, 1879. The expenditure for maintenance is £913 in excess of the corresponding period for 1879, which is to be attributed entirely to the increase of rates imposed by the parochial authorities.

The charges for management are nearly £1500 in excess of those for 1879, caused by the heavy law and surveyor's charges, including those consequent upon the proposed purchase of the Companies during the last session of Parliament.

The exceptional amounts of £1200, being the balance of the cost of reconstructing the filter-beds, as appears in the accounts to Midsummer last, and £527, part of the cost of altering the boundary line between the New River and East London Companies, are also charged against revenue in the present account. The net expenditure on capital account during the half year amounts to £10,223 10s. 4d., making a total beyond the amount received of £30,300 14s. 10d.

The water pumped during the half year amounts to 6,536,892,008 gallons, being an increase of 15 per cent. over the quantity for the corresponding period of 1879, and considerably in excess of any former period. The number of additional supplies laid on was 2329, and a total of 5573 during the year 1880.

No further information can be given respecting the intentions of the Government as to the London Water Supply Bill, which, however, may be introduced without further notice at any time during the present session of Parliament.

In accordance with the report made to the Proprietors in October last, application has been made to Parliament during the present session, to remedy an inadvertence in the issue of £95,000 as debenture stock, which should have been issued as ordinary or preference stock, and for power to raise additional capital. The Bill as it has passed through the House of Lords remedies the inadvertence, and leaves the Company possessed of the power to issue £95,000 ordinary stock, but confers no power to raise further capital. The Proprietors are recommended to authorize the issue of the capital in such amounts and on such terms as the Directors may from time to time approve.

Three Directors go out of office by rotation—viz., Messrs. Helme, Dalton, and Oxley—but all are eligible for re-election. They have given the notice required by the Company's Act of Parliament. One of your Auditors—Mr. H. J. Baddley—also goes out of office by rotation, but is eligible for re-election.

The Directors recommend that a dividend at the rate of 7 per cent. per annum, less income-tax, be declared, payable on the 11th of July next, on which date the interest on the debenture stock will also become payable.

Dr.—REVENUE ACCOUNT, FOR THE HALF YEAR ENDING DEC. 25, 1880.

Maintenance.	
To Maintenance and repair of reservoirs, works, and pipes, or for obtaining and storing of water, including materials and labour	£2,771 11 1
Maintenance and repair of mains, pipes, fittings, meters, and works connected with the distribution of water, including materials, labour, &c.	4,017 13 1
Pumping and engine charges, coals, wages, &c.	7,958 6 10
Filtration, including materials and labour.	2,022 18 7
Salaries of Engineer and Clerks, and wages of Inspectors and Turncocks	4,750 15 1
Rents of houses and lands, accrued due to date, and owing by the Company	769 8 6
Abstraction of water—Thames and Lea.	2,000 0 0
Rates and taxes, exclusive of income-tax	11,072 7 1
	£35,363 5 3
Management.	
Allowance to Directors	£1,076 5 0
Allowance to Company's Auditors	21 10 6
Salaries of Secretary, Accountant, and Office Clerks.	1,266 19 6
Superannuation of servants of the Company	470 8 0
Commission to Collectors	3,217 0 3
General establishment charges	1,309 10 2
Law and Surveyor's charges	1,046 17 11
Official Auditor and Water Examiner	102 11 7
	9,111 2 11
Reconstruction of Middlesex filter-beds.	1,200 0 0
New River Company—alteration of boundary.	527 0 0
Dividend and interest account for transfer of profits	66,049 0 1
Balance carried to next account, to provide for losses	4,500 0 0
	£116,750 8 3

Cr.—REVENUE ACCOUNT.

By Balance brought from former account	£4,500 0 0
Less sums written off as losses, viz.—	
Empty houses, houses cut off, and bad debts	2,166 0 8
	£2,333 19 4
Water-rates accrued to Dec. 25, 1880	112,529 10 5
	£114,863 9 9
Rents of houses and lands accrued to date, and owing to the Company	1,114 14 0
Fees received for registration of shares, transfers, &c.	42 5 0
Charges for laying on water	729 19 6
	£116,750 8 3

LEIGH (LANCS.) LOCAL BOARD GAS SUPPLY.

At a recent Meeting of the Leigh Local Board Gas Committee, the Gas Manager (Mr. Joseph Timmins) presented a report, showing the progress made by the gas undertaking during the past ten years, for the first four of which the works were in possession of the Leigh District Gas Company, the Local Board taking possession on July 1, 1874. The period embraced in the report is rather longer than the present Manager's connection with the gas undertaking, this having commenced five months after the acquisition of the works by the Board.

On entering upon his duties, the new Manager found the mains and services in a very defective condition, of course causing considerable leakage, and one of the gasholders was so dilapidated as to necessitate its being thrown out of use altogether, and subsequently removed, the tank being converted into a tar-well. No systematic inspection of meters had, the report states, been in operation before the Board acquired the works, consequently the condition of these instruments was most deplorable. To reduce the loss by leakage was the first work of the Manager, and in this he was so successful that in about six months the leakage was diminished something like 5 per cent., with a consumption of only 1½ million cubic feet per mile of main. When the Board took over the works the number of consumers was 1109; while at the end of last year they numbered 1574, being an increase of 29·54 per cent. During the time the works were in the possession of the Company, the number of consumers fell, in the three years 1871-4, from 1247 to 1109.

The manufacturing capacity of the works is now equal to 300,000 cubic feet per 24 hours, and on several occasions during the past winter the consumption was found to be 230,000 cubic feet in that time, showing an excess of power of 23·33 per cent. over present requirements. It is believed by the Manager that the revival of trade that may be expected next winter will bring down this excess to 10 per cent. above the actual requirements, which would be a very narrow margin indeed. With a reviving trade, further extensions will have, he says, to be made in the retort-house, by the duplication of the settings, thus encroaching on the space now used for coal-storage purposes, and rendering the erection of special stores inevitable. These extensions the Manager estimates will cost about £2000, and their effect will be to leave a margin of productive capacity of about 60 per cent. in excess of the requirements of the time.

With reference to the quality of the gas, the report states that when the Board took possession of the works the illuminating power was 16 candles. At the end of October last year it was 17 candles, and the Manager received instructions to increase it to 18. Unfortunately the regular supplies of coal were interrupted about this time by the miners' strike, and the result was a diminution of the illuminating power, owing to the straits to which the Manager was put to keep his retorts going.

The report very properly calls attention to the fact that the complaints of bad gas on the part of consumers more frequently arise from the defective condition of their burners and fittings than from any defect in the gas itself; while the cry for more pressure so often heard would, the Manager points out, if it were yielded to, only lead to complaints on another score—namely, excessive consumption—while an excess of pressure at the burners would really be detrimental to the illuminating power of the gas.

In the matter of the public lighting, the report states that in the season to May last the cost of gas was less by nearly £400 than in that for the year 1875, assuming the consumption for each season to be the same. The price now charged for the gas used in the public lamps is 3s. 3d. per 1000 feet, while in the season ending May, 1875, it was 5s. 6d. per 1000 feet—a difference of 2s. 3d., or nearly 42·5 per cent.

Appended to the report are two tables—one giving a synopsis of the distribution of the gas made from 1871 to 1880 inclusive; the other showing the total cost of its manufacture, and the cost per 1000 feet sold, from 1875 to 1880, under the Local Board's management. Leaving out of consideration the figures for the years 1871-4 in the first table, we find that in the next year (1876) 26 million cubic feet of gas were made, of which 23 millions were sold at an average price of 5s. 5½d. per 1000 feet, the number of consumers being 1184, the average illuminating power 16·1 candles, and the produce per ton of coal carbonized 9700 cubic feet. In

this year the capital expended was £48,747, which earned a gross profit of £2462, or £5 1s. per cent.; while the assumed capital of the Leigh Company, if they had retained possession of the works, would have been £24,000; and the gross profit per cent., £10 5s. Three years later the make of gas was 31½ million cubic feet, of which 29½ million feet were sold at an average price of 4s. 4d. per 1000 feet, the consumers numbering 1645, the average illuminating power being 15·8 candles, and the production per ton of coal carbonized 10,178 cubic feet. In this year the capital expended was £59,391, and the gross profit earned was £4117, or £6 18s. 8d. per cent. The Company's figures would have been—Capital expended, £35,391; gross profit per cent., £11 12s. 8d. Last year the make of gas was 33½ million feet; the quantity sold, 30½ million feet; average price, 3s. 9½d.; number of consumers, 1574; illuminating power, 15·8 candles; make per ton of coal, 10,145 cubic feet; capital expended, £69,926; gross profit, £3850; ditto per cent., £5 13s. The Company's figures would have been—Capital expended, £45,926; gross profit per cent., £8 12s. The second table—the cost of manufacture—shows an annual decrease in the cost of coal down to last year, when a slight increase took place; the salaries and wages generally increased, and the maintenance decreased. Taking the total cost for each year, there is a decrease of 29·87 per cent. in 1876 on 1875, of 11·93 per cent. in 1877 on 1876, of 4·43 per cent. in 1878 on 1877, of 8·52 per cent. in 1879 (three quarters) on 1878, and an increase of 5·44 per cent. in 1880 over 1879.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
[From the "Official Report" in the *American Gaslight Journal*.]

After the proceedings, an abstract of which has already appeared in these columns, Mr. C. H. NETTLETON read the following paper on

THE DIETERICH FURNACE.*

In preparing this paper on the making of gas with a Dieterich furnace, I felt that I had nothing wonderful to write about—no great feat accomplished or battle won in the struggle of gas making; but rather that I had but a failure to record—a defeat, and almost a rout. And so I hesitated, and thought of how it would sound to come before you with a statement remarkable for nothing but a want of success. But believing that every failure has its lesson, and that my failure might be of assistance to others working in the same line as myself, and might prevent some waste of time and money, I resolved to overcome all personal feelings that I might have in the matter, and so prepared these notes.

In order that you may have a clear conception of the value, or want of value, of the work done, permit me to give you a slight sketch of the stack of benches in the retort-house of the Company with which I am connected. There are in the stack four benches of five retorts each, two back to back, with exceedingly poor protection on all sides for preventing the radiation of heat—so poor that, although using large retorts and good settings, the average yield per retort, with a coke fire, has never exceeded 6000 feet, and with a tar fire never exceeded 7000 feet. The hydraulic main almost rests upon the top of the brickwork, there being a space of only 3 inches between it and the bricks. The stand-pipes are quite short.

On one side of this stack there was constructed during the summer of 1880 two of Dieterich's furnaces, and in the arches over them were placed two open settings of five retorts each, the four lower retorts being 14 by 22 inches, and the upper one 15 by 30 inches, all 9 feet long. The first furnace was fired on the 3rd of September, and on the 6th the retorts were charged for the first time. In a few days the yield per retort was run up to 8800 feet, and was only stopped by lack of holder room. The yield per pound was over 5 feet.

In about two weeks from the time of starting, trouble appeared in the shape of stopped stand-pipes, and from this time until the bench was let down the trouble never ceased. At times the stoppages were caused by pitch; at others by soot or dry carbon; and often a combination of both. The stoppages were at all points of the stand, bridge, and dip pipes, and occurred at the commencement, during, and at the end of the charge. The men were absolutely worn out trying to keep the stand-pipes free. Several times I have seen all five of the stand-pipes stopped at once.

Not long after this, pitch accumulated in the hydraulic main, especially under and around the centre dip-pipe, and it became exceedingly difficult to make a passage so that the gas could escape to the upper part of the hydraulic. The trouble increasing, it became necessary to take off the ends of the hydraulic and remove the pitch. This latter operation was frequently repeated as long as the bench lasted.

This pitch was productive of two evils. By causing a heavy back pressure, it lessened through leakage the quantity of gas produced, and also caused the carbon to accumulate rapidly; and this last not only diminished the size of the retorts, so that the full-size charge could not be run, but also rendered frequent scurfing necessary, with its consequent wear on the retorts.

In addition to the other troubles, a number (nearly half) of the retort-bolts burnt off in the retorts, so that four out of the five mouthpieces fell away from the retorts from ½-inch to 2 inches. The burning of the bolts was due either to high heats or poor iron; probably both.

During the months of November, December, and January last, owing to want of holder room in proportion to the consumption of gas, the bench was run very irregularly, being crowded hard every week from Monday night to Saturday night, and then charged irregularly till Monday night again. This, combined with high heats and the frequent scurfing, caused the retorts to crack and sag badly, and the middle of January found the bench sadly broken down.

At this time, the pitch having accumulated in the hydraulic worse than ever before, I resolved to have a final cleaning out, and then, by lowering the heats, to try to make the bench last a few months longer. Three good men worked for 17 hours trying to remove the pitch from 7 feet of hydraulic main, and as a result of their labour half of the pitch, and not more, was taken out; and then, by trying to patch the retorts, only two could be made passably tight, the other three being hopelessly broken down.

And so ended my gloomy hopes of a long life and magnificent results from my first bench heated by gaseous fuel. They were born Sept. 6, 1880; they died, "overcome by heat," Jan. 17, 1881, aged four months eleven days and a few hours.

In this connection it may be of interest to record the short time in which the second furnace was fired up. In 20 hours from the time a fire was started in the furnace the retorts were each charged with 100 lbs. of coal and in 24 hours with 200 lbs. each; and after that they ran regularly on 4-hour charges. This seems to me to show the power of the furnace to produce heat more than all that I have previously stated.

In regard to the results obtained. The great point claimed for this furnace is that large charges can be burnt off in three hours. This result I was unable to reach. I tried several times to charge every three hours, and the coke would come out half burnt, and the number of stopped stand-pipes increased. It seems almost a paradox that with a yield probably not much above 4 feet per pound there should be trouble from stoppages in the stand-pipes. According to our general understanding of that subject, when there is a heat sufficient to produce a stopped stand-pipe

there ought to be a heat sufficient to produce a larger yield than the one named.

There was little or no difficulty in making 8500 feet per retort, running 4-hour charges, but when forced to 9000 feet or above, the trouble immediately commenced, as I have described, in the shape of pitch and dust.

The percentage of coke used varied with the size of the charges, and was never less than 36 per cent., and averaged, when running 900 lbs. per retort, from 38 to 40 per cent. The yield per pound for the four months in which the furnace was at work averaged 4·83 feet. [This is taken from the average of all the gas made; the probability is that the yield produced by the furnace was higher than the figure given.]

The candle power, by a Jones's jet photometer, taken at the office half a mile from the works, averaged 16·87 candles for the four months, the percentage of candle being 3·8.

The caking coals were a mixture of Westmoreland, Scott's Ocean, and Montauk—principally Westmoreland. The small quantity of candle employed to produce the result convinces me that a richer gas can be made when generated rapidly than when done slowly.

The results actually obtained for the thirty days of November were as follows:—

Yield per retort	7973 feet.
Percentage of coke used	41
Yield per pound	4·86 feet.
Percentage of candle	5·4
Candle power by Jones's jet photometer	17·3

For the causes of the stoppages in the stand-pipes, and the formation of pitch in the hydraulic, I can only give you my theories. The stoppages in the stand-pipes from the soot were due in some way, I think, to an excess of heat in the retort in proportion to the amount of the coal carbonized. The gas, after being generated, was dismembered, and free carbon or incident soot produced. The cause of the enormous accumulation of pitch in the hydraulic must have been due, I think, to the great heat to which the hydraulic main was exposed. As I have already stated, the main was very close to the bricks upon the top of the bench, and the space between was filled up with an accumulation of dust and tar, so that the heat from the bench was conducted readily to the tar in the main. The tar, standing essentially still in the hydraulic, was heated for a long time very hot, and probably the larger part of the lighter constituents were driven off, and only the pitch left. If the space under the hydraulic had been kept open, the air would have circulated freely, and there would have been a tendency to have kept the main, and consequently the tar, colder. Had this been done, a portion of the trouble would, I think, have been avoided.

Such are my theories for the causes of the two most serious difficulties I met with, and you must take them for what they are worth.

In running the second bench, I have had a chance, for a short time, to experiment on these theories, and I find that the results partially sustain them. The heats have been kept down so as to produce less than 5 feet, and generally less than 4·80 feet, and there has been comparatively little trouble from either soot or pitch while running on both 4 and 3 hour charges.

Last week, with the view of giving the results at this meeting, the retorts for four days were charged very regularly every three hours with 1300 lbs. of coal, or 260 lbs. per retort. The coke saved was carefully measured. The results were as follows:—

	Yield per Retort.	Yield per Pound.	Percentage of Coke Used.
1st day	9277 feet.	4·46 feet.	41
2nd day	9546 "	4·58 "	33
3rd day	9485 "	4·56 "	33
4th day	9953 "	4·93 "	34

At the end of the week I found there had been a daily average of twelve stopped stand-pipes, mostly from soot, and that a small quantity of pitch had accumulated in the hydraulic, although the space under the hydraulic was kept clear.

As this is an improvement over any work I have ever done before, I feel convinced that I am working in the right direction, although the stoppages and the pitch show me that I am far from perfect working yet; and so I have hopes that, sooner or later, I may learn how to run the furnaces so as to produce 11,000 feet per retort and 5 feet per pound, without pitch and without stopped stand-pipes.

That the Dieterich furnace has great power in producing heat, there can be no question; that it has produced, at the works in my charge, much more gas per retort, and with less fuel than by the old method, I know positively; that it can be made to work well, or rather magnificently, the results at Baltimore and Providence prove beyond a doubt; and, therefore, I am forced to the conclusion that the want of success I have met with is not the fault of the furnace, but is due to a lack of proper management—or, in other words, is my own fault.

Mr. M. S. GREENOUGH said that, in some respects, the experience of the Boston Gas Company was similar to that of Mr. Nettleton; and in other respects it differed from it. Having decided on making an experiment with the Dieterich furnace on a sufficiently large scale to enable them to determine its merits, in October last they were able to fire 16 benches that had been altered over to the new plan. Their attention was from the first directed to the effort of getting as high a heat as possible from the benches, and they had been going but a few weeks before they had increased the charge per retort gradually from 2100 lbs. for 12 retorts every three hours, up to 3600 lbs. every three hours—working off 300 lbs. of coal per retort every three hours, and the coke coming out without a foot of gas left in it. The retorts were 9 feet by 15 by 26 inches; and ordinarily they charged them with 261 lbs. of coal every four hours. During the time the retorts were charged in this way they must have been making from 12,000 to 13,000 cubic feet of gas per retort; but in a very short time they began to enjoy the experience to which Mr. Nettleton had called attention. They were previously almost ignorant of the amusement to be derived by cleaning out a stack of stand-pipes; now they appreciated it. They also experienced the difficulty resulting from the stopping of hydraulic mains with pitch. They were obliged to clean the hydraulic main; to devise various ingenious methods for cleaning the stand-pipes; and then to lower the heats and start afresh. He was not prepared to say anything against the Dieterich furnace; neither was he prepared to commend it as a measure to be adopted by all companies. They now had 16 fires going, and were running the retorts at such a heat that he presumed they were making something more than 10,000 feet of gas per retort. The stoppages were comparatively infrequent, and there was little, if any, difficulty with the mains. They were using about one-third of the coke, and doing their best to get as little heat as possible from it, rather than as much as possible. Two or three facts had been evolved from their experiments. One fact was that a very much greater heat could be obtained from a much less quantity of coke than they were ordinarily using; with 30 per cent. of the coke a great deal more heat could be obtained than was possible in the old way. A second fact he had ascertained was that there was a limit to the production of gas in

* For illustrations of this furnace, see ante, pp. 358-9.

a retort; that after there had been put into a retort more coal than could be properly carbonized by that size of retort, in order to work the gas from it it was necessary to subject the coal to such a great heat that the gas would be disorganized, and there would be trouble both with the gas and the tar. There was a third fact, or rather opinion he had formed—viz., that by charging the retorts more heavily there was not obtained a corresponding saving of labour. He had found that the increased amount of coal that had to be handled every three hours, necessitated increased labour, almost exactly proportioned to the increased amount of coal used. He did not anticipate any advance in this respect till it was possible to utilize steam power for the charging and drawing of retorts. However, looking at the matter generally, he did not consider the experiments with the Dieterich furnaces, that had been carried on at his works, had been without some good fruits. They had satisfied him that if this particular style of furnace would not answer for gas-making purposes, some similar one would; and it seemed extremely probable that, after they had gone a little further, they would realize the same good results which had attended the use of the Dieterich furnace in Providence and Baltimore.

Mr. A. B. SLATER said he had only been using the Dieterich furnace for the last 2½ months. On starting they took a little more than a week to get ready, instead of only three days, as Mr. Nettleton did. He had a statement covering 53 days' working—from Dec. 9, 1880, to Jan. 31, 1881; and from this he quoted certain figures. They first started four of the furnaces; on Dec. 28, two more; and on Jan. 11, two more—eight in all, making a full stock. They used a mixture of several kinds of coal. The largest percentage of coke used for any one day was 32·48; and the smallest, 18·42. For 10 days it was more than 29 per cent.; for 11 days it was more than 25 and less than 29 per cent.; for 27 days it was more than 20 and less than 25 per cent.; and for 6 days it was less than 20 per cent. After January it never came up to 22 per cent. for the rest of the month. The charges were all of three hours' duration. The smallest charge in any one day was 211 lbs.; the largest, 293 lbs.; and the average charge for the whole time, 262½ lbs. The yield of gas, per pound of coal carbonized, was—largest, 5·39 feet; smallest, 4·62 feet; average, 4·82 feet. The yield per retort was—largest, 12,057 feet; smallest, 8037; the yield on four days being more than 8000 and less than 9000 feet; on 18 days, less than 10,000; on 25 days, less than 11,000; on 6 days, less than 12,000; and on 1 day more than 12,000. Before they had the Dieterich furnaces they were using from 12 to 14 per cent. of American cannel; but soon after starting them, the illuminating power of the gas ran up so that they were able to reduce the proportion of cannel down to 2 or 3 per cent.; and he hoped in time to be able to dispense with the use of cannel altogether. In reply to various questions, he (Mr. Slater) said his retorts were slightly larger than ordinary ones. He had not had any trouble with their hydraulic main; nor had there been any stopped ascension-pipes. They had, however, been slightly troubled with a thick kind of tar—he could not exactly call it pitch. He had not taken much notice of the labour needed for the additional quantity of coal used; as they had been running the furnaces in connection with the other benches of retorts in use, and so had not figured up the labour separately. He did not think the cost of labour had increased generally. They might have had some trouble with the benches getting too hot, if they had not taken pains to regulate the heat. He had kept the heats back a little; and never allowed a bench to be fired up so as to be ready for charging in less than three to four days—usually they were from a week to ten days in getting ready. He never forced a bench until it had been in use a little time; and he thought the secret of prolonging the life of any retort-setting was to be careful in its use for the first few weeks or months. He did not know that he could exactly account for the increased illuminating power of the gas obtained; their average now was 17 candles.

Mr. HARRISON: How long after starting the fires in the Dieterich furnace are you ready for charging?

Mr. SLATER: About 24 hours; but we heated the benches for three or four weeks before. Now these benches which have been let down can be fired so as to take a charge of 200 lbs. in the 24 hours.

Mr. HARRISON said he asked this question because Mr. Nettleton reported his experience with his retorts sagging and cracking; and it might be presumed that this came from having too high a heat so soon after starting the fire in the bench. If in Mr. Slater's working the retorts were ready for charging about the same length of time after starting the fire as Mr. Nettleton's were, and the retorts did not break down with Mr. Slater, the rapidity of heating might not be the reason for the breaking down.

Mr. SLATER: The reason for the breaking down was probably the intense heat. The heat is so great as to take the life entirely out of fire-brick material.

Mr. GREENOUGH said when his furnaces were built the walls were made about 2 ft. 6 in. through; but the fires heat right through the walls after they had been going six or eight weeks. He never saw such a heat as could be obtained from one-third of the coke that was made.

Major DRESSER said when last he was in Baltimore he called to see Mr. Dieterich. The general inference to be gathered from his conversation was, that in days gone by, in the early history of the furnace in his own works, he had found there were tricks in managing it; but he said he now had no trouble—he had the thing so that he could work it very uniformly. He (Major Dresser) went through the retort-house, and everything seemed to be working very comfortably. They had 20 benches of sixes, the retorts being 9 ft. each by 12 in. by 20 in. Each bench was heated by a Dieterich furnace. There was no gas made at this station excepting what was made by those benches; so that it was a fair working experiment, on a good-sized scale, with no interfering circumstances. The amount of gas sent out from the 20 benches during the month of December was 29,989,000 feet. The yield per pound of coal was 4·98 feet, or 11,144 feet to the ton. The highest yield per retort for any one day during the month was 9133 feet; and the lowest 7300 feet; while the average of all the working for the month was 8610 feet per retort per day. The amount of cannel used during the month was 67½ tons, which was about 2½ per cent. of the coal used. The amount of caking coal used was 2623½ tons. A great deal of the coal had come in wet, and was wet when it went into the retort-house. The highest charge per retort during the month was 229 lbs.; the lowest, 184 lbs.; the average of all the charges in the month was 202 lbs. per retort. The highest temperature of the air during the month was 54°; the lowest, 8° below zero. The highest temperature of the gas as it left the station-metre was 64°; the lowest, 44°. The barometer was 30·5 inches, the highest; 29·9 inches the lowest. The illuminating power of the gas, as tested and reported by the city inspector, was—highest, 18·90 candles; lowest, 17·40 candles; average for the month, 18·22 candles. The practical result of all this was that Mr. Dieterich was making more gas out of half of his retort-house than the whole retort-house was calculated to make, even supposing that every retort in it was running. The result was that all his apparatus—purifiers, scrubbers, and everything else—were over-worked. It was very evident that he would have to increase this part of his apparatus if he was going to run half the retort-house for which they were originally adapted.

Mr. HARRISON: Does he run it all on 3-hour charges?

Major DRESSER: He is running continuously on 3-hour charges.

Mr. HARRISON: What is his experience on the labour question?

Major DRESSER said it was very low—much less than by the old method. Mr. HARRISON: Does he recommend the adoption of smaller retorts?

Major DRESSER: No; I do not think he does. He put the furnaces under the retorts that he had. I asked him about the stopping of stand-pipes. He said that an auger would be found very convenient, and that it would be well to use it regularly—that if used thoroughly after every charge there would be no trouble.

Mr. LAMSON said Mr. Dieterich's foreman showed them how to run their benches; and when he said to him that such a heat would cause a stoppage in the stand-pipes, he replied that they "must not mind such a little thing as that; that they had as many as 60 stopped stand-pipes per day in Baltimore!"

Major DRESSER said he asked Mr. Dieterich about the stopped stand-pipes. He said that they had had them in the early history of the thing, but that they had now learned to manage it so that they had very little trouble. He said they were not absolutely free from annoyance in their hydraulic main, but that by regular systematic attention to matters which they had found out by practically working the thing, they were able to go right along without much annoyance. He (Major Dresser) thought the labour account was enough to satisfy any one that there was no great additional trouble involved from this source, as there certainly would be if there were those excessive troubles.

Mr. SLATER: Does Mr. Lamson run any more heat in the other benches than he has done in the Dieterich furnace?

Mr. LAMSON: At first we ran a very much more intense heat in the Dieterich furnace, but now we are running the heat more nearly uniform with the other benches.

Mr. SLATER: Did you run the furnace with the furnace door wide open?

Mr. LAMSON: We run them in every conceivable way that we knew how. We have tried closing the doors, and we have tried opening them. At one time we ran for quite a long while with the doors entirely closed; at another time we closed the dampers. We were trying various experiments continually. We started under the direction of Mr. Dieterich's foreman, and at first ran as he directed. I think the whole secret is that you can get all of the heat that you want, and more too. The question is, after you get all that heat, how will you control it?

Mr. SLATER said when they first started the furnace they had the doors wide open, and the draught flues open about 3 inches. In a few days they began to see the flame streaming out of the stacks, as in ordinary benches. In two or three weeks they began to experiment how to stop this. When they first commenced to charge the furnaces, any one coming into the retort-house, and standing even right opposite the stack, unless he felt the radiation from the bench, would not know that any gas was being made there, because there was no flame issuing from the chimneys. So far as the outward look was concerned, one would think that no gas was being made. Then they commenced experimenting to try to reduce the flame from the chimneys; but did not succeed until they closed the furnace door and opened the slides of the lower door about 4 inches. By having these slides open about 4 inches, and having the draught door open about 2½ inches, they obtained all the heat they wanted, and, at the same time, there was no appearance of any flame issuing from the chimneys.

Mr. LAMSON said he thought one difficulty was that the furnaces were too large. If the furnace was small in proportion to the retort, one could get a chance to drive the furnace; but when the furnace was too large for the setting it was a great deal more difficult to hold the heat back than to force it. He had an idea that perhaps the fault was with the size of the furnace; the whole trouble being that the fire could not be held back.

The PRESIDENT: I believe Mr. G. Livesey proposes to put ten or twelve retorts to one furnace in order to utilize the great surplus of heat which he has there.

Mr. LAMSON: Perhaps it will be possible to heat two benches with one fire; but until we have tried the experiment we cannot determine such matters accurately.

Major DRESSER: You could easily try the experiment of reducing the size of your furnace by lining up one side of the furnace with fire-brick set on edge, so as to reduce the capacity of the furnace.

Mr. LAMSON: We are proposing to use up this summer in experimenting with these furnaces.

The SECRETARY: As Major Dresser has visited the works in Baltimore, and has seen the furnaces working under the best condition, I would like to ask him where is the gain or advantage in using them? I fail to see it just yet. Taking into account the additional cost of the furnace, and the royalty which must be paid, where is the advantage in their use? Is it in the saving of coke, or is it in the saving effected in working 3-hour instead of 4-hour charges.

Major DRESSER: I do not know what the royalty is, and I have only a general idea as to the cost of the furnace; but it seems to me that the statement which I made, that from one-half of Mr. Dieterich's retort-house, as originally constructed, he is making more gas than the whole retort-house was originally intended for, would answer the inquiry. The point is to get the most gas possible from each square foot of retort-house floor; and this seems to me to be a step in the right direction, as Mr. Dieterich is now getting from each bench double the quantity of gas that the benches were expected to produce when they were originally built. It is an advantage I should say of considerable importance. The saving in fuel is an advantage, though not so important to us in this country as it is in France and England, where the price of fuel is higher than here.

Mr. SLATER said it seemed to him that one of the most important features of the Dieterich furnace was that it maintained a uniform heat all the time. In ordinary furnaces, the fires of which had to be let down to clinker and to cool down the retorts, of course very much heat was lost; but in the Dieterich furnace this was not necessary, and so a uniform, steady heat could be maintained all the time. The charging of the furnace with hot coke was another advantage. In an ordinary furnace from 45 to 60 per cent. of coke was being used; but the largest percentage he had used so far in the Dieterich furnace was 32·48, and the least something over 18.

Major DRESSER: When you say you use from 40 to 60 per cent. of coke in your other furnaces, is that based upon the calculation of a chaldron of coke to a ton of coal?

Mr. SLATER: Yes.

On the motion of Mr. LAMSON, the thanks of the Association were then tendered to Mr. Nettleton for his paper.

MATLOCK WATER SUPPLY.—A meeting was held in Matlock Bath, on Monday, the 4th inst., to consider the inadequate supply of water to the district, and to devise some means of securing for the future a more certain and copious supply. The Vicar (the Rev. E. Latham) presided, and resolutions were unanimously adopted as to the advisability of extending the resources of the present Water Company, and also as to the action it was deemed desirable the Local Board of Health should adopt in reference to the matter. Eventually a Committee was appointed to confer with the Water Company and the Local Board, and to expedite as much as possible the settlement of the questions which have been so long in discussion in reference to this important and urgent local matter.

ILLUMINATION BY MEANS OF COMPRESSED GAS.

At a Meeting of the Society of Engineers, held on Monday, the 4th inst. —Mr. CHARLES HORSLEY, the President of the Society, in the chair—a paper on "Illumination by Means of Compressed Gas" was read by Mr. PERCY F. NURSEY.

The author first referred to the necessity for improvement in railway carriage lighting, which for the most part was, he said, still effected by means of miserable oil lamps. Coal gas had to a limited extent replaced oil, but its use was attended with many disadvantages. The use of gas under pressure had long since been attempted, but the difficulties of compression, condensation, and regulation had told against it. These difficulties having been overcome, the use of compressed gas for railway carriage lighting was now extending. The author stated that during the past two or three years he had had the opportunity of inspecting the working of three different systems of railway carriage lighting by means of compressed gas. The first was that of Mr. W. Sugg and Mr. F. W. Clark; the second that of Mr. G. Bower; and the third that of Mr. J. Pintsch. In the first and second systems ordinary coal gas, enriched by means of hydrocarbon vapours, was used; while in the third, oil gas was employed. The author also observed that Mr. Sugg had recently perfected a system of using cannel coal gas under pressure.

In the Sugg and Clark process it was explained that ordinary coal gas is enriched by the addition of hydrocarbon vapours under the influence of heat, by means of special apparatus. The enriched gas is stored for use under a pressure of about 120 lbs. per square inch, and is delivered, still under pressure, into receivers fixed on the tops of the carriages. A governor or regulator is placed between the receivers and the burners in the carriage, so that the gas is consumed at the proper reduced pressure. The author stated that he had inspected the arrangements for carrying out the practical application of this principle by Mr. T. C. Hersey, on the part of The Gaslight and Coke Company, in connection with the Great Northern Railway at King's Cross. He was also afforded the opportunity of inspecting the light in use in one of the Great Northern carriages, which had been fitted up by Mr. Sugg, the results being very satisfactory. The experiment was made by permission of Mr. Henry Oakley, the General Manager of the Great Northern Railway, and so far as it went, was a success. Mr. Oakley, however, desired to try gas made from cannel coal, which does not require enriching, and this experiment was now being carried out at the Victoria Station of the London, Chatham, and Dover Railway. There, the author stated, The Gaslight and Coke Company had erected compressing apparatus for the supply of trains with cannel gas, the enriching works at King's Cross remaining in abeyance pending the experiment. A train of eleven Great Northern carriages had been fitted up for burning the compressed cannel gas, and was now running.

The Sugg and Clark process of enriching ordinary coal gas had, the author stated, been improved by Mr. Sugg, and the new apparatus had been erected at Swindon for the Great Western Railway Company, in order to light the carriages on that line with the ordinary gas of the Company compressed and enriched. [The apparatus at Swindon was then described, as also the arrangements for lighting the carriages.]

The subject of improved railway carriage lighting had for some time past had the attention of Mr. G. Bower, and he had recently perfected a system of lighting by means of enriched compressed gas, which was now under trial. The system consists in storing ordinary coal gas at a pressure of about 150 lbs. per square inch in wrought-iron cylinders, placed on the tops of the carriages. From the cylinders the gas passes to a regulator, which is the invention of Mr. A. S. Bower, and in which its pressure is regulated as it passes to the lamps; so that, as in the previous case, although the pressure in the store cylinders becomes reduced as the gas is used, it is maintained constant at the burners. Before reaching the burners, however, the gas is submitted to a carbureting process, under the influence of heat, by which it is enriched and its illuminating power increased. By this means a light is produced, of the excellence of which the author stated he had recently had an opportunity of judging from a run in a Great Northern carriage thus illuminated. There are arrangements for simultaneously turning down all the lights in the carriage from the outside, when not wanted, a small flash-jet only being left during the day and when there are no tunnels to pass through. These arrangements were also provided in Mr. Sugg's carriage. With regard to cost, it was stated to be 6s. 8d. per 1000 cubic feet of gas, including the cost of compressing and carbureting. The carriage fitted up on Mr. Bower's principle was stated to have been taken over by the Great Northern Railway Company, and placed for service on the line between London and Peterborough.

Pintsch's system of railway carriage lighting by means of compressed oil gas was next described. The principle was stated to consist in distilling the refuse of shale oil or other similar matter, and in storing and using under considerable pressure the gas produced from it. The gas is of high illuminating power, and is stated to be of a thoroughly permanent character. The gas is produced at works in each case conveniently situated with regard to the railway adopting the system. The works vary in size according to requirements, but the general arrangement, and most of the details, are similar in all cases, subject only to variations necessitated by varying local conditions. The author stated that he had visited several of the works, and proceeded to describe those of the Metropolitan Railway at Hammersmith. The gas is distilled from shale oil refuse in specially constructed retorts, and after passing through the processes of washing and purifying, is stored under a pressure of 150 lbs. per square inch in store holders. From these holders the gas is conducted to filling-posts, and supplied to the carriage by means of coupling hose. The gas is carried at a pressure of 90 lbs. per square inch in wrought-iron cylindrical receivers fixed under the carriages, and on its way to the burners it passes through a regulator, by which the pressure is reduced and maintained constant at the point of consumption. As in the other cases, there are arrangements for turning the lights down simultaneously when not required. The cost was stated to be 4d. per light per hour. The author said he had occasionally travelled in carriages lighted on Pintsch's system on various lines, and had always found a bright, steady, and an efficient light. The system had been in use in Germany, and on the Continent generally, for about nine years, and in England for about five years. On the Continent it was in use on 63 lines of railway, 45 gas-works being in operation for supplying the gas for no fewer than 5500 carriages. In England the system was in use on five lines—namely, the Great Eastern, the South-Eastern, the South-Western, the Metropolitan, and the Metropolitan District Railways. There were seven gas-works in operation, and two more in course of construction in connection with these lines. The number of carriages fitted and running was 700, whilst 300 more were in course of being fitted, thus testifying to the value and practical advance of the system.

The author next described the application of Pintsch's system to the lighting of buoys, in which direction it had proved very successful. The buoys are made of wrought iron, and contain a supply of the gas under pressure. The lamp is mounted on the top, and will burn for six, nine, or twelve weeks, according to size, with one charge of gas. The sizes are 7 feet, 8 feet, and 9 feet in diameter respectively. There are altogether five of these buoys in operation, and six more in course of construction. The Corporation of the Trinity House had, he said, adopted the system,

and had sent in a requisition to the Board of Trade for funds to erect gas-works on Pintsch's system at the Trinity Wharf, for the special service of illuminated buoys. The Clyde Lighthouse Trustees had also adopted these buoys, and gas-works were in course of construction at Port Glasgow, with a view of carrying out the system. The Clyde Trustees also contemplated replacing one of their old lightships by one on Pintsch's principle, which would not require a resident attendant. The author finally described the application of Pintsch's system to the interior lighting of steamers, as practised both in England and America, and noticed the circumstance that the South-Western Railway Company contemplated lighting some of their isolated roadside stations by the same means. His conclusions were that the systems first described could at present only be regarded in the light of experiments, whilst Pintsch's system was an established practical fact.

The paper was illustrated by diagrams and models, Pintsch's light being exhibited burning during the evening.

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

March 23, 1881.

The most important item of interest in connection with the gas industry, since the date of my last letter, is the meeting of the New England Association of Gas Engineers. This, the eleventh annual meeting of the Association, was held in Boston on the 16th, 17th, and 18th ult. —Mr. W. A. Stedman, of Newport, the President, in the chair. After some routine business, the President delivered his inaugural address, which was a practical and interesting paper, meriting the attention it received. The chief point dwelt upon was the almost necessity of so bringing down the cost of gas making, as to place companies in the position to supply their commodity at 1 dollar per 1000 cubic feet; the means by which this desideratum is to be attained being the adjustment of capital to a basis of not more than 50 cents per 1000 feet on the yearly sales, an increase in the yield from a ton of coal, the substitution of machinery for manual labour, and better returns from the residuals.

The only paper at the meeting was one by Mr. C. H. Nettleton, of Derby (Conn.), on the Dieterich furnace,* which was simply a recital of the author's troubles resulting from his experiment with this form of heat-producer. The first furnace that he lighted up destroyed the bench in a little over four months; the second one is being run at a more moderate heat, producing about 8000 feet of gas per retort per day, with a yield of 4.86 feet per pound of coal. For the reason of the destructive effect of the first furnace, I do not think it is necessary to look farther than the author's own statement in regard to the lighting of the second bench—viz.: "In 20 hours from the time a fire was started in the furnace, the retorts were each charged with 100 lbs. of coal, and in 24 hours with 200 lbs. each." It is absurd to expect even a moderate length of life from a bench brought in action as quickly as this. The discussion on the paper was chiefly in regard to the possibility of controlling the heat of the furnace, and as to whether stopped stand-pipes, and pitch in the hydraulic main, were evils inseparable from this mode of heating. On the one hand were the cases of Boston and Derby, where it was found impossible to control the heats, and prevent the formation of pitch; on the other hand were the instances of Providence and Baltimore, where the furnaces were working without any trouble. In the former works the average yield per retort for 53 days, from Dec. 9, 1880, to Jan. 31, 1881, was about 10,150 cubic feet. The regular style of benches were used in conjunction with those heated by the Dieterich furnace, and the average is that resulting from all the retorts. Large retorts—the Davison—are used in Providence. As these furnaces are giving such excellent results in two large gas-works, there does not seem to be any good reason why similar results should not ensue from their use in other places.

The remainder of the time of the meeting was taken up with the discussion of various subjects started by different members of the Association. The President gave the result of a few days' working of a Kirkham, Hulett, and Chandler "Standard" Washer-Scrubber, which had just been erected at his works. The capacity is 250,000 feet per day; each chamber having a surface of 1344 feet, or 5376 feet in the four compartments. A tar scrubber and a frictional condenser are also in use in these works. The gas first passes through the hot tar scrubber, then through the friction condenser, leaving the former at a temperature of from 110° to 135° Fahr. At the exit of the condenser the temperature is reduced to about 60° Fahr. The washer was first put in operation about 8 a.m. on Friday, the 11th of February. All the chambers were filled with fresh water, and no more was run in till the following Monday morning. On Saturday morning, the 12th of February, the strength of the liquor drawn from the first chamber was 6 oz.; on Sunday morning, 8 oz.; on Monday morning, 11 oz. At this time fresh water was turned on at the rate of three gallons per hour, or 1 gallon per 1000 cubic feet of gas, which was increased the next day to 1.25 gallons. On Tuesday morning the test showed the strength of the liquor to be 13 oz. As this machine had been in use but a few days, Mr. Stedman was not able to state whether an increase in illuminating power had resulted from its adoption. A general discussion on condensation followed, in the course of which Mr. Nettleton stated that last summer he had put up a tar scrubber. It was erected outside the retort-house, and was surrounded by a 12-inch brick wall. But the difficulty had been to maintain a sufficiently high temperature in the apparatus, even with the use of steam. As was remarked by some gentleman during the discussion, it is more than probable that the steam was partially condensed before it reached the scrubber, and thus produced but little effect. At Newark (N.J.) it was stated a similar scrubber was used, and in addition to the brick wall with which it is surrounded, it has a space of 3 inches filled in with sawdust. The temperature is maintained at 135° without steam.

The subject of testing meters was next discussed. Attention was called to the advisability of thorough and systematic work in this direction and further it was suggested a complete record of such testing should be kept, as a comparison of notes would be a useful guide in determining the best meters. During the consideration of this subject, the bad position in which meters are usually placed was dwelt upon. Sometimes they are fitted up near a furnace, when the chances are that the gas is registered at too high a temperature. One member thought that if meters were made with a more pleasing exterior they could be fixed in a room, and not be stowed away in a coal-cellar. This would result in the double benefit of preserving the meter, and allowing the consumer to readily determine the amount of gas he is using. Another point was also noted—namely, that meters that had been in use, and then were allowed to remain idle, would go much more quickly than those in constant service.

The preservation of service-pipes was the subject next taken into consideration. Almost all the members had experienced the usual trouble resulting from the corroding of the wrought-iron tubes which are very generally used for service-pipes in this country. Some of the gentlemen had tried galvanized pipes, but as yet the life of these could not be determined. Others had used the ordinary wrought-iron pipes, coated both

* This paper appears in the present number of the JOURNAL, p. 616.

inside and out with tar; the pipes being first heated, then immersed in this liquid. Mr. Cabot stated that he had used, with good results, iron pipes covered outside with a coating of red lead. Mr. Coggeshal employed as a coating a mixture of a quarter of a pound of resin to one gallon of tar. The iron pipes were heated and immersed in it, the superfluous tar being then allowed to drain off. Some of his services had, he said, been in use for twelve years, and appeared all right so far. Another gentleman embedded his service-pipes in cement, which gave general satisfaction. With regard to coating pipes on the inside with tar, it seems to me that besides diminishing the bore of the pipe, which it will do to a greater or less extent, even if the pipes are carefully drained, there is the greater danger of the tar acting as an absorbent of the hydrocarbons of the gas, thus reducing its illuminating power.

Under the head of purification, Mr. Coggeshal stated that he had been using iron sponge for the last year and a half, and that it had given very great satisfaction. His purifier boxes are 6 ft. by 10 ft., and only one layer of the material—22 inches deep—is used in each purifier. He stated that he sometimes had trouble to revivify the sponge during the cold weather of last winter, as it would cool too rapidly to admit of proper revivification. For this reason his results for this winter were not so good as those obtained in warm weather. At first Mr. Coggeshal used the sponge alone, but found 2 per cent. of carbonic acid in the gas. He now uses a bushel of lime in each purifier, and as a result his gas contains little or none of this impurity. He is at present purifying from 13,000 to 14,000 cubic feet of gas per bushel of sponge. Mr. Slater, of the Providence Company, stated that he had used the sponge with very good results. His gas contained from 1.50 to 2.25 per cent. of carbonic acid, no lime being employed. Sometimes he purifies as much as 17,000 cubic feet to the bushel.

Under the head of gas-stoves, Mr. Goodwin stated that he had recently made for a cutlery factory a couple of furnaces for tempering knife-blades, and that they worked very well indeed. The furnace is 16 inches square and 8 inches high, having eight atmospheric burners, which together burn 30 cubic feet of gas per hour. The temperature of the blade is raised to the tempering point in 45 seconds.

During the third day of the meeting, the Association visited the works of the Boston Gas Company, and after inspecting the various appliances in use there, returned to the Company's Office, where the remaining business of the meeting was transacted. Mr. Connelly, patentee of one of the forms of iron sponge for purifying gas, was present, and in reply to questions from the members, gave a brief account of the method of preparing the sponge, and of properly using it. Different kinds of ore are used in its manufacture. The ore is roasted to throw off the volatile matter it contains; and thus it is reduced to a spongy consistency, but resembles coke in its appearance. It is then crushed, and after being mixed with sawdust is ready for use. Mr. Connelly stated that 54 companies were using the sponge, most of them meeting with great success; some purified 6000 feet of gas to the bushel, while others ran as high as 16,000 feet. The gas purified by it contains from 2 to 2½ per cent. of carbonic acid, and from 13 to 18 grains of sulphur per 100 feet. He knew of only four companies who were using lime in conjunction with the sponge. The sponge will last from two to three years. Mr. Jones stated that his experience led him to believe that there was a loss of about 2½ per cent. in the power of the gas from the use of sponge. In conclusion, Mr. Connelly gave an account of some experiments made at the Pittsburgh Gas-Works to revivify the oxide without removing it from the purifier. The lid of the box was removed, and air drawn in by steam at the bottom of the purifier. The sponge was thus kept moistened by the steam, with the object of preventing the material from igniting. After the revivification was complete, the lid of the box was put down, and the sponge left for a few days to rust. This mode of revivifying was only partially successful, as in two or three cases a little fire was discovered in the box. After some discussion on the subject of disposing of foul lime, the proceedings closed.

The report of the Gas Inspector of the State of Massachusetts for the year 1880 contains some tables and figures worth noting. The number of meters tested during the period covered by the report was 6561, of which 6439 were either new or had just been repaired, the remaining 122 being meters brought for inspection at the instance of consumers or gas companies. Of the latter, 48 registered fast, the average error being 4.54 per cent.; 22 slow, the average error being 6.59 per cent.; and 52 were within the limit allowed by law—2 per cent. either way. These were all dry meters. The gas companies of Massachusetts are now working under the law passed by the Legislature last year, which requires the State Inspector to make two examinations each year of the gas of every company having over 50 consumers, and one additional inspection for every 4 million cubic feet of gas made by the company. Thus companies with more than 50 consumers, or supplying, with the public lamps, under 4 million cubic feet of gas a year, are required to have their gas tested twice a year; companies sending out 8 million cubic feet, three times a year; and so on. All companies making over 15 million cubic feet of gas per annum are required to provide a photometer away from the works. The standard power of the gas is fixed at 15 candles. An excess of 10 grains of ammonia or 20 grains of sulphur per 100 cubic feet is forbidden. No sulphuretted hydrogen nor more than 10 per cent. of carbonic oxide is allowed. The following shows the average result of the tests made during the last year in 59 towns. In the smaller towns only one or two inspections were made; but the number of examinations increased with the size of the place to 30, this number of tests having been made in Boston:—Average illuminating power, 17.77 candles; average number of grains per 100 cubic feet—ammonia, 6.5; sulphur, 12.1. The following table shows the result of analyses of gas made by the Inspector during the year:—

Name of Company.	Boston.	Boston.	Cambridge.	Charlestown.	Lowell.
Illuminants (CH ₄ N & C)	6.53	5.73	4.34*	4.82	4.15
Marsh gas (CH ₄)	42.71	37.64	37.71	36.04	35.65
Hydrogen (H ₂)	44.80	46.50	45.16	49.03	51.16
Carbonic oxide (CO)	3.97	7.22	7.92	7.73	6.51
Carbonic acid (CO ₂)	0.08	0.95	0.04	0.26	0.00
Nitrogen (N ₂)	1.70	1.87	4.67	1.90	2.40
Oxygen (O ₂)	0.21	—	0.16	0.17	0.13

From the annual report of the Superintendent of Lamps of Boston (Mass.), it appears that the total number of gas lamps in the city is 10,296. The burners in use are rated at 4 feet per hour; and the number of lighting hours being 3828 per year, makes the amount of gas burned per lamp per annum 15,312 feet. The city pays an average price of 1.80 dols. (7s. 2½d.) per 1000 cubic feet for the gas, being equal to 27.69 dols. (£5 10s. 9½d) per lamp; and adding to this the cost of lighting, extinguishing, &c.—viz., 6.96 dols. (£1 5s. 5½d.) per lamp—the total cost is 34.65 dols. (£6 16s. 3d.) per year for each lamp. The number of oil lamps in the city is 2366; each lamp used 82 gallons of oil, costing 11½ cents (5½d.) per gallon. The total expense of each oil lamp for the year was 14.96 dols. (£3). The gas-burners in use on the Boston lamps are known as the "glycerine" burners, and give great satisfaction.

* This number is somewhat uncertain.

Philadelphia in Pennsylvania is, I believe, the only city of any magnitude in this country where the gas-works are owned by the authorities, and the results obtained there are not such as to encourage taxpayers in other cities to commit to their respective local governments the care of the gas supply. In the city named there has been a good deal of complaint in regard to the manner in which affairs of the gas department are conducted, and at last the grumbling has resulted in an official investigation. As yet, however, no important abuse has been unearthed, but the case is not closed.

Mr. J. R. Smedberg, of San Francisco (Cal.), in a communication to the number of the *American Gaslight Journal* published on the 16th inst., calls attention to the fact that almost all the gasholder tanks in California having a diameter less than 50 feet, are built of redwood lumber. He says: "Some of these tanks are from 15 to 22 years old, and are to all appearance as sound as when first erected. With the experience I have had with them, I infinitely prefer them to brick at three times the cost, especially in an earthquake country. Where the indestructible redwood is to be procured, I would not hesitate to build a wooden tank 120 feet in diameter; and even with you there can be no objection to using 'treated' pine."

Mr. Edison has moved from Menlo Park, and has taken up his quarters in New York City, where he, or rather the Company bearing his name, has leased a mansion in Fifth Avenue, which will be the head-quarters of the Company organized for the purpose of lighting the city, as well as for the general Company which will oversee the introduction of the system through the country. The Gas Commission of New York have appointed March 31 as the time for opening the bids for lighting the city during the coming year; perhaps at that time some of the electric light companies may come forward with proposals for doing the work, when we shall have an opportunity of ascertaining the economy (?) of the new system of lighting. The city authorities of Denver (Col.) have contracted with the Brush Company to light the city.

It seems the Northern Electric Light Company have not yet given up the plan of illuminating cities by means of very powerful lights placed on the tops of high powers, with the object of diffusing artificial daylight throughout the streets and houses of the town. At present the Company have a proposition before Congress to light the Capitol, and, in fact, the whole of Washington, by this means. It is purposed to use 450 lamps of 6000-candle power each.

It is reported that the Brush Company have just completed a lamp of 100,000-candle power, ordered by the British Navy.

THE ELECTRIC LIGHT SCARE AGAIN.

[From *Money*, April 6, 1881.]

There is an offence known to the law, with which, during the wars of the latter Georges, judges and jurors were made far more familiar than are those of this generation, called combining and conspiring unlawfully to debase or depreciate the public securities, and in view of sundry practices that have for some years been in vogue amongst certain classes of unscrupulous persons, both outside and inside the legitimate circle of Stock Exchange operators, it seems much to be regretted that some such process should not now be available in the cases of those who, for the most mercenary and improper ends, have lived for years with impunity by making the grossest misstatements about other people's property; or, to use the flippancy term adapted from Throgmorton Street *argot* to describe what is, in reality, a most serious and nefarious offence, by "bearing;" that is to say, putting forth the wildest and vilest reports about various stocks, shares, and other securities, and thereby causing nervous, timid, and unwary, or ill-informed holders, to part with their property to the Bears for very much less than its real value, the latter realizing in a few days afterwards large sums of money thereby. Indeed, it is anything but certain at this moment whether an intelligent young barrister, equally estranged from briefs and brokers, and longing for a good introduction to both, might not very profitably employ his Easter vacation in looking up the statutes and reported cases upon the law of conspiracy, as further extended and interpreted by the "misrepresentation" clauses of the Debtors' Act of 1869, which can be made to include almost everything that is not only not strictly true, but everything (by which money has been obtained) that a defendant cannot prove to be true, after his own mouth has been closed by a criminal prosecution. This is not always an easy task, as many entirely innocent as well as guilty persons have learnt to their sorrow.

In connection with this subject it is to be noticed that within the last few weeks the gas stock Bears have once more trotted out their turnip-headed ghost to alarm feeble folk, and make them believe that the end of the gas world had at length arrived. But it is not the old ghost this time, on a prop no taller than a lamp-post. The new ghost is mounted on a pedestal half the height of the Monument, and the turnip on top is illuminated by an electric apparatus, or apparition, that seems to look down with a glaring glance of scorn upon the pigmy maze of carboniferous glow-worms that dot the gloom around its ankles in the streets below. Moreover, it is not a single ghost on this occasion, but a whole family of luminous Anaks that have been planted at various coigns of vantage in the big City, to threaten annihilation to everything gaseous. Stocks and shares, mains and meters, retorts and receivers, lamp-posts and lamp-lighters, chairmen, directors, secretaries, clerks, all and several, are shortly to go the way of the thousand institutions and inventions once thought indispensable for all time, but which, like Jonah's gourd, science has destroyed with a breath. *Vae victis!*

At least this is what the Bears say; and, let us ask, upon what authority? Has the slightest advance been made by the electricians towards clearing their path of the obstacles that, as we pointed out three years ago, are insuperable, in the present state of knowledge, to their displacing gas and gas companies? Have they achieved the slightest appreciable economy or decrease in the large comparative cost of production? Have they found out the unvarying and indestructible medium for the electric current? Can they tell us yet the antidote for atmospheric disturbances whereby all London, if dependent upon them, might be in total darkness for hours? Is there the slightest symptom of their having invented any feasible mode of storing the light in case of sudden demand? Is there less probability now than then that thousands of unskilled domestics would be annually sacrificed in the manipulation of this highly interesting but extremely dangerous machinery?

To this day the answer to all these questions is a negative. What has been done is no more, of course, than might have been expected from the energetic, intelligent, and progressive sons of a wealthy nation, who have never hesitated, either in a collective or individual capacity, to give every promising invention a fair and liberal trial. Certain firms, in whose extensive establishments extra expense, that can be distributed over a large area, and ultimately recouped in other ways, is of no consequence, have adopted one or other of the new lights, and after a time we shall have practical reports upon the results as to their respective utility, effect upon the eyes of workpeople, steadiness, cost, continuity, colour, and other important particulars.

Amongst other invited patrons of electric illumination, the Lord Mayor and Corporation of the City of London have naturally not been omitted, and, either by accident or a keen sense of humour on the part of his civic

majesty, the date appointed for making experiments at great expense at various points of the City was that which combines the height of ridicule with the worst omens of superstition—viz., Friday, the 1st of April! Moreover after allowing all the dark winter months to pass by with only the much-abused gas to cheer our lonely way, the trial is to be made from this time to Midsummer between sunset (ranging from 7 to 8.30 p.m.) and sunrise, when nearly all the millions of Londoners are at home in the suburbs and, as a *Times* correspondent pointed out on Saturday last, the only beings left to give judgment upon the electric experiments will be the City office-keepers and the City cats. And now let us examine the ways of the Bears.

The jobbers on hearing of this arrangement—pious and worthy men are they who operate in this market—considerately put down the gas stocks in the official list, in anticipation of immense blocks of stock coming into the market as soon as the lighting experiments were commenced. But there were other wise men in Gotham beside these jobbers—men who thought about gas by day and mused upon it in the night, and who, having made up their minds that there was no danger of gas companies' profits ever decreasing sixpence a share, went their ways rejoicing, and bought every share they could whenever a "fall" was announced in the usual lugubrious style. But the day of discomfiture came for those pious jobbers. When the settlement arrived they had not the stock to deliver that they had so freely sold, and a sudden rise of five or six pounds brought to their serene minds the unwilling conviction that though electricity may give light without heat, gas is something by which unreflecting people may easily burn their fingers. It has been very amusing to watch the wily jobber cunningly endeavouring to persuade the broker that he could only take his client's stock for the account as a favour, and next day exhibiting his poverty of stock by asking the broker if he would like to deliver for cash, thus showing that he had other engagements he could not meet. Space will not permit of our giving all the fluctuations of the kind we have referred to, but the official list will confirm our observations.

In conclusion, we strongly urge gas stockholders not to be scared into parting with their securities. Lighting London Bridge and some other public places with electricity will not affect them in any appreciable manner, while for every factory, theatre, &c., that may adopt it there will be 50 or 100 private houses built to supply customers for gas. Let us hope, then, that this is the last appearance of the Bears' ghost, and that it will now be laid to rest in its grave for long years to come, if not for ever.

METHODS FOR JUDGING OF THE WHOLESOMENESS OF DRINKING WATER.

By Mr. REUBEN HAINES.

[Abstracts of Lectures delivered before the Franklin Institute, Philadelphia, U.S.A., in December, 1880.]

Many years ago the usual way to ascertain the wholesomeness of drinking water was to discover what mineral impurities were present. The water was therefore evaporated to dryness, and a more or less complete analysis was made of the solid mineral substance left, as is done with mineral spring waters. Little attention was given to the organic matter, except when present in very large amounts, as in marsh water, &c. Occasionally, even now, we read of some one making tests for mineral impurities in a suspected well water, but omitting any test for the organic matter. Such analyses were exceedingly troublesome; and, after all, it is very doubtful whether they were of much value—in many cases perhaps of no value whatever, in ascertaining the wholesomeness of ordinary drinking water. Of course, the detection of iron and of sulphate of lime and magnesia, in this way, was of some importance, for waters containing large amounts of these substances should be considered unwholesome for daily use, in health. But we really have no reason at all for supposing that such mineral substances as silica, alumina, potash and soda, as they occur in any but very rare cases, have any influence whatever on health. Moreover, waters which are free from much mineral salts may often be very unwholesome for other reasons not discoverable at all in this way. This sort of analysis has therefore been entirely discarded by chemists conversant with recent sanitary experience, except in selecting a new source of water supply for a city, which involves other than sanitary interests as well.

In the preceding lecture* it was shown that by far the most important element in sanitary investigations of water, is the organic matter contained in it, either in the form of minute suspended particles or in actual solution. It was shown that the purest rain and spring waters contain a minute amount of organic matter, but that rivers, streams, and shallow wells in populous districts contain much larger proportions of it. It has long been known that waters, the sources of which originate in populous districts, were often the apparent cause of disease.

These facts have been for many years recognized by chemists, and it has therefore been their endeavour to devise methods for finding the exact amount and also the nature of this organic material. Let us now briefly review the advances which have been made in this direction.

The earliest method used for this purpose was what is known as the "ignition" process. It consisted in evaporating a measured quantity of water to dryness at a temperature which varied with different chemists, and weighing the residue. This residue was then exposed in a platinum dish to a sufficient heat to burn away all the organic matter. On cooling, the weight was again taken, and the difference was called organic matter. It was very simple, and easily performed, and was extensively practised. It has been shown, however, to give very erroneous results in a large number of cases, especially with hard waters, and well waters containing considerable nitrate. There are numerous chemical objections to it which render it entirely fallacious, but it will not be proper on the present occasion to enter into much chemical detail. We may say, however, that any carbonates of lime, &c., will, by the heat necessary to burn away the organic matter, partially lose their carbonic acid, ammoniacal salts will be volatilized, nitrates will be converted into carbonates by the carbon of the organic matter, these and other salts will lose water of crystallization, and if much chloride of sodium is present, in contact with carbon, hydrochloric acid will be volatilized, the fumes of which are often perceptible in thus treating the residue of a highly polluted water. Moreover, it is frequently difficult to get rid of the last traces of unconsumed carbon without raising the intensity of the heat so as to render the loss of mineral salts positively certain. In fact, we can never know what interchanges may take place among the materials of the residue when heated to faint redness. Various efforts were made to avoid this, or to replace the loss. Carbonate of soda was added during the first evaporation, but it has been shown that by this means a part of the organic matter was liable to be destroyed before the first weight was taken. Carbonate of ammonia or carbonic acid water was added to the residue after being heated, so as to restore the lost carbonic acid; but while this confessedly replaces only a part of the loss, it has also been shown that the weight of the residue is frequently increased in a curious and irregular manner by this means, so as finally to become sometimes considerably greater than it was before being heated at all.

Professor W. Ripley Nichols finds this method, with the employment of aqueous carbonic acid, of some utility for the relative comparison of the very soft waters of many New England streams. In these cases the loss appears to represent chiefly organic matter, and is recorded as "organic and volatile matter," which is the only accurate designation for it. But the results probably can never be constantly very exact, and no reliance should be placed upon them to the exclusion of other tests. In the case of the majority of well waters Professor Nichols considers this method valueless. It may frequently be useful, and as a qualitative test only, to heat the solid residue, and notice the odour, if any is given off. This will aid us in distinguishing animal from vegetable substances.

The unsatisfactory character of the "ignition" method led chemists to adopt what is known as the "permanganate" method. Of this there are numerous modifications, giving different results according to the practice of different chemists. They are all based on the same general principle, which is strikingly illustrated by the action of potassic permanganate on oxalic acid in solution. The magnificent colour of the permanganate almost instantly disappears in a surprising manner. If we pour very rapidly, numerous bubbles of gas rise and burst at the surface, exactly as in a glass of soda water. Now, what happens here is, chemically, just as truly combustion as the burning of coal in a fire, only the oxidation takes place in water instead of air. The permanganate is rich in oxygen, which it gives up very readily, and this combines with the oxalic acid to form carbonic acid and water, just as the oxygen of the air unites with the burning coal to form the same substances. The oxalic acid is destroyed, and the resulting carbonic acid gas passes off in small bubbles. The permanganate also is destroyed, as is shown by the disappearance of colour, and the hydrated oxide of manganese, which would otherwise settle in brown particles, is held in solution by sulphuric acid, a little of which was previously added, forming the colourless manganese sulphate.

Now oxalic acid is only one of the many organic substances upon which potassic permanganate acts in the same way, in a greater or less degree. As long as there is organic substance in the liquid to be acted upon, the colour of the permanganate will be destroyed, although, in some cases, very slowly; but as soon as this organic substance is exhausted, the pink colour will remain permanent in the liquid. We obtain in this way a sort of measure of the amount of organic substance. In the actual analysis the chemist takes a measured quantity of the sample of water, and pours into it from a measuring-tube, called a burette, a solution of permanganate of known strength. This is a very imperfect description of the method, but it is sufficient for our purpose. This method, with whatever modification it is used, does not really show how much organic matter is actually present, but only how much oxygen has been required by the substances which are capable of being oxidized in this way. German chemists are in the habit of reckoning five times the numbers obtained in the analysis as representing the total amount of "*Organischer Substanz*." This is, however, an arbitrary factor, and while it may have been tolerably accurate for some waters used as test analyses, we have no proof at all that the calculation would be accurate in all other cases, and it is hence reduced to a mere guess.

There are many objections to this method which show it to be very unreliable. Different substances are acted upon in very different degrees by permanganate, and upon some that must frequently occur in polluted water there is no action at all. Hence the method cannot by any means be relied upon to give the absolute amount of organic substance. If nitrous acid, ammonia, hydrogen sulphide, or protoxide of iron are present in the water, they will affect the permanganate in the same way as organic matter, and would be counted as such in the analysis. We must, therefore, find the amount of these substances in other ways, and make a correction for them. It is also stated to be uncertain whether the action on ammonia is uniform, and if it is not, no accurate correction for the ammonia can be made. Dr. Frankland, while condemning this method as entirely unreliable for ascertaining the quantity of organic matter, admits that it may be a useful qualitative test. "Thus," he says, "if a clear and colourless water decolorizes much of the permanganate solution, the water ought to be rejected for domestic use, as being of doubtful quality." It has the advantage of being readily performed as a quantitative test in a short time, with few materials and no special apparatus, and is therefore useful on occasions when there is no opportunity for a regular analysis. In the hands of any one chemist, its use as a quantitative method will, without doubt, give some valuable information as to the relative quality of different waters, if the test is always performed in the same manner. The degree of rapidity with which the oxidation takes place will probably give some idea as to the putrescible nature of the organic matter. It is thus that Dr. Tidy's periodical analyses of the metropolitan water of London, by the permanganate method, have not been without value.

In England and America both the methods I have described have been to a great extent abandoned, and two other methods have taken their place. These are Wanklyn's ammonia method, and Frankland's combustion method, which were devised and published at nearly the same time in 1867 and 1868. The Frankland process consists in evaporating a measured quantity of water to dryness and burning the residue in a combustion-tube on the same principle as that by which an organic analysis is made. The resulting gases instead of being immediately absorbed are measured in a delicate and complicated apparatus for gas analysis, and then separated by absorption. The gases resulting from the organic matter are chiefly carbonic acid and nitrogen, and are calculated as organic carbon and organic nitrogen. The gases are drawn out of the combustion-tube by means of a Sprengel vacuum pump, and upon the perfection of the vacuum produced, depends, in part, the reliability of the results.

The Wanklyn method, which is much more generally practised, makes use of the potassic permanganate. A measured quantity of the water to be analyzed is put into a glass retort, to which is attached a condenser. A little carbonate of soda is dropped in through the stoppered orifice in the retort, and the water is distilled rapidly until no more ammonia is given off, and condensed with the steam. The distilled water is collected in flat-bottom test-tubes of perfectly colourless glass. This ammonia, which is first distilled, is called free ammonia. It is that which is present, in the form of ammonia, either in the free state or in combination, in the water. A solution of potassic permanganate, with which a strong solution of caustic potash has been mixed, is now poured into the retort, and the distillation continued until no more ammonia is perceived in the distilled water. The ammonia now found in the distillate is called "albuminoid ammonia," and is that which results from the decomposition of nitrogenous organic matter by the action of the permanganate solution. Hence it represents that organic matter, and forms a relative, more or less definite, measure of it. It is upon this peculiar action of a boiling, strongly alkaline solution of potassic permanganate that the method of Wanklyn is founded. The delicacy of the method depends upon the sensitiveness of the Nessler test for ammonia, which is one of the most delicate colorimetric tests in the whole range of analytical chemistry, being capable of recognizing easily one part of ammonia in ten million parts of water, and distinguishing differences of one-third of this amount.

(To be continued.)

* See ante, pp. 360, 489.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

The movement to establish an exhibition of gas apparatus in Glasgow occurred about the same time that certain Fellows of the Royal Scottish Society of Arts in Edinburgh had taken the same subject into consideration. The latter gentlemen had less "go" than their Western, and more commercial countrymen, and were content to lie upon their oars, and allow the members of the Philosophical Society of Glasgow to secure such honour as appertains to the promoters of what turned out to be the finest and most extensive exhibition of apparatus connected with the gas industry that had ever been held in Scotland. Any one who has taken an interest in the question of making gas more popular than it has been in the past, must confess that no better mode of doing so can be devised than by collecting under one roof the different appliances which have been invented, whether for lighting or heating by means of gas. Now that the Edinburgh folks have seen what can be done in the way of gas exhibitions both in Glasgow and elsewhere in the provinces, it is time they should be bestirring themselves, to emulate, if not to surpass, all previous efforts in this direction. Edinburgh is most conveniently situated. It is connected with England by the two main lines of railway in Scotland, the branches of which fork out in every direction all over the country; and it has within its parliamentary boundaries a place where such an exhibition might be held, the equal of which cannot be found in the kingdom. I refer to the Vegetable Market at the Waverley Station. Some idea of the capacity of this structure may be gathered from the fact that during the parliamentary contest of rather more than a year ago, Mr. Gladstone addressed a multitude of 20,000 people under its roof. If a certain number of spirited gentlemen would only take the matter in hand, I have no doubt their exertions would be entirely successful. Were the scheme once afloat, the Corporation might be induced to grant privileges, and doubtless the two Gas Companies which at present supply Edinburgh and Leith would not be wanting with material aid. It may not be out of place here to mention that within the last ten or twelve years the southern district of Edinburgh has been wonderfully extended. Its population in the period indicated must have more than trebled, and yet the mains conveying gas to the district have not been enlarged. I allude to this fact for the reason that I know several cases where people, after being at the expense of introducing gas-fires and gas-cooking stoves, have been obliged to dispense with their use solely because they could not, at seasonable hours, obtain the pressure of gas necessary to keep the apparatus in proper working order. I have no reason to suppose the Gas Companies are blind to their own interests, and if, therefore, an ample supply of gas is provided, and every inducement offered to people to become larger consumers of gas, the ultimate benefit will be that of the Companies, and at the same time the wants of the community will be more fully met.

The little flutter of excitement caused by the visit of Mr. Chaney to Edinburgh has subsided, and meter makers are now beginning to wonder why there should have been any excitement at all. Matters were working smoothly enough in the city; but outsiders, it is said, were not at all pleased that the makers here should be so free from official restraint, or that they should be afforded such facilities as exist in connection with the stamping of meters, and they therefore indulged in a little wire-pulling—an exercise for which some people have a decided *penchant*—and the consequence was that Mr. Chaney was sent down to the Hyperboreans in this quarter to observe and report upon their mode of conducting business. His report has been given in to the Board of Trade, with the result that a communication has reached the Magistrates of Edinburgh, to the effect that testing-stations must be away from the premises of the manufacturers. This is quite as it ought to be, although those who have an every-day acquaintance with the business seem to think there is no necessity for such procedure; and I understand that all the makers have indicated their readiness to acquiesce in the change. By the establishment of these district offices a certain amount of the annual revenue derived from stamping meters will be swallowed up; but the question still remains for solution, what is to be done with the £6000 odd which has accumulated from past revenues?

The Dundee Gas Commissioners, at their meeting on Wednesday last, had before them a subject of great interest, and one which, on this side the Border at any rate, has not received the amount of attention which its importance deserves—namely, the propriety of the Commissioners sending out gas-stoves on hire. Mr. Charles Scott mentioned to the meeting that in many towns in England the companies or corporations who have the supplying of gas adopted the policy of letting gas-stoves on hire, and he thought the Gas Commissioners of Dundee would find their advantage in following out the same line. Many people, he said, would make a trial of a gas-stove if they could get one on hire, and have it fitted up for them, who would not make the experiment if they had both to purchase the stove and incur the expense of fitting it up. This is quite true, and Mr. Scott might have gone a step farther, and said that many people were so poor that they could not afford to do all this on their own account, and who, if they had the stove at hand, would not grudge a few shillings more per quarter when once they became aware of the excellence and cleanliness of the stove for many domestic purposes. On Mr. Scott's motion a Committee, consisting of himself, Mr. Logie, and the Manager, was appointed to inquire whether it would be profitable to supply on hire gas-stoves for cooking and heating purposes. I have long been of opinion that not only would it pay a company or a corporation to do this, but that they would add materially to their revenue if they were to make a deduction, say, of 5 per cent. on the accounts of all consumers who used gas-stoves.

The Inverness Gas and Water Committee met last week, when the Manager was authorized to take estimates for new pipes required to renew gas-mains in various parts of the borough. From the Water Manager's report it would appear that the inhabitants of the capital of the Highlands are abundantly supplied with pure water. He states that there had been a number of leaks which could only be discovered with difficulty, as, owing to the gravelly nature of the subsoil, the water seldom came to the surface. He then goes on to say that "Loch Ashie is quite full, and is often overflowing, and the pipe from the Loch to the reservoir is now delivering 1,100,000 gallons per day. Providing the reservoir and the pipe from the reservoir are tight, this quantity of water is consumed or wasted in the town each day; and if the population supplied be assumed at 18,000, this would give over 60 gallons per head per day, or about double what is often quoted as an adequate supply."

Almost every local paper in the North of Scotland contains paragraphs relative to the bursting of water-pipes, or, at all events, recording their discovery now that the approaching heat is beginning to have some effect upon the long frozen mains. From Braemar a correspondent asks—When are the frozen pipes to thaw? Many of these pipes, it appears, have been frozen for ten weeks, and a suggestion has been thrown out that householders must bestir themselves, and open up the ground so as to let the pipes have the benefit of the sun and the air. As on the morning of Monday last 9° of frost were registered in Braemar, the thawing of frozen pipes is not in the immediate present.

From the fortnightly report of the Superintendent of the Edinburgh

Water-Works it appears that on the 5th inst. the quantity of water in store was 2,354,174,000 gallons, as compared with 2,422,998,000 gallons on the 22nd of March last, and 2,381,767,000 gallons on the corresponding date of last year. During the past fortnight the city has been receiving a daily supply of 12,475,000 gallons, equal to 40·99 gallons per head per day to a population of 304,300 persons.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At last Thursday's monthly meeting of the Town Council of Hamilton, a report was submitted from the Gas Committee, stating that they were receiving offers for a variety of coal superior to that now in use, with the view of further improving the quality of the gas, and that the report upon the subject would be presented to the Council at the next meeting. They also stated that they had under consideration the propriety of adopting some means for the manufacture of part of the residuals, more especially sulphate of ammonia. It is expected that at the next meeting they will be able to submit the results of their examination and inquiry. Bailie Cassels, Convener of the Gas Committee, moved the adoption of the report, and it was agreed to.

A special meeting of the Town Council of Port-Glasgow, sitting as the Corporation Gas Commissioners, was held on Thursday, when there were submitted 58 applications for the appointment of Gas Manager now vacant. These were reduced to a list of 25, and the Council will still further reduce them at a subsequent meeting.

The Gas Committee of the Town Council of Kilmarnock reported to a meeting of that body held last Wednesday that, after having advertised that the Gas Department wanted to borrow the sum of £9000 on debenture to replace loans falling due, they had received offers to lend them to the amount of £21,600. It was agreed to renew the two mortgage bonds and one debenture bond of the present holders, representing £1000 each, at 4½ per cent. for seven years; and the Manager was instructed to accept in rotation, as offered, the money of those persons who were willing to lend it at 4 per cent. for five years, to the amount of £6000, and advise them accordingly. A report was submitted by Mr. S. Dalziel, the Manager, showing that the gas sold during the month of February amounted to 4,489,650 cubic feet, realizing £1028 14s. 9½d., as against 4,398,400 cubic feet, of the value of £1007 19s. 4d., sold during the corresponding month of last year. He also reported that the illuminating power of the gas made during the month of February was—maximum, 29 candles; minimum, 27·6 candles; average, 28·2 candles. Provost Sturrock remarked that it was pleasant to hear that their credit was so good and that so much money had been offered at 4 per cent.; and Treasurer Reyburn said the Committee proposed to pay off £2000 in May, which would effect a saving of £80 or £90 in interest, besides £20 already saved, and that in future there would be an annual saving of from £100 to £110.

Messrs. A. Shaw and Son, Glasgow, have just fitted up one of Muller's "Alpha" gas-making machines on board the steamer *Staffa*, belonging to Mr. David Macbrayne's well-known West Highland fleet, which includes the far-famed *Iona* and *Columbia*. The gas is made from gasoline on the steamer as it is required, the machine in use being capable of making as much as will keep 100 jets burning. The cost of the gas is said to be about 4s. per 1000 cubic feet. I may have something further to say on this subject in an early issue.

On Monday, the 4th inst., a most interesting and instructive paper on "Coal Tar Products" was read before the Dumbarton Philosophical and Literary Society, by Mr. James Morton, Manager of the Dalquhurn Turkey Red Works, Vale of Leven. As might have been expected, the author gave considerable prominence to the discovery, as also to the manufacture on a large scale of artificial alizarine, the compound which is obtained from the tar pit for the use of Turkey-red dyers and calico printers.

Very few of the metropolitan correspondents of the Scotch newspapers have devoted much attention to the electric lighting of certain portions of the City of London, but there is at least one who, in an ecstasy of delight, has said some extraordinary things in reference to the future of artificial lighting. He says that the new illuminating power is so brilliant that extra lamps outside shop-windows have become obsolete, and that it is amusing to note the efforts of the Gas Companies to regain the ground they have lost. When there was a "scare" two years ago, he says, some of these societies suddenly presented the town with a number of extra powerful burners, which certainly added materially to the brilliancy of London. The "scare" subsided, and the Companies imagined themselves safe. The immediate result was a calling-in of the improved burners, and a return once more to semi-darkness. With the lighting of the City by electricity, a fresh effort is being made by the doomed associations, and once more Charing Cross is furnished with improved lamps. But it is too late. Such an utterance from "Our Own" must certainly be regarded as a climax. But he does not stop there. So far, he further remarks, there has been no very heavy fall in gas shares, but those who hold them had better get rid of them as soon as they can. In his opinion, the establishment of the electric light is now merely a question of time. It has been tried for street lighting and succeeded. Then, speaking for the "experts," he says that they declare that it will soon be available for private dwellings, and then gas will have had its day, or rather night; and he concludes his outburst by saying: "No one will be sorry at the misfortune that has befallen the gas companies—so unobliging and despotic—except, perhaps, the shareholders!" Up to the present time, there has been no electric lighting in Scotland that has warranted the use of such "tall talk" in any of the leading newspapers on this side the Border. There are, however, several experiments in progress and in prospect, regarding which I must by-and-by make some report.

The Scotch iron trade continues quiet, with little or no indication of improvement. There has been less doing in the warrant market this week, and prices have receded nearly 1s. per ton, fluctuating between 49s. 1½d. and 48s. 4d. cash, and closing—buyers, 48s. 4d.; and sellers, 48s. 4½d. It is said that the stocks of pig iron are now larger than were ever previously held in Scotland, the amount being 856,000 tons, or an estimated increase of 117,000 tons since last Christmas.

There is nothing new to report in the coal trade, except that prices are becoming less and less firm.

REDUCTIONS IN PRICE.—The Stockton Town Council have resolved to reduce the price of gas to 3s. per 1000 cubic feet, and to allow 20 per cent. discount to those who pay their accounts within 14 days.—The Darlington Town Council have agreed to reduce the price of gas 2d. per 1000 cubic feet, the reduction to take effect from the 1st of January last.

ABERSYCHAN GAS COMPANY.—The annual general meeting of this Company was held on the 24th ult. The proceedings were of a very satisfactory character, and consisted chiefly in adopting the report of the Directors, recommending the declaration of the usual dividends of 10 per cent. upon the original shares, and 7 per cent. upon the new shares of the Company. Votes of thanks were unanimously passed to the Chairman and Directors; also to Mr. W. White (the Secretary and Manager), in the latter case accompanied, we understand, by a gratuity in recognition of his services since the establishment of the Company.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is but a dull demand for all descriptions of round coal, and short time is now being worked at a large number of the Lancashire collieries. Although the principal colliery proprietors in the Manchester district maintain the advance of 10d. per ton which, during the strike was put on generally throughout Lancashire there is a giving way so far as round coals are concerned, and for quantities sellers are willing to take very low figures. The common classes of coal especially are a drug, owing in part to large quantities of steam coal being thrown upon the home market in consequence of the absence of demand for shipment. Although it is too early as yet to form any definite opinion as to how prices for gas coal will rule, the present condition of the market points to very low prices again prevailing during the ensuing summer, and one transaction which I have heard of during the past week has been at extremely low figures. For round coals at the pit's mouth the average prices are about 8s. 6d. to 9s. for best qualities, 7s. 6d. to 8s. for seconds, and 5s. 6d. to 6s. for common coals. Engine classes of fuel maintain their prices, burgy averaging about 5s., and slack 3s. 6d. to 4s. 6d. per ton at the pit.

Cokes are in fair demand, and in some cases makers in the Manchester district are asking rather higher prices, common cokes at the ovens being quoted at 12s. to 13s., and best cokes at 15s. to 16s. per ton.

The advance in wages which the principal Manchester colliery firms have conceded to their men has brought about, as I anticipated last week, an uneasy feeling in other districts, and notices have been served upon the masters at many of the collieries in the Tyldesley and Wigan districts.

The iron trade continues extremely dull, with prices lower both for pig and manufactured iron. Lancashire pig iron can be bought at 44s. to 45s. per ton, less 2½ delivered equal to Manchester, and Lincolnshire and Derbyshire brands are offered at about the same figure. For bars delivered into the Manchester district, £5 15s. to £5 17s. 6d. are about the average prices. Contracts for pipe castings are being taken at very low figures, and one for about 300 tons of lined water-pipes, ranging from 4 to 9 inches, has just been placed for delivery into the Manchester district at £4 2s. 6d. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The continued prevalence of very strong easterly gales has very materially affected the coal trade of Cardiff during the past week. Sailing vessels are kept almost entirely out of this channel, and even many steamers have been unable to make their passage, being in most cases considerably overdue, to the great inconvenience of all concerned. Although the figures relating to the clearances do not show so large a falling off as might have been expected under the circumstances, the week closes very dead. During the last few days very little shipping has been done in consequence of the scarcity of tonnage in the port, and the docks begin to wear an unusually bare appearance. Although up to the present date the principal collieries have contrived to keep themselves fairly busy, others less favoured have been greatly exercised by the want of ready vessels to relieve waggons and keep their pits open. Under these circumstances, various lots of coal have been sold, or at least offered, at a marked reduction on recent quotations. The following are the clearances for the week:—Coal, 90,727 tons; patent fuel, 2950 tons; iron, 2882 tons; coke, 420 tons. The coal trade of Newport for the past week has been thrown back a great deal in consequence of the severity of the easterly wind. The iron trade continues steady, and though wanting in that speculation which characterized the trade with the States of America some time back, is as brisk as it has been for a long time past. There are several orders in hand for the States, whilst the Brazils have taken and are taking considerable quantities of rails and railway materials.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district is in a declining condition. Owners are daily feeling more the languor now prevailing in the iron trade, and this, together with the advance of spring, has checked the better and comparatively healthy state experienced for the past several months. A decrease in the wages of the miners has necessarily been made, and so far from a speedy improvement in the prospects, a gloomy outlook is everywhere manifest. Thus the quarter which opened well has closed rather the reverse. The arrangements for the re-opening of the old Bilston district mines are nevertheless being pushed on by the Mines Drainage Commissioners, who are negotiating for a loan of £100,000 for expenditure on the new Tipton district.

The iron trade shows no signs of improvement, but, on the contrary, is in a depressed condition. As was intimated in last week's report, a reduction of 10s. per ton on marked bars has been made by the makers during the last few days. With the exception of the make of the Earl of Dudley, marked bars are now quoted at £7, which is 10s. lower than they have been at any time since the autumn of 1869. The markets of the week have been only thinly attended, and sales, with but few exceptions, were of the most limited character. The makers of common sheets are about the only firms who have any call in the market. The figures quoted for these are, however, irregular, and an average rate cannot well be quoted. Boiler plates and girder work are receiving a little attention, but the demand for these, as also that for hoops, strip, and the like, is of less importance. The pig business shares the fate of the finished. Inquiries and orders are scarce, and there is a general weakening of prices. Makers, however, decline to make any considerable concession, and there is a general belief that the number of furnaces now in blast will very speedily be considerably reduced. Common pigs are a complete drug in the market, and but few offers are forthcoming. Buyers are holding what orders they have to place until the quarter-day meetings, which take place during the present week. These, however, are not looked for with any great anxiety, as no further alterations are likely to be made. The heavy ironfounders and manufacturers generally in the district are not overstocked with orders. At a few of the foundries, however, operations are still brisk, but these are exceptional cases. At the annual meeting of the Chillington Iron Company, held a few days ago, a loss was stated to have been made on the year's trading of £8250 19s. 2d.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout both the South and West Yorkshire districts is very quiet, considering the cold weather which has prevailed. Some of the pits are working rather better, but on the whole they are not making full time. The house coal trade is unprofitable, and prices are very low indeed. The traffic to London and the South by both the Midland and Great Northern lines is only moderate, the tonnage rates, which still remain at 8s. 3d. per ton from South Yorkshire, having a tendency to prevent coalowners from competing with seaborne coal in the Metropolis. There is just now rather more done in household qualities for the Eastern

Counties, as well as for Lincolnshire; but prices were scarcely ever lower than they are at the present time.

The steam coal trade is rather better, and during the week several inquiries for hard coal for exportation from Hull have been made. The tonnage to the latter port, as well as to Grimsby, is, however, very small, there being as yet but little coal exported from either place. From some of the pits a rather better tonnage has been sent by water during the week, owing to merchants getting supplies prior to certain alterations and repairs which the Aire and Calder Navigation are about to make. The quotations for the best hard coal are very low for current orders. The locomotive coal contracts are still taking a good quantity of coal from the district pits.

Very little change can be reported with regard to the demand for gas coal. As is usually the case, the demand is scarcely so good as when the nights were longer, and the consumption of gas larger. There is, however, fully an average tonnage sent away in connection with existing contracts.

The coke trade holds well up, and a large output is made weekly, particularly in the South Yorkshire districts, where some very good coke is now made. Although the recent alteration of the tonnage rate made by the Manchester, Sheffield, and Lincolnshire Railway Company has added in some cases as much as 4d. per ton to the cost of transit to North Lincolnshire, there is still a large quantity sent almost daily, the iron trade in that locality being still active.

Taken as a whole, the position of the Yorkshire iron trade is unimproving. The output of pig iron has been reduced by the blowing out of two furnaces at Elsecar, where it is rumoured the other two will be also put out. The foundries are doing a very quiet business, as are also some of the other works where engineers and fitters are employed.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade of the county of Durham shows an average shipment. At the same time the export business was very much kept back last week by the non-arrival of regular steamers which had been storm-bound to the southward. The arrivals of steamers have now become more numerous, and the shipments of gas coals have increased very materially over the past few days. As the coasting demand falls off there is a better over-sea inquiry, and the shipments to the Baltic, under contracts which were made in January, have got a start. Under the circumstances of the coal trade of the North of England at the present time, the prices of many kinds of fuel are irregular. There is no pressure of business; and where coals are not contracted for, colliery offices have in too many instances to seek business, rather than business going in search of them. There is, therefore, a good deal of bargaining in the sale of second-class coals and coke, and what may be called official quotations are not much to be relied on as a guide to business. The shipments of coke to Italy and the Mediterranean ports are very much better than they were, but so far no great amount of trade has been transacted with the Baltic.

Freights do not change, but it is a singular circumstance to note that, though steamers were scarce in the coal ports during the whole of last week, rates did not advance 1½d. per ton in coasting business in consequence.

The iron trade of the North of England does not get any better, the manufacturing iron and pipe-foundry trades being extremely dull in all branches. Chemical business, notwithstanding the navigation of the Baltic and the Continent is now open, is very disappointing. It does not improve; in some instances it is worse, and manufacturers are very much cast down over the long depression in their trade. Prices are wretchedly poor and disappointing. Lead is about 2s. 6d. per ton lower than it was about six days since, and other metals are more or less depressed. Building material, timber, cement, &c., do not improve in value.

THE DRAINAGE OF BRIDLINGTON.—The Bridlington Local Board have accepted three tenders, amounting to £8708 19s. 9d., for carrying out the drainage of the district, according to plans prepared by Messrs. Brierley and Holt, Civil Engineers, of Blackburn.

HOYLAKE AND WEST KIRBY WATER-WORKS.—The mains in connection with the Hoylake Water-Works have been completed to a length of about 6½ miles, and will be brought into use by the end of June, when the reservoir will be completed. The Secretary of the Company states that the water has been analyzed, and found to be of the most satisfactory character.

THE QUALITY OF THE LEEDS GAS.—A few weeks since, some decrease was noticed in the illuminating power of the gas supplied by the Leeds Corporation, and the attention of the Magistrates was called thereto. We now learn, from the report of Mr. C. Buckley, the Magistrates' Inspector, that the average illuminating power of the gas for the past month has been 16·93 candles—nearly one candle more than the Act requires. When tested at the office in Wharf Street, 33 tests showed the average illuminating power to be 16·07 candles—the lowest at any time during the month being 15·13 candles.

THE SEWAGE OF STRATFORD-UPON-AVON.—The Stratford Town Council, at their meeting on the 5th inst., received notice from a firm of millers in the town that they intend applying for an injunction against the Corporation, to restrain them from pouring sewage into the River Avon, unless the nuisance is at once remedied. The Council expressed themselves prepared to undertake the necessary works without further delay, and the Committee who at present have the matter in hand were empowered to call in professional opinion to advise as to the best of the three schemes now before the Council, one of which is prepared by Mr. Bailey Denton. The Committee were empowered to borrow £20,000 in connection with these works, which includes the purchase of 20 acres of land belonging to the Marquis of Hertford.

BRISBANE GAS COMPANY.—The seventeenth annual report of the Directors of this Company—that for the half year ended Dec. 31, 1880—stated that two reductions in the price of gas had been made during the past year. Tenders had been invited for an additional gasholder, and preparations for constructing the tank to receive it were being made. With a view of improving the lighting of the city, a number of street lamps of the best construction had been ordered, as well as six lamps of great power, of the kind coming much into use in England for lighting large open spaces in the streets. The report concluded by recommending the declaration of a dividend of 10 per cent., with the usual bonus. The profit and loss account accompanying the report showed that in the six months to Dec. 31 last the sales of gas had produced £9310 12s. 4d.; the rents were £50; licence fees, £5 2s.; bad debts recovered, 13s. 6d.; and the balance brought forward, £619 10s. 4d.—total, £9985 18s. 2d. There was expended in the manufacture and distribution of gas and management, £4059 3s. 5d.; rates and taxes, £81 13s. 4d.; interest and discount, £952. These sums, with the bad debts, amount written off for depreciation of plant, and the reserve, made a total of £6548, leaving a balance of £3438 to be carried forward.

ESTON WATER SUPPLY.—At the meeting of the Middlesbrough Urban Sanitary Authority on the 31st ult., it was reported that a Mr. Harker's scheme for supplying Eston with water had been accepted by the Committee appointed to consider it. A supply of 90 gallons per minute was guaranteed for sanitary purposes for High Eston, to be under the control of Messrs. Bolckow, Vaughan, and Co., who undertake to use all surplus water. The Committee were empowered to confer with Messrs. Bolckow to carry out the scheme. It was explained that the scheme would cost only about £18,000, with no charge for water, as compared with some £6000 if supplied by Stockton and Middlesbrough Corporations Water Board, and a charge of 6d. per 1000 gallons. The Committee's minute was adopted.

THE WATER SUPPLY OF DIEPPE.—Important works in connection with the conveyance of water for the supply of Dieppe, which have for some time been in progress, are rapidly approaching completion. In carrying out the work it was necessary to construct an aqueduct from the source of supply, which is situate at St. Aubin-sur-Scie, and at one point the water passes underground for a distance of rather over a mile and a quarter. The construction of this subterranean passage was commenced in August last. Thirteen shafts, the deepest being about 70 yards, were sunk, for taking out the earth and rubbish, making about 500 yards of excavation in addition to that required for the construction of the tunnel; but only three of them will be kept open for ventilation and other purposes. The construction of these shafts was attended with considerable difficulty, blasting having to be resorted to in several places, and workmen were engaged upon them day and night. It is to be hoped that the result of these labours will soon be apparent in the provision of a supply of water adequate to the requirements of the town.

SALE OF SHARES IN THE CROYDON COMMERCIAL GAS COMPANY.—Last Thursday, Messrs. Podmore and Martin sold by auction at Croydon 1000 new £10 shares in the above Company, in accordance with the provisions contained in the Company's Act of 1877 in respect to the raising of additional capital. The nominal statutory dividend payable on these shares is 7 per cent., subject to the sliding scale, the maximum price of gas being fixed at 4s. 7d. per 1000 cubic feet; and the dividends on similar shares now existing have been already increased to 9 per cent., with a prospective increase as the Company's business extends. The shares were offered in lots of 5, 10, and 20 each, to suit the convenience of buyers, and the purchaser of any lot was allowed the privilege of taking the next one or two following lots at the same price per share. There were 100 lots in all, and they were disposed of at the following prices:—3 (60 shares) at £305 each, 17 (340 shares) at £302 10s. each, 5 (100 shares) at £300 each, 11 (110 shares) at £151 5s. each, 14 (140 shares) at £150 each, 5 (25 shares) £76 5s. each, 42 (210 shares) at £75 12s. 6d. each, and 3 (15 shares) at £75 each. The total amount produced by the sale was £15,103 15s., the average price realized per share being £15 2s. 1d.

PROPOSED SOCIETY OF CHEMICAL INDUSTRY.—It is proposed to form a new Society, to represent generally the chemical industry, including alkali making, tar distilling, the manufacture of fine chemicals, and all other industries which have any connection with chemical science. At a meeting held at Owens' College, Manchester, on Dec. 4 last, it was resolved that a Society of Chemical Engineers be established, and a Sub-Committee was appointed to make preparations for a meeting to be held in London, and for considering the details of the scheme. For some time past the want of a society having for its object the advancement of manufacturing chemistry in the United Kingdom has been felt. In order to accomplish this it is desirable to establish a Society which may be the means of bringing together, at stated intervals, all those who possess chemical, physical, and engineering knowledge, and who use this knowledge in the utilization of chemical action on a manufacturing scale, and who have the charge of, or an interest in, chemical industries. It may indeed prove afterwards desirable to found a distinct branch of the engineering profession, to be composed of persons who possess the aforesaid knowledge, and who may be designated as Chemical Engineers.

EFFECTS OF THE FROST OF JANUARY, 1881, ON GAS PLANT IN GLASGOW.—There is doubtless much valuable and interesting information available, and in store, regarding the effects produced upon gas plant by the extraordinary frost which visited this country during the past winter, and more especially during the month of January; and we may express a hope that gas managers, meter inspectors, and other persons favourably situated for acquiring information on the subject will put on record some notes of their experience. We have received some memoranda on the subject from Glasgow, where the frost seems to have been most remarkably intense, and to have played many curious freaks on gas-meters and on main and service pipes. The following summary will give some indication of the effects of the frost on the meters, &c.:—

Gross number of complaints booked during the month of January	18,826
Number of wet meters affected by, and changed in consequence of, the frost	956
Number of dry meters ditto	653
Number of wet meters found burst and destroyed by the frost	278

About 96 yards of 3-inch, and about 20 yards of 1½-inch main-pipes were found to have been completely frozen up, principally on the higher levels of the city; the average depth which the frost was found to have penetrated into the ground under the causeway being about 2½ feet.

A WATER COMPANY'S FISHING RIGHTS.—On the 27th of October last, three men in the employ of the Devonport Water Company were summoned before the Justices at Tavistock, "for that they, on the 15th of September, 1880, at the parish of Lydford, in the county of Devon, did then and there fish and take common trout by means of an instrument or device, not being a rod and line—to wit, a net—without a proper licence." The fish were taken with a net by order of the Manager of the Water Company, in the grounds of Dartmoor Prison, from the lead of the Company which supplies water taken from the Dart to the town of Devonport. The taking of the fish was admitted. At the hearing of the case, the objection taken was that the Board of Conservators had no jurisdiction over the fish in the Devonport lead, so that no licence from the Board was required by the Company to catch fish therein. The Justices decided against the Company, who thereupon gave notice of appeal, and this came before the Devon Quarter Sessions on Wednesday last. The case for the appellants was mainly that the circumstances were not such as to make the lead a tributary of the Dart, for the reason that no sufficient quantity of water passes over the outlets in the lead for such a continuance of time as to create anything like a communication; and that if there were it was contended that this would not make the lead a tributary. The Bench, however, decided to confirm the decision of the Court below, and Mr. Pitt-Lewis, on behalf of the Company, thereupon asked the Bench to state a case for a higher Court, and the application was granted.

EXPLOSIONS OF COAL CARGOES.—A pamphlet has been issued by the Marine Department of the Board of Trade, calling the attention of ship-owners, shipmasters, colliery owners, coal brokers, underwriters, and others to the conclusions arrived at by the Royal Commissioners with regard to the prevention of explosions of coal gas in ships. The Marine Department specially calls attention to the following conclusions of the Commissioners:—"That with a view to guard against explosion, free and

continuous egress to the open air, independently of the hatchways, should be provided for the explosive gases by means of a system of surface ventilation, which would be effective in all circumstances of weather. That the breakage of coal in its transport from the pit to the ship's hold, the shipment of pyritic coal in a wet condition, and especially ventilation through the body of coal cargoes, conduce to spontaneous combustion, even though the coal may not be unfit for conveyance on long voyages. That when coal is being carried on long voyages the temperature in the various portions of the cargo should be tested periodically by thermometer and registered in the log." Certified masters and officers are specially warned that neglect on their part will, in the event of accident, be brought to the notice of the Wreck Commissioner or of the Court investigating the case. The Board of Trade also give notice that it is their intention to prosecute any person concerned in sending or taking, or attempting to send or take, to sea British coal-laden ships which, on account of insufficient or improper ventilation, are in such unseaworthy state that the life of any person is likely to be thereby endangered.

THE STOCKTON AND MIDDLESBROUGH CORPORATIONS' WATER SUPPLY.—The *Newcastle Chronicle* of Wednesday last says: "It is rumoured that the Stockton and Middlesbrough Water Board has still another scheme in contemplation for giving it the additional water it will soon want. It appears that over the whole of the half year ending last month, it pumped an average of 54,447,000 gallons of water weekly from the Tees; it cannot take more than 60 million gallons weekly, so that the margin is narrow. But it is still less if the latter part of that period be taken. In the latter part it supplied for several weeks more than it had power to pump—drawing the deficiency from its reservoirs. In the last week of January it supplied 63 million gallons, and in the previous week 73 million gallons. Nor was the increase entirely owing to waste in the domestic consumption in the frost, for the consumption by meter—that is, at the works, chiefly—rose steadily, as it has risen for months, and as it is likely still to do. Hence there are facts to justify the belief that, in the first place, the ordinary consumption of the district is rapidly rising, and must soon reach the point at which the Board cannot supply it from its present source, for there is the restriction imposed by Parliament of 60 million gallons as the 'maximum to be pumped. And also it is clear that any additional demand—such as arises usually in certain states of the weather—cannot be met from present sources. Hence there is the need of the Board adding early to the supply. The projected works in Upper Teesdale would take years to make, and the supply seems likely to be soon needed. The scheme at High Force is given up; that of pumping water from the limestone north-west of Hartlepool could not be effected without additional powers to convey the water, and it is found that it is not the quality of water best fitted for boilers and works, which furnishes the chief part of the demand in the Stockton Board's district; so that in the necessities of the Board, and in its want of water, there may be that which supplies the foundation for the rumour referred to."

THE STRETFORD GAS COMPANY AND THEIR CONSUMERS.—Meetings of the gas consumers of Sale, Stretford, and the neighbouring districts, were held last Wednesday and Thursday, to consider the arrangement effected with the Stretford Gas Company relative to matters which have formed the subject of recent legal proceedings. The meeting at Sale was held in the Institute, under the presidency of Mr. G. Rooke, who said the meeting had been called for the purpose of asking the consumers to confirm the arrangement by the Consumers' Committee with the Gas Company. Mr. S. N. Williams, having explained the settlement come to, Mr. W. Yates moved the following resolution:—"That this meeting of gas consumers of Sale, Ashton-on-Mersey, Brooklands, and Timperley, having heard read the arrangement provisionally entered into at the Queen's Hotel, Manchester, on Saturday, Nov. 6, 1880, and signed by Alderman William Booth (Chairman of the Stretford Gas Company), which recites that the Shareholders of the Company shall refund the sum of £8500, which sum shall (after the payment thereof of all expenses incurred in connection with the agitation by the Company and by the Consumers' Committee, legal or otherwise) be placed to the reserve fund of the Company, and shall be considered to be a settlement of the consumers' claim of £17,109 6s. 6d.; and having also heard read the statement of Mr. Reuben Spencer (Vice-Chairman of the Company), to the effect that the said arrangement will be *bona fide* carried out by the said Company, and the said sum of money placed in the Company's reserve fund at the earliest possible moment, resolves to accept the agreement, when carried out, as a full settlement of the consumers' claim of £17,109 6s. 6d. against the Company; and further resolves that the terms of the said arrangement shall be made known to the consumers generally, in such way as the Committee may agree upon." The resolution was seconded by Mr. J. Morley, jun., and carried, and a vote of thanks accorded to the Vigilance Committee for their services.—The meeting at Stretford was of a similar character to that at Sale, the resolutions proposed at the latter place being again put and carried.

GREAT WASTE OF WATER AT SOUTHAMPTON.—At the last meeting of the Southampton Town Council the Special and General Works Committee reported that the Borough Engineer (Mr. G. Manwaring) had submitted to them a report upon the subject of the water supply of the town, suggesting the appointment of efficient water inspectors to prevent the waste of water. The Town Clerk had been instructed, in reference to the waste of water in the borough, to inquire of the Local Government Board whether they had issued any suggestions for the guidance of sanitary authorities generally; and in reply the Board had forwarded a book with instructions as to house fittings for water supply, and further stated that they believed means to check waste had been adopted with beneficial effects at Liverpool, Manchester, Croydon, and Wallasey. Inquiries were directed to be made of the authorities at these places. Mr. Manwaring and Dr. Osborn (the Medical Officer of Health) had conferred with the Committee as to the duties of the turncocks and inspectors of nuisances. The Committee expressed an opinion that every person supplied with water should remove forthwith the screw-down taps from closets, and provide proper cisterns, ball and stop cocks in lieu thereof, and failing their doing so within a month, the Committee would take legal proceedings, and, if necessary, cut off the water supply of the houses. Handbills to this effect were directed to be issued. The Committee further resolved that the police and persons employed in the various departments of the Corporation be authorized to demand admittance to and inspect all premises supplied with water, and to take proceedings against all persons wasting the same. They also recommended the Corporation to pay the sum of 2s. 6d. to the police upon every conviction obtained for the waste of water. The Committee had also had an interview with Mr. Griffiths, of the Waste of Water Company, Liverpool, and had subsequently instructed Mr. Manwaring to forward this gentleman a plan of the borough, showing the position of all the water-mains, so that he might mark thereon the position of some waste-water meters the Committee proposed to have placed at certain intervals to detect where the waste occurred. Mr. G. P. Perkins moved the adoption of the report, stating that the Committee hoped, by what they proposed, to entirely stop, in the course of time, the great waste of water. Mr. J. Miller seconded the motion, but after some discussion the report was referred back to the Committee for re-consideration.

APPLICATIONS FOR LETTERS PATENT.

1411.—PASS, E. DE, Fleet Street, London, "An improved hydraulic apparatus for indicating at a distance the extent to which gas and other fluid reservoirs or holders are filled." A communication. March 31, 1881.
1439.—WESTWOOD, W. H., and WRIGHT, E. T., Dudley, Worcester, "Improvements in valves for liquids, gases, and vapours." April 1, 1881.
1485.—TALL, G., and DADDY, J., Kingston-upon-Hull, "An improved manufacture of a compound for preventing the escape of steam, gas, water, or air from joints of engines, boilers, pipes, and machinery." April 5, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4167.—WATES, P. J., Balham, London, "Improvements in apparatus for extracting tar and other impurities from gases or vapours." Oct. 13, 1880.
4254.—BENSON, W. A. S., Kensington, London, "Improvements in apparatus for the distribution of artificial light." Oct. 19, 1880.
4604.—WARING, G. E., jun., Newport, U.S.A., "Improvements in and relating to the construction and arrangement of sewers or drains, and to apparatus for ventilating the same." Nov. 9, 1880.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending April 6, 1881.

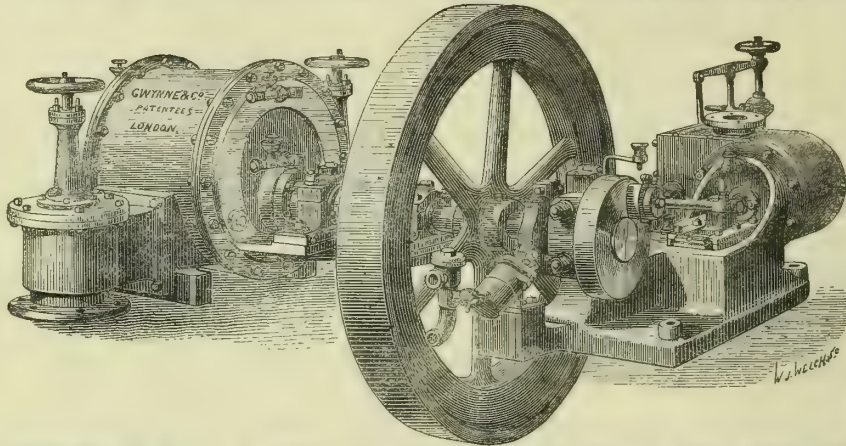
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . .	Notting Hill	17.3	16.8	17.1	11.7	6.9	9.7	0.2	0.0	0.0	None.	In excess.
	Camden Town	17.8	16.3	16.7	15.5	11.5	13.5	0.1	0.0	0.0	"	"
	Dalston	17.3	16.5	16.9	11.3	8.5	10.1	0.2	0.0	0.0	"	"
	Bow	17.4	16.8	17.1	13.7	11.3	12.6	0.6	0.2	0.4	"	"
	Chelsea	16.9	16.7	16.8	15.2	13.7	14.3	0.0	0.0	0.0	"	"
	Kingsland Road	17.0	16.4	16.9	17.2	9.0	12.5	0.1	0.0	0.0	"	"
	Westminster (cannel gas). .	21.6	20.9	21.4	11.5	6.3	8.3	0.4	0.2	0.3	"	"
South Metropolitan Gas Company .	Peckham	16.8	16.4	16.5	12.9	8.6	11.1	0.4	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.6	16.7	17.1	14.7	11.2	12.8	0.5	0.3	0.4	"	"
	St. George-in-the-East . .	17.7	16.4	17.2	7.6	5.9	6.8	0.3	0.0	0.1	"	"

(Signed) T. W. KRATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Bow station, and 25 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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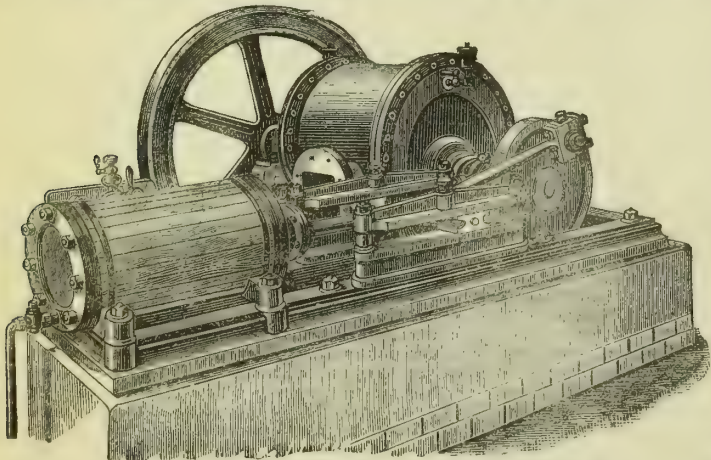
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[SEE ALSO ADVERTISEMENT PAGE 638.]

PHENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

TO CORRESPONDENTS.

G. N.—See "Notes from Scotland" this week.
 J. G. W.—We are sorry not to be able to find room for your interesting letter. The main point of it, however, is dealt with in our Editorial columns to-day.
 G. B. AND CO.—Your letter—calling in question, as it does, the refusal of a responsible Board of Directors of a public Company to adopt a proposal of yours—is not of such general interest to our readers as to warrant its insertion.
 No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
 WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 19, 1881.

THE FUTURE OF THE BRITISH ASSOCIATION OF GAS MANAGERS.

THE time has arrived when managers of gas-works, and members of the gas engineering profession throughout the kingdom, begin to feel themselves within measurable distance of the annual gathering of the members of the British Association of Gas Managers. The Birmingham meeting of the current year may be expected to be marked with unusual features of interest and importance. The external circumstances of the assemblage will, probably, be notable in many respects; but, in addition and superior to these considerations, however calculated to enhance the importance of the occasion, there will, we anticipate, be grave questions of internal organization submitted to the members of the Association then present together, the solution of which will necessarily constitute an event in the history of the society. Before proceeding to indicate the character and scope of the proposals for the reform of the constitution of the Association which will probably be made at Birmingham, it will be advisable to review briefly some of the causes which have led to a determination on the part of the most prominent members of the Association to undertake this difficult and somewhat delicate enterprise.

The British Association of Gas Managers, when it was first founded, and for some time afterwards, occupied a position and supplied a want which would have otherwise remained painfully obvious. From the beginning of its existence it had one great duty to perform, which was, indeed, indicated by its very title. It was to be the Association of Gas Managers—that is to say, it was founded to promote the intercourse and fellowship of a class of men who, by the nature of their calling, are thrown almost as com-

pletely upon their own resources as are master mariners. The social and professional isolation of men who, so far from being given to an habitually contemplative life, are constantly exercised in command and responsible action, is an evil of considerable magnitude. It is commonly seen how such men grow opinionated, domineering, and objectionable to their equals; and how, eventually, their own minds become narrowed, and their professional faculties grow hopelessly fossilized. The evil of almost continuous isolation is, of course, in a measure inseparable from the life of a gas manager; but its worst effects can be and are obviated by mutual association for the periodic exchange of ideas, between those who, on such occasions, are enabled to find their own level among their professional brethren. It is difficult in these days to appreciate the state of the members of the gas engineering profession, with reference to each other, at the time when the British Association of Gas Managers was founded, or for some time anterior to that period. Now-a-days, if we find a gas-man so wrapt up in his own self-importance as to stand sullenly aloof from his fellows, or to shut the gates of his little world in their faces, we regard him as a kind of geological specimen who has outlived his era; and we console ourselves for his selfishness with the thought that, even if he would speak, he could not tell us anything worth listening to, while his works, if displayed, would probably be useful merely as examples to be avoided. We have become accustomed to a freedom of communication, and readiness of one gas manager to help or advise a brother in need, which has so grown into a general custom, that it is difficult to believe there was a time when the very reverse was the almost universal practice. For this altered state of things—for this letting of daylight into gas-works, and general spread of good fellowship amongst their managers, thanks are due in no sparing degree to the Association which has now pursued for eighteen years its career of consolidating, and at the same time widening the scope of the profession actively followed by the majority of its members. It might be permissible to enlarge somewhat upon the benefits which this advent of the more friendly spirit, and the more liberal principle, has conferred not only upon the profession and the interests confided to the charge of the members thereof, but upon the community at large. We will, however, be content with expressing the conviction that they are great, and extend into unexpected ramifications. In measuring the past work of the Association, this great division of it, which is so complete that it is almost in danger of being overlooked, must never be forgotten.

No sooner had the charm of intercommunication and mutual confidences begun to work, than it naturally appeared so desirable a thing that a single general organization for this purpose seemed to many persons altogether insufficient for the needs of the various naturally-defined districts of the kingdom. Hence a number of more localized provincial gas managers' associations have sprung up, all of which follow, more or less faithfully according to circumstances, the constitution and practice of the parent organization. "Imitation" is the sincerest form of flattery," and the central society may be considered to have hitherto gauged its duty pretty accurately, in that so many offshoots should still have been trained on the same lines. The principles taken by these local societies from the original model appear to fulfil their requirements admirably; for wherever there has been sufficient scope, they have continuously advanced in strength and importance, until it has come with ever-increasing clearness to be seen, by interested observers of parent and offspring, that the difference between them is merely one of degree and not of kind, and is, moreover, in some cases diminishing year by year. If we take, for example, the Midland Association, or the Manchester District Institution, it is difficult to distinguish radically between these and the British Association of Gas Managers. The objects sought and, more or less, attained are in each case the same, as the members are also the same men. Locally, as nationally, the members meet ostensibly to hear papers read, and to discuss their contents, besides which they meet each other, and occasionally unite in a pleasure excursion. The district society perhaps has the advantage of the national association as regards affording facility for mutual intercourse among its members, for its meetings are held quarterly or half-yearly instead of annually. In what respect, save as regards bulk and the importance derived therefrom, does the parent society possess a countervailing advantage over its more youthful and localized rivals? A man who contributes a paper to one, will do the same for the other; a speaker at the great annual meeting will also speak at the gathering of

his own more immediate neighbours. In short, as long as the functions of both are identical, the proceedings of the older gathering will resemble those of two of the district meetings rolled into one, and little more.

This is not the first time that a comparison, such as the foregoing, has been made; but from the moment when such a parallel became possible, there was entailed upon the British Association of Gas Managers the necessity for reconsidering the position. It became of paramount importance to the Association to go forward, as the only guarantee against falling to the rear. The question then arose: How can the prestige and utility of the Association be preserved and extended, in view of the growth of subsidiary organizations which, instead of feeding, appear destined to weaken it? The possible solution of this problem is a matter of life and death to the Association, for so soon as it becomes generally believed that a professional man can obtain as much information and assistance from his own district society as from the British Association, from that day will the national society begin to decline in numbers and influence. We believe, however, that this day need never come, if the present members of the Association—official or otherwise—seriously set themselves to prevent it, by taking timely measures to give the Association not only a widened and consolidated form and substance, but also to mark out for it a path and aim which no provincial or other society of the kind can observe or fulfil. It must not be forgotten that the question is of individual interest to every existing member of the Association; and the officials, who under ordinary circumstances are enabled to conduct the affairs of the society, will not be able, in the present instance, to effect any useful work without the active, faithful, and critical co-operation of the whole body of members. Upon this they should be able to confidently rely. In their ordinary course of duty, the Managing Committee have, we believe, discussed and come to practical agreement respecting certain suggestions to be laid before the members of the Association at the next meeting. Other proposals will probably assume a definite form by that date, and we shall reserve for another opportunity the discussion of the possible future of these proposals, and of the requirements of the case.

THE LONDON GASLIGHT COMPANY'S MEETING.

THE half-yearly meeting of the London Gaslight Company, held on Wednesday last, was more than usually harmonious, not to say dull. The Directors were apparently so very well pleased with themselves and their position, and the anticipation of full dividends was so soothing to the Proprietors present, that the official speakers had all their own way, and the entire proceedings might have been measured by minutes. There were, however, one or two rather noticeable remarks made by the Governor (Mr. Major Rohde Hawkins) and by Mr. Rawlinson, C.B., who delivered the second-best speech of the meeting. Placidity characterized the Governor's utterances, and he was so plaintively convinced of the truth that, at least in the Metropolis, the rightful principles of gas administration are now only upheld by his own Company—the sole survivor of the good old times left to the envious admiration of a degenerate age—that any of his sympathizing hearers would have been quite justified in dropping a tear of regret when the thought obtruded itself that such a happy state of things could not endure for ever. At all events, the Proprietors seemed well pleased to hear their present estate lauded in comparison with that to which they must in their inmost hearts believe they are inevitably drawing near. The Governor was doubtless justified in pointing to the recently-quoted prices of the Company's stock in the market, as proof of the estimation in which the investing public hold the security of a high maximum price. In proportion to those of the other Metropolitan Companies, all of whom are governed by the sliding scale, the recent scare affected the London Company's stock but slightly. We have had occasion to refer to the greater sense of security which would attach in time of panic to a large reserve fund, rather than to a high dividend; and no doubt the increased revenue at the command of a Company that can raise its price without reducing its dividend is practically a reserve of very considerable amount. The London Company have not only this security; they have also others much stronger. They have used their powers wisely, and, instead of presuming on their right to charge a high price, have supplied their consumers at as low a rate as the Companies who have the bait of larger dividends to tempt them to economy. They have done this while so maintaining and improving their works that, in general character and engineering completeness, they are equal to any in the Metropolis;

and are probably possessed of a margin of manufacturing power, beyond the current necessity, greater than most. At the same time by their judicious expenditure upon new works they have steadily reduced the proportion of capital to rental, until from being, as they were but a few years ago, the most heavily burdened of the Metropolitan Companies—except only the Chartered—they are now rapidly approaching the lightest; and, in part, of course, because of the lower rate received by the Shareholders, the gas supplied to the consumers is, we believe, weighted with the very smallest charge per thousand feet for dividend.

It is pleasant to record all this, as evidence of the honesty and ability with which the affairs of the Company have been conducted, under conditions that have perhaps been unduly depreciated. Admitting this, however, we yet cannot but regret the apparent resolution of the Directors to abide by their present position till inevitable circumstances drive them from it. Hitherto the Company have kept free from the exciting contests and revolutionary changes which have recently been the lot of their neighbours, and the language of the Board is yet marked by so much contentment that it reminds us of the "happy nation which has no history." But although no consenting party to the arrangement, the future has been shaped for the London Company as for their neighbours. For illustration: The Governor when referring to the privilege still enjoyed, of allotting new capital among present Shareholders, gave as one of the reasons why he objected to amalgamation, that by it this privilege would be lost. It was surely in momentary forgetfulness of facts that he so spoke; for he must be aware that except the margin of capital authorized and still unissued—an amount which would certainly, under any scheme of amalgamation, be promptly called up, and necessarily distributed among the existing Shareholders—the Company can never again raise capital in this way. It is conceivable that a Parliamentary Committee might grant extended powers without insisting upon the sliding scale, especially if the imposition of the latter would increase the dividend; but would have no power to waive the application of the auction clauses, even though willing to do so. If the choice were really open to the London Company—if it were theirs to elect whether they would continue as they are, or consent to submit to modern legislation, we should have little to say; but they will have no such choice. The time cannot be distant when they must accept the change, whether they like it or not. At present they are in a position to require that it shall be made in the manner most conducive to their future interests. They can demand such terms as they deem fair and satisfactory; and the probability of their obtaining them is the greater, because each side—an amalgamating Company or a Parliamentary Committee, and themselves—is in a position to decline anything not considered suitable, and to try again another day. We have no reason to suppose that better terms will be obtainable later on than now. Experience distinctly points the other way, and because injurious precedents have so great a tendency to be repeated, we hope in the general gas interest that the London Company will not delay too long. Better the sliding scale now, when it may bring increased dividends, than at some not remote future, when a reduced initial price will remove this one advantage, but leave all else unchanged.

The intimation given by Mr. Rawlinson of an intention (on the part, we presume, of the Local Government Board) to ask Parliament in the current year to grant general powers to Local Authorities, which will enable them to authorize the opening of public streets by Electric Light Companies for the purpose of laying down wires, &c., is one that need cause little alarm to Gas Companies. Powers so unusual are not likely to be granted, there being no cause to show why exceptional facilities should be granted for supplying electricity than for gas and water. At the same time conditions such as these will not influence the issue of the competition between the two lights. We would say let each have equal opportunities of proving itself; the better must and ought to win. Like the London Company's Directors, we too have no fear of the result; although, as a correspondent has reminded us, they are in error in supposing that the electric light is unfit to be trusted alone, but must "have the gas kept burning by its side." Both in the streets and in railway stations it is now trusted to stand alone, and the failures reported are very few. The electric light, at its best, has so many other disadvantages and drawbacks to its general introduction, that there is no need for raising objections to it founded so slightly on fact that its many friends may score an easy victory by exposing their baselessness.

THE END OF THE STRETTFORD GAS AGITATION.

THE notable Stretford case may be considered at an end. An arrangement has been concluded between the Gas Company and the Vigilance Committee, representing the consumers—which settlement has, moreover, been approved by the consumers and others in public meeting—to the effect that the price of gas is to be reduced, and certain other concessions made by the Company. We have repeatedly referred to this case, and it would, therefore, be superfluous to recapitulate the facts. The present result of the late warfare in the Stretford district need only be noted here as a remarkable instance of a Gas Company attacked in a perfectly fair and legal way, and, in the end, surrendering at discretion to their own customers. We would desire to put aside, as things to be forgotten as soon as possible, the many extraneous issues which have from time to time been introduced into the conflict, and we have no wish to hear any more vituperation of their opponents from either party. Some questionable exuberances of expression have undoubtedly been permitted to mar the impartial intention of the last “manifesto” of the Vigilance Committee; but it must be remembered that such a victory as theirs is not gained every day, and it is the natural custom of victors to shout, without too nice a regard for the feelings of other people. The Committee, as we have just intimated, have signalized the termination of their labours by issuing a circular address, a copy of which is to be sent to every consumer of the Company’s gas, and which gives a narrative of the agitation against the Company from the commencement to the triumphant termination. The Committee claim that, by their exertions, the price of gas has been reduced from 4s. 2d. to 3s. 2d. per thousand cubic feet; and the Company’s reserve fund has been filled up with money returned by those Shareholders who were found to have received, by way of bonus shares, illegal grants from the profits. If the required amount cannot be recovered in this way, diminished dividends will be paid until it is made up. The consequence of this operation, as affecting the consumers, will of course be the advantage that nothing can interfere to stop reductions in the price of gas. Certain other successes are catalogued by the Committee, some of which, however, would be the natural result of the late case of *Warmington v. The Dudley Gas Company*, wherein the Gas-Works Clauses Acts of 1847 and 1871 were held to be as one Act, applying to every incorporated Gas Company in the kingdom. Further than this, the Stretford Company are to pay the entire cost of the agitation. The Committee flatter themselves that their action is likely to be a stimulating example to gas consumers in other districts, who may yet be groaning under the tyranny of a Gas Company with views and principles similar to those until lately in practice at Stretford. We shall not be accused of favouring one side more than the other if we state our belief that there are few localities where an agitation such as that of Stretford will prove to be equally well justified, and consequently successful. Hence, we would recommend caution to those who, on slight grounds, or perhaps upon no other grounds than those supplied by deeply-rooted prejudice and suspicion, may think to repeat the experience of the Stretford Vigilance Committee. At the same time we should be more than unjust to the interests of fair-dealing Gas Companies if, for one moment, we were to express a wish that the rightful condemnation of erring members of the same great class should be withheld. Cases such as the Stretford example are simply scandalous, whether occurring through ignorance or design; and the sooner they are rendered generally impossible, the earlier will Gas Companies regain the confidence of the public.

THE GAS TROUBLES AT DUDLEY.

A FIT pendant to the foregoing story comes from Dudley, where a three-sided campaign has been raging between the Gas Company and the Corporation. It was the Town Clerk of Dudley who obtained against the local Company the now famous decision anent the unification of the Gas-Works Clauses Acts of 1847 and 1871. This was one side of the dispute. Another consisted in a repetition of the Stretford action—the examination of the Company’s books by an Accountant, with a view to reducing the price of gas, being applied for by the Mayor and an Alderman of the town. The Justices granted this part of the application, and consequently an investigation was carried out by the Accountant appointed by the Court. The substance of his discoveries was embodied in the report, portions of which will be found reproduced elsewhere. The Company appear by this statement to have acted in a manner likely to expose themselves to misconstruction, to say the least of it; but, as the Court eventually found, the conditions under which a

summary order for a reduction in price could be made had not arisen. The Company were called upon to pay the costs of the application, but this was finally compounded for by their paying an informal sum of £50. The Corporation therefore won a half-success; while the Company cannot be said to have lost much. The Mayor and his colleague, who were the moving spirits in the affair, are not contented. At the same time it is difficult to know what would have sufficed to satisfy them. They now fall back upon the remaining method of attacking the Company which is afforded by the circumstance that the latter are at present in Parliament for further capital powers. The Bill, which has already passed the House of Commons, is to be opposed in the Upper House, ostensibly in the interests of the ratepayers, in every possible way. On the whole, it cannot be said that this year is passing without incident for the Dudley Gas Company.

Water and Sanitary Affairs.

THE Local Government of London is rarely discussed without some reference to the Metropolitan Water Supply. Hence all who feel a particular interest in the latter question must naturally give attention to the former. Perhaps our readers are aware that there is a London Municipal Reform League. But it is not equally certain that everybody is acquainted with the momentous issue which the League have lately had under consideration, and which may be said to affect the entire destiny of the Metropolis. The critical nature of the controversy may be imagined, when we state that it has related solely to the letter “a.” The question has been whether London should have the benefit of “municipal government,” or of “a municipal government.” It is stated that “an influential section” objected to the “a.” With a desire to secure unanimity, “and with it the adhesion of all reformers,” it was finally decided that the “a” should be omitted. We are told “there was evidently a very strong feeling against prejudging the question,” and so the concession was made. Hence regenerated London may have many Councils, or it may have one, and it is hoped that as the obnoxious “a” has been expunged, the Vestries will unite their forces to that of the League, and help to get “municipal government” for the Metropolis. It is very odd that a correspondent in the *Echo*, who appears to know all about these things, declares that “the League is not committed to the one Council scheme;” whereas the *Daily Chronicle*, which is supposed to take special cognizance of local affairs in London, has just stated in its editorial columns: “The object of the London Municipal Reform League is, we are told, the pro-motion of one representative Municipal Government for the Metropolis.” Thus the letter “a” seems to be revived, and London is left in painful uncertainty as to its fate. The *Daily Chronicle* deals with the subject philosophically, and puts the question thus: “We do not say or believe that the present system is wholly bad; but we are obliged to conclude that the balance of advantage is not in its favour, and we are disposed to think that the League points the way to a decided public improvement.” We venture to observe that however “decided” the improvement is to be, there is something rather undecided as to “the way;” and this is generally the case.

Lieut.-Col. Bolton’s report on the supply furnished by the several Metropolitan Water Companies during the month of March shows an apparent decrease in the number of houses provided with water by the Chelsea Company. This, however, is due to the circumstance that the Company have just corrected their account, by deducting the number of houses pulled down during the six months ending on the 31st ult. The number of houses thus eliminated in the half year was 92, while the number of new supplies laid on during March was 15. It may be noticed that the new supplies for the past month were scarcely equal to the average monthly reduction. In the previous month the Chelsea Company showed better results, having then an increase of 44 supplies. In January the increase was only 18. In that month the East London Company showed a decrease of no less than 912 supplies. We may presume this was occasioned—as in the present instance with the Chelsea Company—by deducting the houses pulled down during the half year, or perhaps for the whole of 1880, though even then the number seems remarkably high. The growth of London is very directly indicated by the extension of the water supply, and by this test we may even detect in which direction the development is most rapid. During the

past month the supplies furnished by all the Companies have been augmented by 1972—an astonishing number, when we consider that it represents one new house in little more than each ten minutes during the working hours of the day. The East London Company's district shows an increase during the month of 497, this being the highest. The Southwark and Vauxhall district comes next, with 422, followed by that of the Lambeth Company with 325. The remaining districts of the various Companies appear thus : West Middlesex, 260 ; Kent, 212 ; Grand Junction, 172 ; New River, 69 ; Chelsea, 15. The districts extend beyond the Metropolitan area, the estimated population supplied being nearly four and a half millions, or about 800,000 more than the population of the Metropolis as defined by the Registrar-General.

The Corporation of Stafford seem to be in a peculiar position with regard to their sewage works, or rather what is designated as "the sanitary depôt." A species of pail or tub system prevails in Stafford, and an attempt has been made to convert the contents of the tubs into saleable manure. After rather more than two and a half years had been expended in getting the machinery at the depôt into working order, the authorities succeeded in converting thirty-three tons of tub contents into two tons of *poudrette*, at a loss of ten guineas per ton, omitting all charge for wear and tear, rates, taxes, and supervision. The latest results showed that the drying apparatus took sixty-six hours to work 7 tons 3½ cwt. of raw material, producing 8 cwt. 1 qr. of manure. In fact the bare cost of the coal came to more than the value of the article produced. The Borough Surveyor, in reporting on these operations, remarked that "the cost was ruinous, and it seemed that they would have "to stop the manufacture." The present machinery, it was said, had been subjected to many additions and improvements, and the entire outlay would probably exceed £1300. One of the parties concerned proposed that there should be a further expenditure of £1000, whereby the power of the machinery would be increased three-fold, so as to deal with the whole of the material to be obtained from the town. By this arrangement it was expected that from six to seven tons of manure would be produced each week. At a meeting of the Town Council specially held to discuss this question, and that of the water supply, the Mayor declared himself "personally very much dissatisfied with the result of their "working." When a deputation from Stafford visited Rochdale, they were told that this system was giving the authorities there a profit, and similar statements were made elsewhere. One of the speakers at the Town Council meeting declared that "the Corporation had been deceived." At the recommendation of the Mayor, a committee of five was appointed to superintend further experiments. The Stafford Corporation are doubly unfortunate, for while they have been manufacturing sewage manure at a tremendous sacrifice, they have met with a dismal failure in their search for water. We referred to this subject some little time back, when they had lost their boring tool in the depths of the earth; and all efforts to recover the implement have proved futile. The project is pronounced "an entire failure," and unfortunately this is the third bore-hole which has ended in disappointment. At the recent special meeting it was resolved to consult "one or more mechanical engineers" as to what should be done. After the passing of this resolution, Mr. Stooke, of Shrewsbury, and Mr. Deacon, of Liverpool, were selected as parties to be consulted; negotiations first of all to take place as to terms.

Mr. J. Thornhill Harrison, C.E., one of the Inspectors of the Local Government Board, expended a day at Birmingham last week, in conducting an inquiry into the application of the Birmingham, Tame, and Rea Drainage Board for power to borrow £180,000 for works of sewerage and sewage disposal, and at the same time for the suspension of the third section of the Rivers Pollution Prevention Act while the works are being carried out. Alderman Avery stated the case, which was very favourably listened to by the Inspector. We referred to the general character of the scheme in a recent number of the JOURNAL. On the present occasion Alderman Avery explained that the combined system of tanks and land had been adopted in preference to simple irrigation, because to deal with the sewage of Birmingham on the principle of broad irrigation would require from three to four thousand acres of land, and the total expense would be at least £2,000,000. The adoption of the system of tanks, in which the sewage would be treated with lime, would render one acre of land sufficient where otherwise ten would be necessary. Dr. Frankland considered that an area even less than that which the United Drainage

Board proposed, would be sufficient for the next fifty years. Alderman Avery explained that the scheme in its entirety was practically the same as that submitted to Parliament in 1872, and which, he remarked, "was unfortunately then rejected, "by means which need not be further referred to." The Drainage Board, he said, were keeping completely within the original estimates. The amount scheduled in the Bill of 1872 was £400,000. The expenditure thus far amounts to about £160,000, for constructing tanks and for the purchase of land at Saltley. At the close of the inquiry a vote of thanks was presented to the Inspector, for "the patience, care, "and great judgment" with which he had performed his functions. In responding, Mr. Harrison said "he thought "they had the prospect of having one of the finest sewage "farms in the country." On this point we may express some doubt whether the Birmingham works will represent the fertilization of land by means of actual sewage. The scheme is a good one under the circumstances of the case, but it is wholly different from that utilization of sewage to which the public were anxiously looking forward in years gone by.

THE SOUTH METROPOLITAN RATING APPEALS.

The valuations with which we are about to deal in the present article were prepared respectively for the Company and the Assessment Committees in the cases recently concluded, and already noticed in these columns. That the method of rating applied to gas-works is not a satisfactory one, is generally admitted; but until a better is substituted, and indeed with the purpose of helping to find a better, we are glad to lay before our readers illustrations of the manner of determining the value which at present has the sanction of the law. It is also instructive to see how far it is possible for two parties, accepting the same principles, to differ from each other in their deductions therefrom.

The following is the Company's valuation of their entire property as a going concern, based upon the income and expenditure for the years 1879 and 1880 :—

1880.	GROSS RECEIPTS—	1879.
£509,381	{ Private consumers. }	£519,026
11,411	{ Public lamps. }	11,596
	Meter rents	
£520,792		£530,622
3,843	Less bad debts	3,013
£516,949		£527,609
	WORKING EXPENSES—	
£259,130	Coals.	£256,377
10,287	Lime for purification.	11,139
£269,417	Less residual products—	£267,516
177,420	{ Coke and breeze. }	161,919
	{ Tar and ammonia. }	
£91,997	Net cost of coal and lime	£105,597
56,048	Wages	55,582
30,079	Salaries.	27,603
9,086	Collectors' commission	8,659
4,791	Office and incidental expenses . .	5,549
2,987	Law charges	1,636
3,700	Directors' fees	5,000
592	Auditors' fees	588
9,609	Repairing, renewing, inspecting, and testing meters.	8,189
11,076	Lighting, cleaning, and renewing public lamps	11,135
	Sundries	3,168
19,670	Rates and taxes, 4s. in the £, on an assessment of £99,878 . . .	19,976
239,635		252,682
£277,314	Net receipts	£274,927
	OCCUPIER'S SHARE—	
£18,750	Interest, 5 per cent. on tenant's capital, £375,000. (See schedule.)	£18,750
37,500	Trade profits, 10 per cent. on ditto	37,500
9,375	Risks and casualties, 2½ per cent. on ditto	9,375
65,625		65,625
£211,689	Gross value	£209,302
	STATUTABLE DEDUCTIONS—	
£109,339*	Repairs and renewals, calculated according to the average cost of repairing and renewing all the London works, per 1000 feet of gas sold	£105,424
4,000	Insurance, ½ per cent. on £800,000	4,000
113,339		109,424
£98,350	Rateable value of whole property	£99,878
	£48,816 Unproductive	£48,816
(Equal to 9½ per cent. on £520,792)	49,534 Productive	51,062
	£98,350	£99,878

* (3,546,132,000 feet, at 7·4d. per 1000.)

The next statement is the valuation of the same property prepared for the Assessment Committees, in support of their rates.

RECEIPTS:—

Gas rental (private)	£501,364
Public lighting	50,786
	£552,150
Meter rental	11,411
	£563,561
Less bad debts	3,843
	£559,718

EXPENDITURE—

Coals	£259,129
Purification	10,287
	£269,416
Less residuals	177,420
	£91,996
Net cost of coal and purifying	£91,996
Wages carbonizing	56,048
Salaries	28,094
Collectors' commission	9,085
Office and incidental expenses	4,790
Law charges, say	1,000
Directors' fees	3,700
Gas Referees and Auditors	591
Repairs and renewals of meters	9,609
Public lamps—lighting and repairing	11,076
	215,989
	£343,729
Working capital, £118,982, at 17½ per cent.	£20,822
" " 85,055, at 7½ " "	6,379
	27,201
	£316,528

STATUTABLE DEDUCTIONS—

Repairs and renewals, calculated according to the average of 3 years' cost of repairing and renewing all the London works per 1000 cubic feet of gas sold, viz., 3,545,132,000 feet, at 7.16d. per 1000	£105,763
Insurance ½ per cent. on £500,000	2,500
	108,263
	£208,265
Rates in the £ at 4s.	34,710
	£173,555
Rateable value of the whole property.	£173,555
Stations and unproductive mains (actual ratings)	36,500
	£137,055

It will be seen that the lines on which the two valuations are made are identical; that there is no difference whatever in principle, although the conclusions reached vary so widely. In the very first item—that of receipts for gas—there is a serious divergence, which is rather upon a question of fact than of either principle or even opinion. The makers of the rate put down these receipts at £559,718, which is the actual sum paid to the Company for gas and meter-rent in the year 1880. The Company, however, reduce the amount to £516,949, the difference—£42,769—being the value of certain reductions in the price of gas made during the year 1880, and of that from 3s. to 2s. 10d. per 1000 feet made from the 1st of January of the present year. As the rate is being determined, not for the year that is past, but for several years to come, it would clearly be unfair to assume the continuance, at its full amount, of an income which has been thus diminished. A reduction in price is, as Mr. Woodall pointed out, an absolute surrender of so much of the profit of the undertaking; a position proved by the fact that in the present case the difference of £42,769 in the receipts represents an exactly equal difference (subject only to a slight alteration in the rates themselves) in the rateable value.

Nearly the whole of the variance remaining is due to the allowances made for tenant's capital and profit. We therefore give the respective schedules prepared by the two parties, and also one separately prepared by Mr. Penny in support of the more liberal claim.

SCHEDULE OF TENANTS' CAPITAL.

COMPANY.—(No. 1.)

Coals	£259,130
Purification materials	10,287
Wages	56,048
Salaries	30,079
Collectors' commission	9,086
Office and incidental expenses	4,791
Law	2,987
Meter expenses	9,609
Public lamps	11,076
Rates and taxes	say, 20,000
	£413,093
Cash at bankers	£172,122
Coals (½ of £259,000)	say, 5,978
Sundry stores, tools, and implements	32,391
Meters	30,000
	134,509
	£375,000

SCHEDULE OF TENANTS' CAPITAL.

ASSESSMENT COMMITTEE.—(No. 2.)

3ths of a year's expenditure (£215,989)	£81,174
Coals—stock	26,584
Stores	11,221
	£118,982
Working capital	£118,982
17½ per cent. thereon	£20,822
Meters, present value	£57,055
Rates and taxes	20,000
Cash at bankers	8,000
	85,055
7½ per cent. thereon	6,379
	£204,037
	£27,201

MR. PENNY'S ESTIMATE OF TENANTS' CAPITAL.

Amount actually required as shown by Company's accounts—

Due for one quarter's gas to Christmas	£184,035
" residuals	32,417
" sundries	1,703
Value of stock in hand, coals, coke, tar, &c.	39,023
Cash at bankers	13,665
	£270,848
This amount is actually required for 3 months' expenditure to Christmas	£270,848
Six weeks' additional gas rental to end of February, ½ of £184,035	122,666
One quarter's rent	25,000
Rates and taxes	5,000
Tools, implements and stores	30,000
	£453,514
Less profit on gas £100,000	
" for sale of residuals £40,000	140,000
	£313,514
Add for meters	134,509
	£448,023

As a matter of fact, we believe that long before the end of January a large portion of the Christmas quarter's rental is collected, instead of remaining outstanding at the middle of February, as Mr. Penny assumes. Consequently his claim for two-thirds the expenditure of a second quarter is excessive. Corrected in this respect its total agrees closely with the first schedule.

Comparing estimates Nos. 1 and 2, the working expenses are less in the latter, because the receipts for residuals are credited against the cost of coal, while the former assumes that, as with the gas, this revenue is collected quarterly. Neither is correct; but we think the Company's claim is a fair one. Some considerable portion of the coke made is, doubtless, paid for with cash; but for at least an equal proportion, together with all the tar and ammonia, credit is allowed. Then, also, as five-twelfths of the year's expenditure is only equal to that of about three months of the heaviest season, a tenant would probably be pressed for money if he had not the advantage of these cash sales. A stock of coal equal to one-eighth of the year's consumption would, if not replenished, be used up in little more than three weeks of midwinter; it is, therefore, not more than a prudent Company or tenant should have in reserve. As to the item for sundry stores and implements, a tenant would, admittedly, have to provide himself with tools for the workmen, general stores, and a considerable amount of moveable plant. For these purposes the £30,000 set down in schedule No. 1 is moderate, especially when it is remembered that the Company carry on their operations at ten different stations.

The objection usually offered to the treating of consumers' meters as chattels to be provided by the tenants, was not raised in this case. We may hope, therefore, that it is now abandoned; and the ruling of the Courts of Law accepted by the rating authorities. Scattered as they are in the fifty thousand houses of the consumers, these meters cannot add to the value of the hereditament to be rated; and yet they must be provided if required. There are towns where all the meters are the private property of the consumers. In such cases the tenant might find himself called upon to replace all these with others, on the usual rental system; and he would then only be in the position of Companies, such as the South Metropolitan, who have always followed this system. The principle being admitted, we think that the estimate of their value at the lowest price for which they could now be purchased new is a proper one. Companies are as a rule sedulously careful to uphold their meters in the most perfect repair; and it will hardly be disputed that the average value to-day is, at least, as great, with any old-established Company, as it was ten or twenty years ago.

We cannot understand upon what principle the capital provided by the assumed tenant of such a concern as a gas-works should be divided as it is in schedule No. 2, and a higher rate of profit allowed on one than on the other. All the money is necessary, and must therefore be found by the

tenant, to carry on his business. The money spent in paying rates is of the same value to the man who provides it; is as much withdrawn from possible investment in other lucrative ways as is that spent in coal; and is entitled to the same rate of profit.

We think, therefore, that the valuation of the South Metropolitan Company's undertaking, as prepared for the Company, is a just one; and that, in the present position of the law and practice in such cases, it may safely be taken as a guide by others in determining the fair rateable value of similar properties.

As supporting to some extent the suggestion made in the JOURNAL of the 5th inst. as to rating upon the structural value directly, we publish the following sketch—hurriedly prepared by Mr. George Livesey while the cases were in Court—showing the method he would desire to see followed. It has at least the merit of being readily applicable, and we do not regard it as an objection to the plan that, under it, an extravagant capital would entail an extravagant rating also:—

The system at present adopted is altogether wrong, and the principle, if it can be called a principle, utterly unintelligible.

The system, or principle, appears to be that of rating the profits rather than the annual value of the hereditament. Barclay's brewery, or a public house, is not, however, rated on profits.

An attempt is made to approach to a fair sum by allowing the "hypothetical tenant" a considerable amount of tenants' capital at a high rate of interest.

It is not supposed that anything which can now be advanced will break through the precedents in such cases; but it may throw some light upon this difficult question to state the case from another standpoint. Instead, therefore, of dealing with a myth—the "hypothetical tenant"—the capital expended by the actual landlord may be considered as the basis of rating; and this will be found to be far simpler and more fair.

For this purpose let the total capital of the Company be taken; from which certain deductions must be made in order to find the actual amount of capital the landlord has expended on the rateable plant.

The total capital is as follows:—	
March, 1881—	
Ordinary stock	£1,850,000
Debenture stock and bonds	120,000
Total	£1,970,000
Deduct—Meters fixed	£134,000
Services	45,000
One-half of works in progress, £56,000	28,000
Moveable plant—30 barges, horses and carts, portable engines and cranes, tools and implements, furniture, &c.	70,000
Stock of coals	30,000
Stores—main-pipes, service-pipes, meters and materials of all kinds	60,000
Unexpended capital	115,000
	482,000

Landlords' rateable capital £1,488,000
Say, in round numbers, £1,500,000; and, dividing it in the proportion of one-third and two-thirds, we have £1,000,000 for works and manufacturing plant, and £500,000 for mains.

What is a fair rate of interest a landlord might claim on the capital? This is a question that should be far easier of solution than the complicated question of the "hypothetical tenant." Considering the precarious nature of gas property in the estimation of the general public—as evidenced by the fall in the value of gas stocks, two years ago, from £220 to £150; and now again from £190 to £160, with a further fall in prospect—5 per cent. on the capital might fairly be taken as the *net* rateable value, or 6 per cent. as the gross value. This would give the net rateable value for the whole as £75,000; which is quite as much as it ought fairly to be.

A STUDY ON GASHOLDER CONSTRUCTION.
(Continued from p. 608.)

THE HOLDER.

Dimensions of the Cylindrical Portion.—The conditions of the design fixed for the tank an internal diameter of 40 mètres and a total depth of 8·5 mètres, of which 8 mètres constitute the working range of the holder. In view of the necessities of the case, the following dimensions have been adopted for the holder. Exterior diameter of the second or lower lift 39·2 mètres (128·6 feet); interior diameter of the upper lift 38·4 mètres (125·9 feet); depth of the upper lift 8 mètres (26·25 feet); depth of outer lift 7·95 mètres (26 feet).

Dimensions of the Dome.—The crown has a spherical rise. If from the point of view of resistance it is advantageous to give the highest possible rise to the crown, it is also very inconvenient to exaggerate the rise. A rise equal to one-twentieth of the diameter of the holder may be considered a good proportion to be adopted. In order to facilitate the fixing of the articulated inlet and outlet pipes (which are attached to the crown), and also of the guide-rollers, as well as to give sufficient rigidity to the junction of the crown with the sides, the first ring of crown sheets, 1 mètre wide, have been made flat, without rise, and of considerable thickness. The dome proper, which therefore commences 1 mètre from the top curb, has for its base a circle of 36·4 mètres in diameter, with a rise of 1·82 mètres in the middle.

The radius of curvature $\rho = \frac{(18\cdot20)^2 + (1\cdot82)^2}{2 \times 1\cdot82} = 91\cdot91$ mètres; α being the semi-angle at the centre, we have—
 $\text{Sin. } \alpha = \frac{18\cdot20}{91\cdot91}$, whence $\alpha = 11^\circ 25' 26''$.

Dimensions of the Hydraulic Joint.—The hydraulic joint should always contain enough water to maintain the hermetical junction of the two parts of the holder. As the seal cup may, during the working of the holder, lose part of its water by evaporation, leakage, and above all by the oscillation of the holder, it is necessary to give to the cup such dimensions as shall ensure its holding sufficient water at the moment of emergence from the tank. In the annexed engraving, fig. 1 (a), H is the depth of the joint, R the height of the rim, the utility of which we shall see. If the rim is omitted, it will suffice to make $R = 0$ in the following formulæ; p being the pressure given by both lifts; and h the height of gas in compartments 2 and 3 at the moment of cupping. This figure shows the position of the lifts at the instant when the outer lift is just rising. The relative positions of the water and the gas contained in the joint remain the same until the moment when the rim, R, begins to emerge. From this time until the bottom of the cup, a, b , reaches the water-line n, n' , the pressure of gas contained in the joint, and consequently the water-level in the compartments 1, 2, 3, changes every instant. The study of these alterations in the water-level permits the determination of the best dimensions for the seal. Fig. 1 (b) shows the cup partly emerged. If λ is the path remaining to be risen through for the bottom, a, b , to reach the water-line, n, n' ; let x, y, u, z , be the varying differences in the water-line which may be determined as functions of the quantities H, R, p, h . To simplify the problem it will be admitted, that the sections 1, 2, 3, are all equal to one another, and consequently that the volumes of water and gas contained therein may be measured by the depths occupied. This being assumed, it will at once be seen that the gas pressure being clearly the same in sections 2 and 3 we should have $u = R + x - y$. (1). The volume of gas contained at starting being unchanged, we have $x + z = 2h$ (2). Finally, the difference between the water-level in the interior of the tank and in the

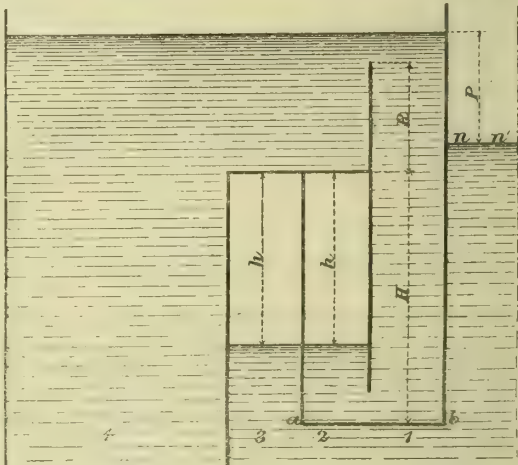


FIG. 1 (a).—OUTER LIFT ON GROUND.

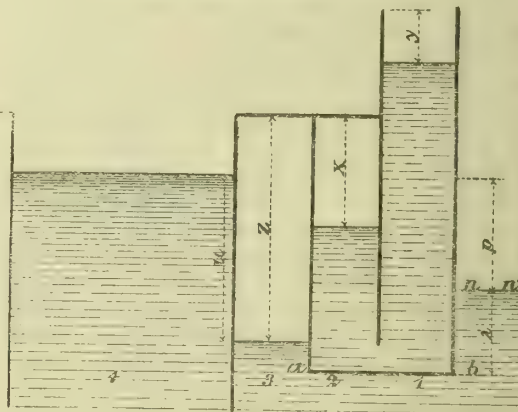


FIG. 1 (b).—CUP RISING.

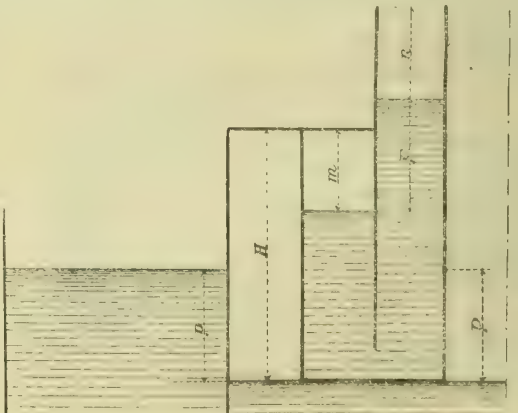


FIG. 1 (c).—CUP HALF-RISEN.

compartment 4 being constant, and equal to p , we have the fourth equation $p + \lambda = u + H - y$ (4). From these four equations we deduce—

$$x = \frac{3h + (p + \lambda) - (R + H)}{3} \quad (5)$$

$$y = \frac{(R + H) - (p + \lambda)}{3} \quad (6)$$

$$z = \frac{3h + (R + H) - (p + \lambda)}{3} \quad (7)$$

$$u = \frac{3h + R + 2(p + \lambda) - 2H}{3} \quad (8)$$

These equations permit of the determination of the variable positions of the gas and water in the compartments of the joint, during the period of emergence, as functions of λ and of the quantities H, R, h, p , of which all are unknown except the last. The gas-holder being supposed to work with perfect regularity and without leaks, if we consider the joint in its falling course at the moment when the bottom, a, b , reaches the water-line, n, n^1 , it will be seen the volume of gas contained in the joint is equal to $H + m$ (fig. 1c). It is this volume which becomes imprisoned in the grip upon the immersion of the joint. When in the ensuing movements of the holder the seal again completely emerges, the respective positions of the gas and the water will clearly be the same as at the end of the preceding course, since for the moment we suppose the conditions established and the joint absolutely tight.

Consequently the quantities which have been used to designate m and n represent the values assumed by x and y (5) and (6) for $\lambda = 0$. Otherwise, evidently $2h = H + m$; and $3m = H + 2p - 2H$ (9); $3n = R + H - p$ (10). These two equations allow the fixing of the limits between which H and R must be taken. In fact, in order that the joint may be able to hold the greatest possible quantity of water, n must be made sufficiently large so that in the oscillating movements of the holder the water may not run over the edge. Now, the maximum play of the guiding arrangements being 20 mm. (0.75 in.), the rocking of the two extremities of a diameter of the holder may reach $20 \times 38.430 \text{ m.} \div 8 \text{ m.} = 96 \text{ mm.}$ (3.75 in.) As also under the influence of gusts of wind which cause the holder to oscillate with sufficient rapidity, waves of noticeable amplitude may be formed in the cup, it will be convenient to make $n = 150 \text{ mm.}$ (6 in.) to prevent the water from being ejected over the edge. Introducing this value into the equation (10), we obtain $H + R = 650$.

If a simple cup without extra rim is to be adopted, we have $H = 650 \text{ mm.}$ (2 ft. 1½ in.), $n = 150 \text{ mm.}$ (6 in.), $m = 350 \text{ mm.}$ (13½ in.). If, on the contrary, H is to be made equal to 500 mm. (1 ft. 7½ in.), we have $R = 150 \text{ mm.}$ (6 in.), $n = 150 \text{ mm.}$ (6 in.), $m = 200 \text{ mm.}$ (8 in.). This gives the same volume of water and the same guard as in the preceding case, but with a decided saving of materials. Finally, if in order not to have any wasted space in the joint we would make $m = n = 150$, we may deduce $H = 3n = 450 \text{ mm.}$ (1 ft. 5½ in.), $R = p = 200 \text{ mm.}$ (8 in.)—an arrangement as effectual and more economical than the preceding. This is the plan which has been adopted.

Hitherto we have supposed that the volume of gas stored up in the joint does not vary in the interval between the risings of the holder, which implies the verticality of the holder, and also the absence of any cause of loss of water or gas contained in the cup and grip. It may, however, be assumed that these conditions are not always rigorously fulfilled, and that the volume of gas contained in the joint may vary within wide limits. In the first few weeks' working of a gasholder it may continually disappear entirely by leakage, or by dissolution in the water of the tank. To make this study complete, it now remains for us to examine the influence of these variations of volume upon the quantity of water carried by the cup at each immersion. If the quantity, whatever it may be, positive or negative, in which the height h of the contained gas at the rise may be varied, is represented by α , we have $2h = H + m \pm 2\alpha$. If in the equation (5)—

$$\lambda = 0, \text{ and } h = \frac{H + m}{2} \pm \alpha$$

we deduce $x = m \pm \alpha$, y being independent of h , we always have for $\lambda = 0$, $y = n$.

At the moment when a, b , touches the water-level, n, n^1 , during the very brief period which precedes the moment when the communication with the holder is made, the pressure of gas in the compartment 2 is equal to $p \pm \alpha$; from the time of making the communication the pressure becomes equal to p , the water takes its normal level in the two sides at the same time that a volume of gas, α , passes from the joint to the holder, or *vice versa* (according as α is positive or negative); that is to say, that the volumes of gas and water in the joint have assumed their normal proportions, which are, volume of gas, $H + m$; volume of water, $2H + R - (m + n)$. Thus the variations which may be accidentally produced in the volume of imprisoned gas are always compensated for at the beginning of the succeeding working course, the result being the same as though h were really constant.

Capacity of the Holder.—Crown, 36.4 mètres diameter, 1.82 mètres rise = 950 cubic mètres capacity. First lift, 38.43 mètres diameter, 8 mètres high = 9280 cubic mètres capacity. Second lift, 39.2 mètres diameter, 7.950 mètres high, or 7.5 mètres working height = 9052 cubic mètres capacity. Total capacity of both lifts = 18,332 cubic mètres.

Calculation of the Dimensions in regard to Strength.—Having indicated the principal measurements of the two lifts, as given in

the general design, their dimensions as regards strength will now be studied.

The Sheeting.—The sheeting or skin of the holder is required to resist—(1), the internal strain of the gas; (2), the external pressure of the wind.

Pressure of the Gas.—The internal pressure of gas being measured by a column of water 200 mm. to 250 mm. (8 in. to 10 in.) high, the thickness of 3 mm. (No. 11 B.W.G.) given to the sides of the two lifts, and of 4 mm. (No. 9 B.W.G.) of the crown are quite sufficient to resist the internal strain.

Pressure of the Wind.—The external pressure of wind, even in the very improbable event of a hurricane of the velocity of 36 mètres per second, being very much less than that of the gas contained in the holder, no direct deformation may be feared from this cause. But as this action causes reactions of the guide-framing upon the holder, it is necessary to determine the resultant of the wind pressure, in order to be able to take account of it in calculating other dimensions of the work.

Experience has shown that when wind strikes directly upon a plane surface, the total pressure, P , exerted by it upon that surface may be expressed by $P = 0.113 V^2 \omega$ (1); when V = the velocity of the wind in mètres per second, and ω = the area (in square mètres) of the surface directly struck. First, let us assume that the wind blows horizontally. If the plane surface is considered as making an angle β with the direction of the wind, its projection upon a vertical plane perpendicular to the wind will be equal to $\omega \sin. \beta$. As to the velocity V , it becomes decomposed and follows two directions— $V \cos. \beta$ parallel to the surface, and $V \sin. \beta$ perpendicular to the exposed surface. Substituting for V and ω their new values in the equation (1), it becomes $P = 0.113 V^2 \omega \sin.^3 \beta$ (2). If, other conditions remaining as before, the plane exposed to the wind makes with the horizontal an angle ϕ , we shall see by a similar line of reasoning that the pressure exerted upon this surface will be $P = 0.113 V^2 \omega \sin.^3 \beta \sin.^3 \phi$. When the wind, instead of striking a plane surface, making a constant angle with it, acts upon a curved surface, the total pressure, P , will equal the resultant of the pressures exerted upon each of the infinitely small plane elements of which the surface in question is composed.

As the result of an intricate computation of the factors involved, it has been determined that the total pressure upon the half cylinder exposed to the wind is but 0.589 of that which would be exerted upon the plane diameter perpendicular to the direction of the wind. The resultant of the wind pressure upon the crown is determined in the same manner. It may be laid down that (1), the horizontal component of this action upon the crown is very feeble, and may be absolutely neglected; (2), the value of the vertical component rapidly rises when the wind blows obliquely to the horizon. When this inclination is of higher value than the semi-angle at the middle of the crown, this vertical component becomes of sufficient importance to increase in an appreciable degree the pressure given by the holder. But if this resultant is capable of exercising a certain influence upon the regularity of the outlet pressure, so far from being detrimental to the stability of the structure, it must necessarily increase it; it is therefore unnecessary to calculate it with reference to the strength of the holder. As to the horizontal stress exerted upon the body of the holder, it has been shown that under conditions the most unfavourable to the stability of the work—that is, when the wind blows horizontally—this stress is equal to $0.113 V^2 \times 0.589 DH$. A wind velocity of 20 mètres per second is very rarely experienced in our climate, and then only during very short periods. Be this as it may, we will suppose the wind to attain a velocity of 36 mètres per second (or a pressure of 31.5 lbs. per square foot). The pressure exerted on the cylinder will then be expressed—

$$0.113 (36^2) \times 0.589 DH = 86.3 \text{ kilos. } DH;$$

When the holder is at its highest point, the total pressure will be—

On the top lift	= 38.4 m. × 7.55 m. × 86.3 kilos.	= 25,020
On the lower lift	= 39.2 m. × 7.65 m. × 86.3 kilos.	= 25,880

$$\text{Total pressure} \dots \dots \dots 50,900$$

which is thus distributed—

Upper tier of guide-rollers	25,020 ÷ 2 = 12,510 kilos.
Middle " "	25,020 + 25,880 ÷ 2 = 25,450 "
Bottom " "	25,880 ÷ 2 = 12,940 "

In each tier this pressure is divided between at least two guides. In the direct system of guides, the two components being directed radially, their value may be obtained by dividing the resultant by the double of the cosine of the semi-angle at the centre of the two acting rollers. If the holder bears upon two adjoining vertical lines of rollers, the pressure is divided as follows between the six points of contact with the guides:—

Upper tier	$\frac{12,510}{2 \cos. 10^\circ} = 6,352 \text{ kilos.}$	on each of the two pulleys.
Middle "	$\frac{25,450}{2 \cos. 10^\circ} = 12,922$	" " "
Bottom "	$\frac{12,940}{2 \cos. 10^\circ} = 6,570$	" " "

In a system of *tangential* guides, the strains being transmitted parallel to the total pressure, we have the division as follows:—

Upper tier	12,510 ÷ 2 = 6,255 kilos.	upon each of the two pulleys.
Middle "	25,450 ÷ 2 = 12,725	" " "
Bottom "	12,940 ÷ 2 = 6,470	" " "

(To be continued.)

Notes.

A FRENCH SAFETY LAMP.

At the usual annual meeting of the Académie des Sciences, just held, the yearly prizes bestowed by the society in recompense of services to science have been awarded. Among others, M. Birckel, a civil engineer employed at the Pechelbronn mines, has received the Montyon Prize—which is restricted to improvements in dangerous industries—for a modification of the Davy safety lamp. M. Birckel's improvement is very simple, consisting in providing the wire-gauze cylinder with a double iron casing. The top case is moveable, and slides over the under one, which is fixed, when a concentric movement is given to it by turning the hanging handle. These casings have corresponding openings of equal section, so that it is possible to more or less restrict the supply of air, or to shut it off altogether, and so instantly extinguish the gas burning inside the lamp when there is much light carburetted hydrogen in the atmosphere. It is not generally necessary to go so far as to extinguish the lamp by hand, because if the air supply be carefully regulated, any addition of combustible gas to the atmosphere will of itself cause extinction through lack of oxygen. M. Birckel's lamp has been used for nearly a year in the Pechelbronn mines, which are very fiery, without any accident having happened.

THE PRESSURE OF EARTH AGAINST RETAINING WALLS.

At a recent meeting of the members of the Institution of Civil Engineers, Mr. B. Baker communicated some valuable observations on the principles of construction of retaining walls, with reference more particularly to the actual lateral earth pressure upon such structures. Mr. Baker stated that the pressure of earth against walls, as given in the usual "text-books," is greatly in excess of the truth. In illustration of this, he mentioned the cases of many walls which, by the usual methods of calculation, should have failed, but which stand most successfully, while other walls apparently better proportioned have repeatedly fallen. Mr. Baker observed that all calculations of the thickness required for walls are liable to be upset by the variable conditions affecting the foundations. Remembering that General Burgoyne built an experimental battering wall founded on rock, which, although only 17 per cent. of its height in thickness, supported perfectly the heavy sodden filling at its back, Mr. Baker remarked that no calculation was required to show that the 32 and 45 per cent. counterforted wall of the Southampton Dock, the 42 per cent. Avonmouth Dock wall, the 36 per cent. West India Dock wall, the 50 per cent. Belfast Harbour wall, and the 30 per cent. Victoria Dock wall, would all have stood perfectly had the foundation been rock (as in the instance of General Burgoyne's wall), instead of mud, clay, and silt, as was actually the case. As a result of his own experience in the construction of 34 miles of deep timbered trenches and other works of the Metropolitan Railway, Mr. Baker makes the thickness of retaining walls, in ground of an average character, equal to one-third of the height from the top of the footings, and if any material is taken out to form a panel, three-fourths of it is put back in the form of a pier. The object of the panel—as of the 1½ inch to the foot batter given by Mr. Baker to his wall—is not to save material, for this would involve loss of weight and grip on the ground, but to effect a better distribution of pressure on the foundation. It was stated that all the walls on the Metropolitan District Railway are designed upon this basis, and there had not been a single instance of settlement, or of falling over, or sliding forward.

PHOTOMETRY BY THE PHOTOGRAPHIC METHOD.

It is announced that M. Janssen has made a promising advance in the application of photometrical methods to the precise measurement of the intensity of light, the process adopted being equally applicable to strong or feeble light, and needing only the presence of one light-source at the time of measurement. M. Janssen's photometer consists essentially of a frame with a sensitized plate, before which, and in the path of the light-rays to be measured, a perforated screen is caused to pass with a known rate of uniform motion. If the perforations were rectangular, in the form of slits, a uniform shade would be produced on the plate; but, by making them triangular, a variation of shade is obtained, decreasing in depth from the side corresponding to the base of the triangles to that corresponding to the apex. To compare two luminous sources with each other, each source is made to act successively on two similarly prepared plates in the instrument, when the points of equal shade in the two plates indicate the ratio of intensity. There is no difficulty in obtaining and testing by the same instrument the exact ratio of sensibility between any number of plates, so that absolute reliability may be placed upon the equality of the conditions under which the tests are made. It is stated that this photometer is so delicate, and at the same time capable of such universal application, that M. Janssen has succeeded in comparing the light of the sun with that of various stars, and has compiled a table to express the illuminating power of the latter in terms of the former. In this way it is expected that a definite solar scale might be constructed, to which all artificial lights might be referred.

WITHDRAWAL OF OPPOSITION TO THE NEWPORT (MON.) WATER BILL.—At the meeting of the Newport Town Council on Tuesday last, the Parliamentary Committee recommended that, in consideration of the opposition offered by the Corporation to the Newport and Pilgwenly Water-Works Company's Bill having led to a reduction of the proposed increase of capital from £100,000 to £75,000, and in view of the general result of the official inquiry at Newport, no further opposition should be offered.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE GLASGOW EXHIBITION OF LIGHTING AND HEATING APPLIANCES.

THE REPORT OF THE JURORS IN SECTION III.

SIR,—We write to you by request of our clients, Messrs. W. and B. Cowan, gas-meter manufacturers, in this city. In your number published on the 29th of March last, at p. 527—under the heading "The Glasgow Exhibition of Lighting and Heating Appliances. Report of the Jurors in Section III."—the following paragraph appears:—

"The only wet meter that was prominently brought before the Jurors was the Warner and Cowan meter of Messrs. W. and B. Cowan. This is a most ingeniously contrived apparatus, and gives, under variations of water-line, an accuracy of registration which has not been attained by any other wet meter, and which appears to leave nothing further to be desired. It was pointed out to the Jurors that this meter, although of unqualified excellence under ordinary circumstances, is particularly susceptible of being tampered with by dishonest consumers of gas who are sufficiently ingenious to discover the weakness of the apparatus; and they were shown how the meter could be made to register only a proportion of the gas passed, or none at all. They do not, however, consider it within their province to point out how these frauds may be carried out. All wet meters are capable of being tampered with to some extent; and even dry meters may, by a clever trick, which was shown to the Jurors, be made to register backwards in the usual forward direction. Probably, in the next Sale of Gas Act that is passed, attention will be given to this matter; and makers of all classes of meters will require to exercise their ingenuity in devising means to thwart the nefarious designs of dishonest gas consumers."

The Glasgow Exhibition of Lighting and Heating Appliances took place in October, 1880, and the following is a copy of the certificate regarding their wet meters granted to Messrs. W. and B. Cowan:—

Philosophical Society's Exhibition. Glasgow, 1880.

FIRST-CLASS CERTIFICATE

For Accuracy of Registration and Excellence of

Workmanship of Warner and Cowan's Wet Meter.

§ III. Catalogue No. 80.

Messrs. W. and B. Cowan, Edinburgh.

J. M., Sec.

(Highest Award).

This was not the only award made to Messrs. Cowan.

As appears from your JOURNAL of the 29th of March, the Jurors at the Exhibition were Dr. William Wallace, F.R.S.E., Gas Examiner for the City of Glasgow (Convener); Mr. Hazelton R. Robson, and Mr. D. Corse Glen, F.G.S., Engineers; and Mr. J. J. Coleman, F.C.S., F.I.C.

After the appearance of the paragraph above transcribed, our clients, on the 2nd inst., addressed a letter to Mr. John Mann, the Secretary of the Philosophical Society's Exhibition, 154, St. Vincent Street, Glasgow, in which they said:—

"In the JOURNAL OF GAS LIGHTING, of the 29th ult., there is a report of the Jurors in Section III. of the Glasgow Gas Exhibition, respecting which we apply to you for some explanation before proceeding further. Certain remarks are made regarding the Warner and Cowan meter, of which we think we have a just right to complain. We are entitled to ask who it was that pointed out to the Jurors that this meter, 'although of unqualified excellence under ordinary circumstances, is particularly susceptible of being tampered with by dishonest consumers of gas, who are sufficiently ingenious to discover the weakness of the apparatus;' and further who showed the Jurors 'how the meter could be made to register only a proportion of the gas passed, or none at all.' We must respectfully request that you favour us with a distinct answer to these questions. The Jurors are good enough to say that, notwithstanding the information thus kindly afforded to them, 'they do not, however, consider it within their province to point out how these frauds may be carried out;' but seeing they have thought it within their province to stigmatize the meter in the above terms, you will not be surprised that we ask them to describe to us the mode by which the results referred to may be obtained. To this question also we request a distinct reply."

Messrs. Cowan deny the accuracy of the statements contained in the paragraph referred to, so far as throwing discredit on their wet meter. Mr. Mann has made no answer to this communication. On their behalf we repeat the request through you, with a view perhaps to ulterior proceedings.

43, Castle Street, Edinburgh,
April 13, 1881.

MURRAY, BEITH, AND MURRAY,
W.S.

SIR,—We have been waiting to see if any explanation or correction of the report of the Jurors in Section III., which appeared in your issue of the 29th ult., would be made in your current number, which we have just received. In this we are disappointed.

So far as the results of tests are concerned, we think we stand very favourably; yet in the notice of the various exhibits, with the awards of the Jurors, we are unable to find our name, or any mention of our exhibits, either honourable or otherwise.

We are quite sure that, under the able supervision of Dr. Wallace, the Convener, the various tests were made by the Jurors in the best manner possible; but it is not about this that we have any doubt. It is the entire omission of our name from the detailed statement at the end of the report, which we think must be an overlook.

We may also say that we are disappointed that no notice has been taken of our exhibits of patent safety station governor, or our patent dry metallic district governor.

Edinburgh, April 8, 1881.

D. BRUCE PEEBLES AND CO.

STREET LIGHTING BY GAS.

SIR,—The moment does not appear inopportune to discuss this important subject; and as there is no other channel except the JOURNAL through which it will so readily claim the attention of interested parties, I trust you will afford me space for a few observations.

There can be no doubt the American and German electric companies are making strenuous efforts to convince the public that they can supersede gas in street lighting, notwithstanding the notorious collapse it has experienced in its boasted application to domestic or house-

hold illumination. For my own part, I regret to find our streets even temporarily given up to foreigners, in order to promote experimental attacks upon some of our most respectable undertakings and soundest industries. I am not, however, going to discuss the deficiencies or advantages—if the latter exist—of the electric light; that to which I would draw attention is an explanation of the unfavourable comparison between street lighting, as at present conducted, and any kind of experimental lighting set up to invite comparison. It is this possibility of an unfavourable comparison which emboldens the electric light companies to compete, by exhibitions on ruinous terms, for the bare prospect of getting a footing in the streets; and I do not find that companies or corporations are doing anything to restore the good name of gas, or even seriously to defend their own interests upon this ground. All that has been done appears to be confined to the introduction of a few lights of increased power; which are effective, I admit, but are merely so at the expense of an increased outlay for gas.

Referring to the display in Parliament Street—the increased cost of which The Gaslight and Coke Company have assumed upon themselves—it is no doubt cleverly managed; still I cannot help viewing it as a step altogether in the wrong direction, for the increased cost of these very lights will narrow the margin of cost between electric lighting and gas lighting, in favour of the former. By increasing the cost of lighting in a moment like this, The Gaslight and Coke Company—I say it with unfeigned regret—are taking a step which in its effects may recoil upon gas interests.

Is it likely that vestries or municipalities, which have always adhered to, and never will swerve from principles of economy, will extend all over their streets these improved lights, and increase their lighting budgets four or five fold? And yet this exhibition, if it means anything, invites them practically to do so! If the gas interests are to be defended adequately—and I think in the emergency something is expected of The Gaslight and Coke Company, by interested as well as disinterested parties—I maintain that there should be an entire reform in the present mode of lighting the London streets; and this reform must not be confined to Parliament Street and a few refuges, but must extend to the whole area of public lighting.

Now, this reform, Sir, must be accomplished without appreciably falling on the ratepayers. In other words, they should have an improved light without increased cost; and in this way the margin of relative cost between gas and the electric light will be widened instead of narrowed, which at present is being done. I am sure you will allow that I have some experience of municipalities, and the principles by which they are governed, and you will probably agree with me that if the streets were lighted with a sufficiency of light at their present cost, all the electric lights of the present or of the future would not allure our town commissioners into wasteful expenditure. You may depend upon it, a prospect of economy is more than anything else at the bottom of the interest the towns are taking in this matter.

I do not, however, consider that our streets have a sufficiency of light; and, with some experience of the lighting in Continental towns, I consider that the lighting of English streets is intolerably ineffective. No one can doubt that this is assisting the foreign electric companies considerably in their crusade against gas, whatever may be its ultimate result—about which personally I have never entertained any serious misgivings; but I should like to consider ourselves secure against these attempts, which appear likely to be renewed periodically.

The truth about burners I consider to be this: When gas is burnt in fashionable burners, Referees' burners, or burners made specially by Mr. Sugg, 5 cubic feet yield approximately 16 candles of illuminating power; but I am of opinion that when a light exposed in the street to the uncertainties of winds, dirty glasses, irregular pressures, &c., in addition to the compulsory use of the non-fashionable batswing burners, this same 5 feet of gas yields no more, on an average, than 10 candles of illuminating power. The impression that the illuminating power of gas has been substantially increased by the Legislature, is contrary to fact. Certain test burners have been contrived so as to reduce more light out of ordinary gas, and some people avail themselves of them, and some do not; but I assert that the street lights, in which the ordinary batswing burners are used, do not participate in the 16 candles. It would be very surprising if they did, considering that a few years ago gas companies only extracted 8000 feet of 12-candle gas from a ton of Newcastle coal, whilst now they get 10,500 feet out of the same coals without so much as adding a fraction worth speaking about of canal coal. Can it be that, by the practice of taking out 2500 cubic feet more of gas from a ton of coal, the illuminating power of the gas has been raised from 12 to 16 candles? The fact is, it was as much 16 candles in 1860 as it is now, if the Argand burners and processes now in use had then been introduced; but I admit that household illumination has participated largely in the increase, because of the extended use of the improved Argand burners.

This, however, brings me to the subject of my letter—viz., that as there exists an admitted deficiency in the street lights, that does not apply to the lighting for domestic purposes, this deficiency should be made good; and that, for street lighting, gas of a higher quality must inevitably be supplied. To manufacture gas especially for the purpose, and supply it through a different set of mains, is out of the question. There remains, consequently, but one way to achieve this end, and it is simple enough—by carburetting the gas and passing it through enriching oils or hydrocarbons. At some expense the present lamps would have to be modified so as to receive internally suitable carburettors, placed out of sight; and as these enriching products are numerous, and not unreasonably dear, I should propose that every lamp be treated in this way, and the gas thereby raised to 30 candles of illuminating power.

Now, the advantage of this experiment would be that it could be made on every lamp, and I am sure that when gas suppliers awake from their supineness, and think it necessary to rescue the street lighting from its present condition, it is in the direction I have indicated that they had better turn their attention, for the cost of increasing in illuminating power the comparatively small amount of gas used for public lighting will be far and above recouped to them in the fact that they will have placed the street lighting beyond the unfavourable

comparison of which it is now not unfrequently the object, and which explains in so great a measure the delusive prospects of success in which recent electrical exhibitions are indulged. ARTHUR SILVERTHORNE.

1, Westminster Chambers, S.W.,

April 13, 1881.

Legal Intelligence.

WORCESTERSHIRE QUARTER SESSIONS.—MONDAY, APRIL 4.
(Before Mr. G. W. HASTINGS, M.P., Vice-Chairman, and a Bench of Justices.)
THE DUDLEY GAS COMPANY AND THEIR ACCOUNTS.

It will be remembered that at the last Worcestershire Quarter Sessions* the Mayor of Dudley (Mr. H. M. Wainwright) and Alderman Bagot (Chairman of the Streets and Sanitary Committee) applied to the Court, on behalf of the Corporation, for the appointment of an Accountant to examine the accounts of the Dudley Gas Company; and Mr. Hopkins, Accountant to the Corporation, was appointed for the purpose. The parties to-day came before the Court with this gentleman's report.

Mr. GODSON again appeared for the Corporation; Mr. AINSLIE and Mr. O. SMITH for the Company.

Mr. AINSLIE said the whole matter was now before Parliament, the Company having in the present session a Bill, which had already passed the Lower House. The Corporation intended further opposing the Bill before a Committee of the House of Lords. They would then have every opportunity of dealing with the materials they had obtained, and no doubt would lay all they could before the Committee. The effect of the decision of the Committee might be to displace and render nugatory anything that might be done by the Court, and he submitted that the whole matter should be postponed until the Bill had been dealt with.

Mr. GODSON contended that it could not possibly affect this case, as it would deal only with the future, and not with the past.

Considerable discussion ensued, and eventually it was decided to read the report, in the course of which were the following statements:—

The Company, by their Act passed in the year 1821, were authorized to raise capital to the amount of £12,000 by creating 600 shares at £20 each. The Company was re-established by an Act passed in May, 1853. It appears that at the time of the passing of that Act the Company had expended £60 0 and upwards out of the profits of the undertaking, and by sections 14 and 15 this £6000 was added to the £12,000, and the capital was fixed at £18,000, the 600 £20 share being converted into 600 £30 shares. Section 17 authorizes the Company to raise by the creation of shares, in addition to the capital of £18,000, further sums not exceeding in the whole £38,000. These new shares, or any part of them, may be made preference shares, and are, when created, to be first offered to the existing Shareholders. Section 21 empowers the Company to borrow on mortgage a sum of £2000.

The Company's books show the share capital raised to be as under:—

June, 1853, 600 £30 shares	£18,000
June, 1854, to June, 1860, 300 £30 "A" shares	9,000
December, 1857, to June, 1863, 300 preference shares of £30, bearing 5 per cent interest	9,000
Same dates, 185 preference shares of £30, bearing 4½ per cent interest	5,550
June, 1866, to December, 1875, 800 £10 original "B" shares	8,000
December, 1877, to June, 1879, 445 £10 original "C" shares	4,450

Total £54,000
Raised on mortgage 2,000

Making a gross total of £56,000

Most of these shares were allotted to the Shareholders at premium.

I find in June, 1853, the amount expended in building works, laying mains, &c. of meters, &c., amounted to £25,804 15s. 2d. At the same date there is written off for depreciation an item of £5769 9s. 11d., or 23 per cent. on the total cost, and the balance £19,315 5s. 3d. is carried forward to the account.

In December, 1880, the cost of works, &c., as shown by the Company's accounts, amounts to £76,033 4s. 7d. To arrive, however, at the actual amount of this account the sum written off for depreciation in June, 1853, should be added, which will make the total expenditure £81,802 14s. 6d.

In the year 1880 the sum of £988 11s. 6d. was expended under this head, although no call on capital was made.

In June, 1853, a depreciation fund was formed, and from that date to December, 1866, 24 per cent per annum on the cost of works, &c., was set aside. These sums (less items charged against same) amounted to £11,395 7s. 7d. From December, 1866, to December, 1877, the amount set aside was at the rate of 2 per cent. Nothing, however, has been placed to this account since December, 1877. In December, 1880, the account shows a total of £17,481 11s. 11d., which, if added to the amount written off for depreciation in June, 1853, and which is not included in this account, the total amount written off for depreciation is £23,251 1s. 10d., and which has from time to time been taken from revenue.

The Company's Act not prescribing the rate of dividend, section 30 of the Gas-Works Clauses Act, 1847, which is incorporated in the Company's Act, limits it to 10 per cent. on all paid-up capital, "unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend which shall have fallen short of the said rate." The whole of the share capital, therefore, bears 10 per cent. dividend, except the preference shares.

From June, 1853, to December, 1869, dividends varying from 5 to 10 per cent. per annum have been paid, and from that date the maximum dividend has been paid, except in the year 1874, when 8 per cent. only was paid.

From calculations that I have made I find the amount which might have been paid to make up the dividends to the prescribed rate would be £10,078 17s. 8d.

Sections 31 and 32 of the Gas-Works Clauses Act authorizes the Company to form a reserve fund out of profits after paying the statutory dividends to provide for the equalization of dividends and for meeting any extraordinary claims. This fund is not to exceed 10 per cent. of the nominal capital.

In December, 1872, a reserve fund was formed by the transfer of £500 from profit and loss account, which sum has been invested in shares of the Birmingham Canal Company, and the dividends received from that Company make the reserve fund at December, 1880, £689 5s., but no sums have been at any time taken from this fund for the object for which it was created.

In each amount paid for dividend on ordinary share capital no deduction has, at any time, been made for income-tax. If the tax had been deducted, from June, 1853, to December, 1880, a sum of £1579 17s. 5d. would have been added to the credit of profit and loss account. The tax on the preference shares has, however, always been deducted. The Directors now receive £300 a year for their services. No income-tax has been deducted from this, which would amount to £101 19s. 7d.

On an account called "wear and tear," meaning ordinary repairs, maintenance of meters, mains, services, &c., the amount expended in the year 1880 was £2488 13s. 4d. (£1525 1s. 6d. of this during the latter half of the year). The average expenditure of the nine previous years was £895 12s.; the greatest amount paid in any one year (1878) being £1240 11s. 11d., the smallest (1871) £318 5s. 2d.

In January, 1878, a sum of £2320 9s. 6d. was received from the Great Western Railway Company, being purchase-money for land belonging to the Gas Company. This is not, at present, placed to any account, but appears in their books as an open or suspense account. This applies to the sum of £431 14s. 7d. received as premiums on the sale of new shares.

The profit and loss account on Dec. 31, 1879, shows a balance of profit amounting to £3392 6s. 4d., which, however, is subject to a half year's dividend, and which would reduce that balance to £1077 4s. 8d. On Dec. 31, 1880, the balance was £3473 15s., which is also subject to a half year's dividend, and which, when paid, would reduce the balance to £1160 2s. 6d. This sum is still in hand.

In dealing with this account I may mention that a reduction of 1d. per 1000 cubic feet of gas, according to the consumption in 1880, would amount to £351 15s. per annum.

Mr. GODSON then went over the items in the report, and contended that the Company had a dummy reserve fund, which they called a "contingent and depreciation fund," of £17,481 11s. 11d., and which ought to have

* See ante, p. 57.

been applied, for the benefit of the ratepayers of Dudley, to a reduction in the price of gas. He submitted that dividends of more than 10 per cent. could not be paid in any one year, and the Company had not only paid 10 per cent., but had £1000 over, which was equal to 3d. per 1000 feet in the price of gas. Beyond this they had for years paid income-tax on the 10 per cent., or presented the Shareholders with a bonus equal to the income-tax paid. The learned Counsel argued at length that this was an illegal payment, and that the profits clearly showed that the gas consumers were entitled to a reduction in one case of 6d., and in another of 3d. per 1000 feet.

Mr. James Hopkins was examined, and proved the report which had been read. During his examination of the Company's books, he said he found a fund called the "depreciation fund," the grand total of which was £23,251. This included £5769 written off in 1853. The balance, therefore, would be £17,481, which had been written off since 1853. It had no doubt been spent in new works.

The CHAIRMAN: I ask you as a Public Accountant and expert, is it not a fact that it is a custom in manufacturing concerns, conducted on a sound basis, to write off 2 or 2½ per annum for depreciation?

Witness: I believe that is the rule in most manufacturing businesses. Have you ever examined the accounts of any other gas company?—No, I have not.

And you are not in a position to tell us whether it is a custom with gas companies?—No; I am not in a position to answer that question.

Mr. AINSTIE: Perhaps I ought to mention that I am prepared to show that a portion of the money has been spent in works of this description.

The CHAIRMAN (to witness): Am I correct in supposing that you are not yourself cognizant of the way in which this money has been spent?

Witness: No; my knowledge is simply derived from the accounts. But it has been spent upon new works?—Yes.

You have not been in the habit of seeing the accounts of this Company before?—Not as an Accountant.

Mr. AINSTIE contended that the Acts of Parliament under which the Company were working empowered the Directors, before apportioning dividends, to set aside such sum out of the profits as they thought proper to meet contingencies or improve the undertaking, or they might divide the balance; and that they were also empowered to apply subsequent profits to deficiencies in earlier dividends. It was unreasonable to suggest that the Company should go to Parliament for the sole purpose of improving their works, or that such a large concern could be carried on without a depreciation fund. The money had been spent, and if improperly, let action be taken to have it brought back and applied to the proper purposes. Then the Corporation would perhaps have some grounds for saying the Company had means which would enable them to supply gas at a lower rate. He did not know what he had to answer; the case had not advanced in the least since the last Court, and he submitted that the Company were entitled to have the Corporation's application discharged.

Mr. Godson, in reply, argued that Mr. Ainstie had misinterpreted the words of the Act of Parliament, for the depreciation fund could not be used in putting in new mains and service-pipes for extending the concern. They had most boldly and openly said they had not the money in their possession, but this was an unfortunate affair for them. The consumers were entitled to benefit from it, and if the Company wanted more capital it was their duty to apply to Parliament.

The CHAIRMAN said that by Act of Parliament the Company had power to set aside annually a reasonable sum to meet contingencies, before apportioning the profits among the Shareholders, and this was the way the £17,000 had been accounted for. Putting aside every other question, it was very certain that the Court could not interfere until it had been shown that the Company had a large reserve fund in hand. It was quite clear to him that the conditions under which the Court could exercise its jurisdiction had not so far arisen, and therefore the Bench must refuse to grant the prayer of the petitioners. At the same time the Court ordered the Company to pay the costs of the petition, for the reason that the way in which their accounts had been presented was quite sufficient to lead the petitioners to believe that they had a good case against the Company. Having kept their accounts in such a way as to mislead, it was only fair that the Company should pay the costs, when the petitioners exercised their legal right to move for the public benefit.

After some discussion as to the liability of the Company to pay the costs, it was arranged that they should pay 50 guineas.

Mr. Godson then asked for a special case as to whether the Company had a legal right to spend certain money in the improvement and extension of their works; but he subsequently withdrew the application, remarking that perhaps he should proceed in some other way.

Miscellaneous News.

RIO DE JANEIRO GAS COMPANY, LIMITED.

The Sixteenth Annual General Meeting of this Company was held at the City Terminus Hotel, Cannon Street, E.C., on Monday, the 11th inst.—Mr. BARTLETT JAMES in the chair.

The SECRETARY (Mr. T. Dawson), having read the notice convening the meeting, the following report and accounts were presented:—

The Directors, in accordance with the Articles of Association, paid on the 11th of October last an interim dividend of £37,500, free of income-tax, being at the rate of 10 per cent. per annum on the paid-up capital of the Company; and they have now the pleasure of submitting to the Shareholders the annexed statement of accounts for the year ending Dec. 31, 1880, showing a balance at the credit of profit and loss account of £100,696 18s. 1d., reduced by the above mentioned interim dividend, and by the transfer of £7000 to the insurance and contingency fund, and of £15,000 to the amortization fund, to £41,196 18s. 1d.

Out of this sum of £41,196 18s. 1d. the Directors recommend that a dividend at the rate of 10 per cent. per annum, also free of income-tax, be paid for the half year ending the 31st of December last; this will absorb £37,500, and reduce the available balance to £396 18s. 1d., which the Directors have carried forward to the next account, and out of which income-tax for the past year has to be paid.

The insurance and contingency fund now stands at £60,741 18s. 6d., and the reserve fund remains at £6000.

Although the results of the past year's operations have been less favourable than those of 1879, yet on the whole they may be considered satisfactory, when it is remembered that no fair comparison can be instituted between 1880 and preceding years, the whole of 1880 having been at the lower prices charged under our new contract.

Mr. Bartlett James is the retiring Director in accordance with the Articles of Association, and, being eligible, offers himself for re-election.

Mr. William Henry Holman, who at the date of the last report had been invited by the Directors to join the Board, has since then taken his seat, having come to England for the benefit of his health.

The Auditors, Messrs. Harding, Whinney, and Co., also retire, and offer themselves for re-election.

On the 22nd of September last, the Directors issued a circular informing the Shareholders that the new contract had passed two readings in the House of Deputies during the session of 1879, and that upon its coming on for the third reading on the 24th of August last, Senhor Buarque de Macedo, the Minister of Public Works, had proposed certain modifications most disadvantageous to the interests of the Company, but which were accepted by the House. Since then nothing new has occurred, the Chambers having been closed without any further steps being taken, they having been fully occupied with

important matters of home legislation. The Board are informed that the Chambers are not likely to meet again until August next, when they will use every endeavour to complete a satisfactory settlement of the new contract under which the Company are now working.

Dr.—Balance-Sheet, for the Year ending Dec. 31, 1880.

To Capital				£750,000	0	0	
Amortization fund				30,293	8	0	
Insurance and contingency fund				60,741	18	6	
Reserve fund				6,000	0	0	
Bills payable				4,574	17	11	
Dividend warrants still unpaid				1,003	0	0	
Sundry creditors in Rio and London				4,334	7	4	
Profit and loss—							
Balance of profit brought forward from Dec. 31, 1879			£3,101	17	10		
Less income-tax for 1879			2,326	13	8		
				£775	4	2	
Net profits for the present year				99,921	13	11	
				£100,696	18	1	
Deduct, carried to amortization fund this year	£15,000	0	0				
Carried to insurance and contingency fund this year	7,000	0	0				
Interim dividend paid in October last on £750,000	37,500	0	0				
				59,500	0	0	
					41,196	18	1
					£898,144	9	10

Cr.—Balance-Sheet.

By Sundry assets, being value of the Company's property in Rio de Janeiro, according to the valuations made by the Government	£607,003	15	7
Engineers	22,773	14	8
Investments accounted	6,750	18	1
New works executed by order of the Government	47,552	15	1
Stock of stores in Rio de Janeiro	22,950	2	0
Coals	7,232	2	6
Gas-fittings	55,117	18	11
Sundry debtors, being gas and coke consumers at Rio	129	1	3
Office furniture	7,717	7	5
Shipments afloat	59,883	3	2
Bills receivable, in hand	60,693	11	4
Cash in London	339	19	10
Cash in Rio			
	£898,144	9	10

The CHAIRMAN said: I regret that, in rising to propose the adoption of the report and balance-sheet, I have again to allude to the absence of our worthy chairman, Mr. A. D. MacGregor. The report which we present to you to-day contains very few features that require much comment from me—the figures speak for themselves. But I may again call your attention to the fact that this is our first full year's working under the new contract; the previous year, 1879, having embraced one quarter under the old prices and conditions. Your Directors think that, on the whole, the results may be considered satisfactory, helped as they have been by the still reasonable prices of coals and rates of freight. As regards our present position with the Brazilian Government, and the confirmation of our contract by the Legislature of that country, your Directors have nothing to add to the circular they issued on the 22nd of September last year. The Chambers are at present closed, and a great deal of uncertainty exists as to when they will again be opened. A new electoral law having now come into force, the minor regulations of which are still, I believe, incomplete, some considerable delay may possibly take place. We must, therefore, await patiently the course of events, and I have every hope that in due time we shall arrive at a settlement that will be satisfactory to all parties. You may depend upon every effort being made by your Board, and their able representative and colleague in Rio, who will return to Brazil the moment his presence becomes necessary. I think I need not make any allusion on this occasion to the present trial in London of the electric light, beyond remarking that the prices of gas shares, which had fallen considerably previous to its commencement, appear to be fast recovering their old position. In concluding these few remarks, I have merely to say that your Directors will be most happy to reply to any questions you may see fit to put. I now move—"That the report of the Directors for the year ending Dec. 31, 1880, be received, adopted, and confirmed."

Mr. J. H. JAMES seconded the motion.

Colonel POYNTZ asked questions as to the items in the balance-sheet, of "sundry debtors, being gas and coke consumers at Rio, £55,117," and "bills receivable, in hand, £59,883."

The CHAIRMAN, in reply, said: The sundry debtors simply represent a quarter's consumption. I dare say they are nearly all paid by this time. You need not be surprised at this sum for sundry debtors, for you will find it in all previous balance-sheets. A quarter's consumption at Rio would amount to a very considerable sum; and there is also the Government monthly sum, which is a large account. As a rule, our debts are very safe, and our losses and bad debts in Rio are a mere shadow. As to the bills receivable, the larger this amount is the better, for they are all first class.

Mr. WEIR asked what the investment account, £22,773, was invested in.

The CHAIRMAN: That account represents East Indian Railway Company's annuities, class B, £14,999; Consolidated Three per Cent. Annuities, £2938; and Metropolitan Railway Company's 4 per cent. permanent debenture stock, £7481.

Mr. WEIR expressed satisfaction at the substantial character of the investments. Seeing that no interest was received, he had a notion that the money might be invested in stocks.

Mr. L. HOWARD, in answer to the latter remark, stated that further investments had since been made, and the sum now invested—including some Consols bought the previous week, and the investment of the amount already received as dividends—was £30,723, which represented the amount of the amortization fund plus £293 since received as dividend on Consols.

The motion was carried unanimously.

The CHAIRMAN then moved the declaration of a dividend at the rate of 10 per cent. per annum, free of income-tax, for the year ending the 31st of December last.

Mr. J. HOLLOCOMBE seconded the motion, and it was carried.

The retiring Director and Auditors having been re-elected,

Mr. WEIR moved a vote of thanks to the Chairman and Directors for their able administration of the Company's affairs. He said he was very glad the Chairman had touched on the electric light, for it showed that they were not sleeping with respect to it. He had no fear of it at the present time, but thought it was well that directors of gas companies should "keep their eyes on it." He thought it would be a long time before they were beaten out of Rio with the electric light; and he supposed that if they were beaten out of the streets there it would not hurt the Company very much.

Colonel POYNTZ seconded the motion, and it was unanimously agreed to.

The CHAIRMAN having acknowledged the compliment, the proceedings terminated.

LONDON GASLIGHT COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Wednesday last, at the Freemasons' Tavern, Great Queen Street, Lincoln's Inn Fields—MAJOR RHODE HAWKINS, Esq., in the chair.

The SECRETARY (Mr. A. J. Dove) having read the notice convening the meeting, the following report and accounts were submitted:—

Annexed to this report are submitted the accounts, showing the result of the manufacture and distribution of the Company's gas for the half year ending Dec. 31, 1880.

In comparing these accounts with those of the corresponding period of 1879, it will be seen that there is a decrease of £1698 2s. 11d. in the rental for gas, which is accounted for by the unusually large increase that occurred in the former period, produced, to a certain extent, by the low temperature and darkness of the season. It had been anticipated that, unless similar conditions should prevail, the increase would not be maintained. A considerable proportion, however, proved to be of a permanent character.

and during the last two years very substantial progress has been made. Although the quantity of coals used has decreased during the half year, the residual products have realized an addition of £3984 15s. 10d.

The Directors felt themselves justified, under these circumstances, in making a reduction of 3d. per 1000 cubic feet in the charge for gas, which took effect from the commencement of the present year, thus bringing the price down to 3s.

After making provision for the interest and dividends on preference capital, there will remain to meet the dividends on the ordinary capital £21,307 7s. 3d., out of which the Directors recommend that the usual dividend at the rate of 10 per cent. per annum be declared.

Three Directors—namely, Major Bohde Hawkins, Esq., Juland Danvers, Esq., and Miles Miley, Esq.—retire by rotation, and, being eligible, offer themselves for re-election. One Auditor—namely, Jonathan Denny, Esq.—also retires by rotation, and, being eligible, offers himself for re-election.

No. 1.—STATEMENT OF STOCK AND SHARE CAPITAL, *on Dec. 31, 1880.*

Acts of Parliament relating to the Raising of Capital.	Description of Capital.	Maximum Dividend Authorized.	Number of Shares Issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Remaining to be called up.	Total Amount Authorized.
15 Vict., cap. 82	Ordinary stock.	10 per cent.	Stock	Stock	Stock	£391,300	..	£391,300
	2nd pref. " " " " " }	6 ditto.*	Do.	Do.	Do.	4,850	..	4,850
	3rd ditto " " " " " }	6 ditto.*	Do.	Do.	Do.	1,000	..	1,000
	1st ditto " " " " " }	6 ditto.	Do.	Do.	Do.	150,000	..	150,000
29 Vict., cap. 55.	A ditto shares.	6 ditto.	12,000	£25 0 0	£20 and £1 5s.	188,407	£111,593	300,000
20 & 21 Vict., cap. 73	1 & 2 Deben. stocks.	6 & 5 ditto.	Stock	Stock	Stock	26,569	..	26,569

- With option of conversion.

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing the Loan Capital.	Description of Loan.	RATES PER CENT. OF INTEREST.		Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
		4½ per Cent.	5 per Cent.			
15 Vict., cap. 82	Bonds, 4½ per cent.	£88,862	£7,687	£96,549	£82,305	{ £91,667 100,000
29 Vict., cap. 55	Debenture stock, &c.					

No. 3.—CAPITAL ACCOUNT

		Description of Capital.	Certified Receipts to June 30, 1880.	Received since that date.	Total Receipts to Dec. 31, 1880.
To Expenditure to June 30, 1880.	£831,535 3 10	By Ordinary stock	£390,000 0 0	£1,300*	£391,300 0 0
Balance	10,519 5 0	2nd Preference ditto.	5,650 0 0	†	4,850 0 0
		3rd ditto ditto.	1,500 0 0	‡	1,000 0 0
Total expenditure.	£842,054 8 10	1st ditto ditto.	150,000 0 0	..	150,000 0 0
Balance	16,621 6 2	A ditto shares, £25 each, including amount received in anticipation of calls	188,307 10 0	100	188,407 10 0
		1st & 2nd Debenture stocks, under 20 & 21 Vict., cap. 73	26,613 5 0	§	26,569 5 0
		Bonds, &c.	66,987 0 0	||	65,987 0 0
		4½ per cent. debenture stock	30,562 0 0	..	30,562 0 0
	£858,675 15 0		£859,619 15 0	..	£858,675 15 0

Note.—+ £800 converted into ordinary stock; † £500 ditto; *total, £1300. ‡ £44 redeemed. || £1000 paid off.

No. 4.—REVENUE ACCOUNT, *for the Half Year ended Dec. 31, 1880.*

To Manufacture of gas—					
Coals, including dues, carriage, unloading, and trimming (see statement No. 8)	£55,216	17	0		
Salaries of Engineers, Superintendents, and other Officers at works	2,452	0	9		
Wages (carbonizing)	11,410	3	4		
Purification, including £1072 12s. 5d. for labour .	1,660	12	5		
Repairs and maintenance of works and plant, materials, and labour, less £167 3s. 3d. for old materials	23,500	8	11		
	£91,240	2	5		
Distribution of gas—					
Salaries and wages of Officers (including Rental Clerks)	£2,466	3	6		
Repairs, maintenance, and renewals of mains and service-pipes, including labour	10,260	14	8		
Repairs and renewals of meters	1,664	1	3		
	14,390	19	5		
Lighting and repairing public lamps			2,368	19	8
Rents, rates, and taxes—					
Rents payable	£650	9	6		
Rates and taxes	4,098	19	11		
	4,749	9	5		
Management—					
Directors allowance	£1,250	0	0		
Company's Auditors	75	0	0		
Salaries of Secretary, Accountant, and Clerks . .	1,367	12	1		
Collectors' commission	1,368	16	11		
Stationery and printing	324	3	10		
General charges	660	10	5		
	5,046	3	3		
Law charges			409	6	5
Bad debts			634	18	6
Depreciation fund for works on leasehold land			100	0	0
Superannuations, sick allowances, and gratuities			552	1	1
Total expenditure	£122,492	0	2		
Balance carried to net revenue account, No. 5	34,564	2	4		
	£157,056	2	6		
By Sale of gas—					
Common gas, per meter, at 3s. 3d. per 1000 cubic feet	£106,335	19	3		
Public lighting, and under contracts—					
Common gas	10,885	7	10		
(See statement No. 10.)					
	£117,221	7	1		
Rental of meters.	2,266	4	6		
	£119,487	11	7		
Residual products—					
Coke, less £1985 16s. 8d. for labour and cartage .	£20,435	18	11		
Breeze, less £260 0s. 10d. do.	927	0	8		
Tar, less £18 12s. 8d. do.	7,940	9	1		
Ammoniacal liquor, less £22 15s. do.	6,974	6	9		
	36,277	15	5		
Rents receivable	1,275	18	0		
Transfer fees	14	17	6		
	£157,056	2	2		
	£157,056	2	2		

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on bonds, $\frac{4}{5}$ per cent. debenture stock, &c., to Dec. 31, 1880	£2,212 14 5	Balance from last account .	£20,517 11 5
Dividends on preference capital	11,077 1 8	Less dividend on ordinary capital for the half year ending June 30, 1880 .	19,500 0 0
			£1,017 11 5
Interest on temporary loans .	£13,289 16 1	Amount from revenue ac- count, No. 4	£31,561 2 4
Redemption fund, reserve per London Gaslight Act, 1857 .	234 10 5		
Balance applicable to divi- dend on ordinary capital .	750 0 0		
	21,307 7 3		
	£35,581 13 9		£35,581 13 9

No. 6.—RESERVE FUND.

Balance on Dec. 31, 1880.	£77,834 18 3	Balance on June 30, 1880.	£76,762 7 4
		Interest on amount invested.	1,072 10 11
	<u>£77,834 18 3</u>		<u>£77,834 18 3</u>

No. 7.—DEPRECIATION FUND (FOR WORKS ON LEASEHOLD LAND)

Balance on Dec. 31, 1880.	\$2,547 18 2	Balance on June 30, 1880.	\$2,411 12 10
		Interest on amount invested.	36 5 4
		Amount brought from revenue account for the half year ending Dec. 31, 1880.	100 0 0
	<u>\$2,547 18 2</u>		<u>\$2,547 18 2</u>

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1880.	Received during the Half Year.	Carbonized during the Half Year.	Used for Sundries during the Half Year.	In Store, Dec. 31, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	16,663	67,330	72,886	23	11,074
Cannel	1,438	3,956	4,145	..	2,249

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

Description of Residual.	In Store, June 30, 1880.	Made during the Half Year (estimated).	Used during the Half Year (estimated).	Sold during the Half Year.	In Store, Dec. 31, 1880.
Coke, chaldrons of 36 bush.	480	75,654	20,350	52,784	3,000
Freeze " " "	167	8,705	..	8,594	278
Tar, gallons " " "	116,000	748,539	..	776,539	88,000
Am. liq., butts of 108 gals.	333	17,140	..	16,843	630

No. 10.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made (measured by Station Meters).	QUANTITY SOLD.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	777,820	58,561	654,375	712,936	9,509	722,445	55,375	5,667

BALANCE-SHEET.

To Capital—	By Cash at Bankers and in hand	£17,565 11 0
For balance, per account No. 3	Amount invested—	
Net revenue—	Reserve fund	£76,762 7 4
For balance, per account No. 5	Redemption fund.	9,076 0 0
Reserve fund—	Unclaimed dividends	5,313 7 5
For balance, per account No. 6	Depreciation fund (for works on leasehold land)	2,311 12 10
Depreciation fund (for works on leasehold land)—		93,463 7 7
For balance, per account No. 7	Stores on hand, viz.—	
Redemption fund	Coals	£11,863 16 11
Bond, 4½ per cent. debenture stock, &c., interest for amount due to Dec. 31, 1880	Coke and breeze	1,156 5 0
Preference dividends, ditto.	Tar and ammoniacal liquor	1,008 6 8
Unclaimed dividends	Sundry stores	4,306 16 1
Sundry tradesmen and others, for amount due for coals, stores, and sundries		18,335 4 8
	Accounts due to the Company—	
	Gas and meter rental, quarter ending Dec. 31, 1880	£68,300 15 4
	Ditto arrears outstanding	3,686 17 8
		£71,987 13 0
	For coke and other residual products	17,604 12 3
	Sundries	1,034 5 8
		90,626 10 11
		£219,990 14 2

The GOVERNOR: You see from the report that our business during the past year did not increase very materially. There was a slight increase—I believe we carbonized about 1000 more tons of coal than in the previous year; but you have seen by the reports of other Gas Companies in the Metropolis that the same reason is given in all cases—that the weather was not favourable, or was not so favourable for the consumption of gas as in the previous year, and we cannot always expect that our business will go on with leaps and bounds, in the same way as it did the year before last and the year before that. In the two previous years, 1878 and 1879, taking the two years together, our business increased on the whole by 25 per cent. over 1877. You can understand that after such an expansion as this it is not unnatural that business should rest for a while. I am happy, however, to say that since this year commenced—whether it is that the weather has been a little colder or the price of our gas has been lowered to 3s.—the business has begun to show a certain amount of elasticity, and no doubt when we meet you next year we shall be able to report a very satisfactory increase in our business. Be this as it may, our business has so far succeeded as to enable us to pay our way thoroughly, to offer the full parliamentary dividend, and also to present something like £18,000 a year to the public in the shape of a reduction in the price of gas; and if we go on as successfully as we have hitherto, I hope the time is not far distant when we shall be able to benefit the public still more, though they do not seem very grateful to us for it. Another point I would refer to is the question of amalgamation, but of this I have nothing material to say. I have not heard a word on the subject since we last met. I know indirectly that the two great Metropolitan Companies have been discussing the question between them, but I suppose they have taken a leaf out of the book of national management at the present time, and think it is not desirable to extend their borders, and enter into any fresh engagements. On this subject, therefore, they have been silent, and we know no more now about it than we did before. The only other subject that interests you is the electric light, which no doubt many of you have seen in the City. We shall not be able to learn until the year is out, and the City authorities publish a fair account of the trial, what the cost has been. There is no doubt it is a very brilliant light, but the Corporation are obliged to have the gas alongside of it to help them through, and guard against contingencies; and it is only used for a small number of hours. I saw in one of the papers that by the present contract the light will cost four or five times the price of gas, and a citizen has already publicly complained that it is not of any use at present except for the housekeepers and the cats; but no doubt in the winter the commercial community will benefit by it. Still, I have no doubt it will not interfere with our lighting; but even if it did, as I have said before, there is ample business for us independently of any interference which the electric light could cause. I am happy to say that the investing public and the Stock Exchange seem very much of the same opinion, for you can see for yourselves that the price of our shares has not diminished, which is one good point, while another is that our security is considered so good that, although we pay no more than 10 per cent., while other Companies pay 11 and 11½ per cent., I think you find that our shares fetch quite as much as theirs; and therefore, if you will only be contented with 10 per cent., with first-rate security, you may be quite certain that your property, when you choose to die, will fetch quite as much as that of other companies. (A SHAREHOLDER: MORE.) Or more; I am very glad to be corrected. I now move—"That the report of the Directors and the accounts now laid before the meeting be received and adopted."

The DEPUTY-GOVERNOR (the Right Hon. Lord Kinnaird) seconded the motion, and it was carried unanimously.

The GOVERNOR: I have now to move that the following dividends be declared:—The fixed dividends on all classes of preference shares and stocks, and a dividend at the rate of 10 per cent. per annum on the ordinary stock; payable on the 16th inst.

The DEPUTY-GOVERNOR seconded the motion, and it was also carried unanimously.

The retiring Directors and Auditor having been re-elected,

In answer to Mr. Key, the GOVERNOR said he did not think it would be desirable to make a call at present on the last issue of shares. The Company were doing a capital business, but last year it had not increased, and as they had been able to supply their customers admirably with what capital there was in hand, it was of no use to raise more money. As long, however, as the Company remained unamalgamated, capital would be issued when necessary, and it would be to the advantage of the Shareholders. When they came to any amalgamation scheme, and any future capital that might be required had to be raised, the benefit would go into the pockets of other people, not the Shareholders. Holding a considerable sum of money for future distribution was one of his (the GOVERNOR'S) reasons for not wishing to amalgamate with anybody. There was one matter he wished to bring before the Shareholders. He had explained that the Company's business is in a prosperous condition. It would not, however, be so were it not for the energy and skill shown by

the officials of the Company, and therefore he asked the Shareholders to accord a vote of thanks to Mr. Dove and Mr. Morton, the Company's Secretary and Engineer, for the admirable way in which they, and those serving under them, performed all the duties assigned to them in the management of the Company.

The DEPUTY-GOVERNOR seconded the motion, and it was carried unanimously.

The SECRETARY, on behalf of his colleague, the other officers of the Company, and himself, acknowledged the kind way in which the Governor had spoken of their services. The remarks came with great value to the officers, knowing how well the Governor looked into everything. The affairs of the Company were so thoroughly watched over by the Governor that he inspired confidence not only in the Board, but in every one who had anything to do with the concern.

Mr. R. RAWLINSON, C.B.: Before separating, I should like to say a few words to the Shareholders. The electric light certainly does act as a scare to persons who are not cognizant of what is going on; but there are interested persons who wish to make it a scare, and to use it for the purpose of depreciating gas shares, that they may possess themselves of them when they run them down as far as they can. Now, there is another scare that is coming on you, which has not yet been made public. Power will be sought for from Parliament, to enable corporations throughout England to give any persons proposing to introduce electricity into the public streets and highways, parliamentary powers to break up streets and roads for the purpose of laying the cables necessary for the electric light. If this came on you unawares, you would think there was something very alarming in it, and that it would very seriously imperil your interests. Now, let me tell you that I do not speak lightly, but from having studied the question, and made myself acquainted with it, and I say that so far from its being injurious to gas interests, I think all this movement about electric lighting will absolutely result in advantage to us. It will put the manufacturers of gas upon their mettle; it will compel those who manufacture gas to make it of the best possible quality. It will also compel those who have the management of gas-works to see that the best appliances are used, for I can assure you that a great deal of discouragement in the use of gas has arisen, first of all, from the want of care exercised in its purification, and in the second place, and most particularly, from the carelessness of the users in having bad fittings. Now it may result in this, that gas companies will find it to their benefit absolutely to take charge, as it were, of the fittings—that is, to employ inspectors to go round, and instead of waiting till complaints flood in upon them, or till mischief has been done by continuing the use of bad burners, to have an inspector or inspectors to see that the fittings are proper and right. As all good fittings tend to economy in the use of gas, there would be a benefit all round. The company would gain in having their light used to the best advantage, and the consumer would benefit in having the greatest power out of the light he uses. We must not have any narrow jealousy between ourselves and our consumers; we must be with them if we want to hold our own, and we must take this into account—that electricity is useful for certain purposes. I am not so ignorant or so prejudiced as to believe that it will go back. I believe that electricity will accomplish considerably more than we have yet seen, but at the same time I do not think it will do anything to interfere seriously with the profits of gas making, if the gas makers are true to their own interests. When gas was first introduced it was thought there was an end to oil lamps, and that it would do away with the candle trade. Now civilization advances so rapidly, and the wants of a community in a civilized country are so extensive, that in place of gas having interfered with the use of lamps and candles, their use has been extended far beyond what it was previously. I could go over a list of great improvements to civilization, where, instead of improvements having extinguished what had gone before, they simply tended, by the growth of civilization, and the wish for extended comfort and convenience, to increase the use of both. I merely wish to add—Do not part with your property lightly; do not care what sensationalists say in the papers; do not even care what the Stock Exchange may do in a temporary fit. Sit quietly and hold your property. I think as far as any person in this room can hold his property—and even, I believe, his children after him—he may safely calculate on getting 10 per cent. dividend, and I tell you candidly that I am not in love with 11 or 11½ per cent. I am not so hungry to rise up to it, because it means ultimately a pulling down and opposition. In this great free country of ours the public will not sit still with large and overgrown dividends. You have your 10 per cent., which you may reasonably be satisfied with, and therefore do not fret because other Companies are getting 11 or 12 per cent.

On the motion of Mr. KEY, seconded by Mr. WARD, a vote of thanks was passed to the Governor and Directors for the able way in which they had managed the affairs of the Company.

The GOVERNOR briefly acknowledged the vote, and the proceedings terminated.

THE PURCHASE OF THE NEWTOWNARDS GAS-WORKS BY THE TOWN COMMISSIONERS.

LOCAL GOVERNMENT BOARD (IRELAND) INQUIRY.

As reported in our columns at the time, on the 27th of January last, a Local Government Board inquiry was, *pro forma*, opened at Newtownards, and adjourned in consequence of the illness of the Inspector; the subject-matter for investigation being an application by the Newtownards Town Commissioners, acting as the Urban Sanitary Authority for the district, to the Local Government Board (Ireland) for their sanction to a loan of £11,500, of which £10,000 is to be applied to the purchase of the gas-works in the town, and £1500 to pay off a debt already incurred for market purposes. The adjourned inquiry was held on Friday, the 25th ult., before Mr. C. P. COTTON.

Mr. C. C. RUSSELL and Mr. J. GIBSON appeared for the Town Commissioners; Mr. J. DINNEN for the Gas Consumers' Company; Mr. MURLAND and Mr. O'RORKE for certain ratepayers opposed to the purchase of the works by the Commissioners.

At the opening of the proceedings,

The Inspector said this was an adjourned inquiry from one opened by Mr. Hamilton when he (the Inspector) was unfortunately unable to attend. Having read the letter of instructions which he had received from the Local Government Board directing him to hold the inquiry, he said he would hear what was to be said on the part of the Commissioners in addition to the evidence given at the former inquiry last year, and then he would be glad to listen to any of the objectors to the scheme.

Mr. GIBSON having stated the case on behalf of the Commissioners, the evidence was proceeded with.

Mr. Arthur Silverthorne, examined by Mr. RUSSELL, deposed to his having had considerable experience regarding the acquisition of gas-works by local authorities. He made a valuation of the works* entirely independent of Mr. Anderson, whom he saw at the time. Mr. Anderson, he understood, was appointed by the Gas Consumers' Company, Limited. Mr. Parr was present and gave witness much information on the subject. Witness's attention had been drawn to objections that had been made previous to his valuation having been settled. To the first objection, which stated that owing to their construction the gas-works would not be a desirable investment, he entirely dissented. On the contrary, he found the works quite as good as any he had been in the habit of visiting. At his valuation he considered their acquisition would prove profitable. Under suitable management he anticipated a very decided increase in the consumption of gas. Of late years there had been a considerable decrease in the consumption of gas in Newtownards, but this he attributed to the high price charged. Applying proper management to the works they could nearly double the present supply, and this showed the purchase to be a most advantageous one. The gasholder was very large, and the coal stores would contain a supply of coal sufficient to last a whole year. This might be explained by the fact that coal was sometimes difficult to obtain. The purifiers were much larger than were necessary, and the site of the premises would allow of the erection of another gasholder, although it would not be necessary for some years. Another objection—the introduction of the electric light—he did not think a good one; for the light, he thought, would never be suitable for household purposes. Witness took 16½ years' purchase as fair in the making of his calculations. He allowed for part of the very large holder, and deducted £186 for the depreciation of service-pipes. He had also allowed for cottages on the grounds. The retort power, too, was in excess of the requirements. By the management of the Company at present, only 8000 feet of gas were manufactured out of a ton of coal, whereas it was usual to make 9000, and, where exhausters were used, 10,500 feet could be obtained, but he did not advise the use of exhausters except in large works.

Cross-examined by Mr. MURLAND: This was the first valuation he had made in Ireland. In his calculation he took coal as costing 16s. 7d. per ton delivered; which was the actual price at the time he made his valuation. For bad debts he allowed 1 per cent., which was the usual amount. He calculated that the net profits of the Company amounted yearly to £519. There was a great amount of leakage, which arose from many causes, and would decrease as the consumption increased. Witness's valuation was a commercial one, and was based on a structural valuation of £6998. The gasholder was a very large one, unnecessarily so. Holders usually lasted 40 years, and only required painting yearly. He had added for the excessive storage. Supposing this excessive storage was not required for 20 years, interest on the amount expended would, of course, require to be paid, but this would be opposed to all his experiences. The Company's books showed a decrease in the consumption for the past four years, but he considered this to be the effect of the present price of gas in the town, being 7s. 6d. per 1000 feet. A great saving might be made by closer inspection of the meters and service pipes and in using the holder carefully. The present leakage was 27 per cent. of the quantity made; and he quoted instances where in five years the leakages had been reduced, under good management, from 30 and 40 to 6 and 7 per cent.

By Mr. DINNEN: Sometimes 27 years' purchase was taken, but this was in the case of incorporated companies.

By the INSPECTOR: There would be no expenses necessary to set the works right.

This closed the evidence in favour of the scheme.

Mr. MURLAND, who said he represented 176 ratepayers, then addressed the Inspector. He said all these gentlemen would be very glad to see the gas-works purchased at a fair price, but they strongly objected to take them at the valuation of Mr. Silverthorne. He thought, considering the fact that there were Shareholders and Directors of the Company who were Town Commissioners, the Company should have given every possible facility to enable them to examine the works. This they had declined to do, as they considered that the appointment of Mr. Silverthorne rendered it unnecessary. He (Mr. Murland) denied that this gentleman was appointed by the ratepayers as the sole judge in the matter. He went on to say that it would be a very hard thing to saddle a poor town like Newtownards with such a debt. The average valuation per head of the town was only £1 2s., against £2 8s. in Dublin, and £2 10s. in Belfast. Then there was a water supply and other sanitary and sewerage improvements required for the town, and these would take a further loan. He thought the purchase of the gas-works would be injurious to all in the town except those who had made the bad speculation of investing in the Company. If it possessed such a future as Mr. Silverthorne stated could be made out of it by good management, why did the Company not keep it?

Mr. L. L. Macassey was then examined by Mr. MURLAND. He said he had had considerable experience in valuation, but not much in the management of gas-works. He had read the report of Mr. Silverthorne, and observed in it his estimate of the cost of coal, which Mr. Silverthorne, taking at its present price and freight, estimated at 16s. 7d. per ton. He believed that this was an under-estimate, and that a proper estimate could only be formed by taking the average for, say, ten years. The price of coal per ton in 1871 was 10s. 3d.; in 1872, 10s. 3d.; in 1873, 17s. 6d.; in 1874, 22s. 9d.; in 1875, 20s. 6d.; in 1876, 14s. 9d.; in 1877, 13s. 3d.; in 1878, 13s.; in 1879, 11s. 6d.; in 1880, 11s. 6d.—the average being 14s. 6d. per ton. Then

there was freight to Donaghadee, which would be 5s. 5d. per ton; from there to Newtownards, 1s. 3d.; cartage and trimming, 8d.—which would bring the total average up to £1 1s. 10d. per ton for the past ten years. As the high price of 1874 would not be likely to occur again, he thought £1 per ton a fair average to take for coal delivered at the works, which was a difference of 3s. 5d. from Mr. Silverthorne's valuation. If this was considered with the amount of coal consumed it would make a great difference. He had made a calculation as to what new works would cost. They could generally be erected for £1 per 1000 feet of gas supplied, and taking the supply required to be 7 million cubic feet, the total cost of the works would be £6500. He had ascertained that the Ballymena Gas-Works had cost 18s. 7d. per 1000 feet; Carrickfergus, 17s.; but if the works were purchased at Mr. Silverthorne's valuation, the cost of the Newtownards works would be £1 18s. per 1000 feet producing power. He had been through the town of Newtownards, but had not had an opportunity of examining the works. Newtownards was a very poor town, and there was little hope of getting gas consumers amongst people whose valuation was under £4. Taking all circumstances into consideration, he believed that it would not be for the advantage of the ratepayers, or the town, to pay what was proposed for these works.

By Mr. O'RORKE: Transfers usually ranged from a cost of 2s. to 7d. per 1000 feet, and the present transfer would add 2s. 0½d. per 1000 feet to the price of the gas. This would be a strong argument against the purchase even for a fairly prosperous town, and more so for a stagnant town like Newtownards. They would be paying the highest transfer rate of any town in Ireland or England.

By Mr. GIBSON: Works capable of producing 7 million cubic feet could be erected for £6500. For works capable of producing double this amount between £9000 and £10,000 would be a fair price.

Mr. George Walker, examined by Mr. O'RORKE, said he was the proprietor of a spinning and weaving mill in Newtownards, which employed between 500 and 600 hands. He believed he was the largest consumer of gas in Newtownards, in which town he had been for 17 years. He knew that the price of gas was 7s. 6d. per 1000 feet; and had made a calculation that he could supply himself for considerably less. Mr. Silverthorne had said that there must be an increase in consumption before there could be a decrease in price, but he (Mr. Walker) thought there was no reasonable prospect of increased consumption so long as the price charged was 7s. 6d. per 1000 feet. A large number of consumers ceased taking the gas, and some people burned partly gas and partly oil. A poor man could better afford to pay 2d. or 3d. per week for oil than pay quarterly for gas. Some of his own people had told him that they could get as good light for 9d. or 4d. per week by using oil, as they could get for 1s. per week by using gas. The weaving trade was good in Newtownards in summer time when the gas was little required, and bad in winter when light was more in demand. It was only the odds and ends of the Glasgow weaving trade—work that could not be done on power-looms—that they obtained in Newtownards. He would as soon burn oil himself if it were not for the bad smell; for he considered that it gave as good light. Mr. Silverthorne had stated that the profit of the gas-works was £519, and after the town had paid interest on the money to be borrowed, there would remain but a small sum of under £9 yearly to work upon. Mr. Macassey had stated that the transfer would amount to 2s. per 1000 feet, but in Belfast it was only 1s. The town would further require to contract loans for the purpose of a water supply. The town was supplied by means of pumps and wells, and in many places the water was discovered to be bad and impure. [The remainder of Mr. Walker's evidence was with regard to the water supply.]

Mr. Magowan, the Town Clerk, examined by Mr. RUSSELL, deposed that in 1874 £2000 was borrowed from a London company, repayable in sixty half-yearly instalments of £63 14s. 8d. Of the amount borrowed about £500 had already been paid out of the profits of the markets. The net yearly profits arising from the markets he estimated at £200 at least. This was the only debt on the town that he was aware of.

The inquiry then terminated, the Inspector intimating that he would have the evidence forwarded to the Local Government Board as soon as possible, and their decision communicated to the Commissioners.

DARLINGTON CORPORATION GAS AND WATER SUPPLY.

At the Monthly Meeting of the Darlington Town Council on Thursday, the 7th inst.,

Alderman KITCHING, when moving the adoption of the Gas Committee's minutes, stated that, for the last six months of 1880, the gross profits from the supply of gas, were £3577 15s. 3d.; from which had to be deducted, for interest, £1566 7s. 2d.—leaving a net profit of £2011 8s. 1d. The amount of liquidation for the half year amounted to £1114 7s. 2d., showing an actual net profit of £897 0s. 11d., after allowing for liquidation and interest. The Committee, therefore, proposed a reduction in the price of gas of 2d. per 1000 feet, taking effect from Jan. 1 of the present year. This reduction would amount to something like £397, but the Committee thought they saw their way to lessen this sum in another way which he need not then mention. Also he might state that certain expenses amounting to £211 11s. 7d., which had hitherto been charged to capital, they had charged to revenue. If they added this sum to the original profit they would find it pretty large. During the half year they made 55,948,000 cubic feet of gas, requiring 5482 tons of coal, costing 10s. 5½d. per ton. After putting the £211 11s. 7d. charged to revenue, the only actual difference between the expenditure of the half year of 1879 and that of 1880 was £21 14s. 6d. He hoped his statement would satisfy the Council that the Gas Committee had done their duty.

Mr. ROBINSON seconded the motion.

Alderman H. PEASE thought the Committee ought to be congratulated, especially as the aspect of things had not been all they could wish. He asked whether they could not establish a sinking fund for the gas and water works, which would eventually cover alterations without appealing to the town.

Mr. FOGGITT said there was a resolution, passed five years ago, that any surplus profits from the gas and water works were to be applied to the district fund. Owing to this, they were at the present time supplying the street lamps at less than cost price.

The MAYOR having expressed his satisfaction at the report and the proposed reduction, more especially as the latter was to be retrospective, the minutes were confirmed.

Alderman E. L. PEASE then moved the confirmation of the minutes of the Water-Works Committee. He said he was sorry he could not give such a flourishing account as Alderman Kitching could; but the water department was better last year than the previous one. The income had increased £823 17s. 8d.; while the expenditure was only £195 more. The water department, unfortunately, was worked under a disadvantage; they were forced to keep pumping water whether they needed it or not. Therefore, a constant expenditure was going on which need not be, if they did not have to furnish a number of houses in a high part of the town with a constant supply of water. Not having any storage there, they should always labour under this disadvantage. The expenditure under capital account had been very small—only £134—principally for the extension of

* See JOURNAL, Vol. XXXVI. p. 612.

mains. The total profit was £2587 18s. 10d., including all charges but liquidation. The liquidation for the year was £2297 10s. 7d., leaving a net profit of £290 8s. 3d. It was, however, satisfactory to know that they were in a better position than they had been.

The minutes were unanimously confirmed.

WOLVERHAMPTON CORPORATION WATER SUPPLY.

The monthly meeting of the Wolverhampton Town Council was held on Monday last week, when the Water-Works Committee presented a report upon their operations during the past year, in the course of which they stated that the accounts of the water department showed that a profit was made of £2292 7s. 1d.—an increase on that made in 1879 of £441 8s. 5d. They also submitted a statement of the capital and income expenditure account during the 13 years which have elapsed since the Corporation took possession of the water-works, showing an accumulation of profit to Dec. 31, 1880, of £10,652 15s. 5d. Of this sum £5000 is set apart as a reserve fund, in accordance with the resolution of the Council in 1879. A further sum of £1656 11s. 3d. has been expended in extension of plant, and the balance the Committee proposed to apply towards the cost of certain contemplated extensions at Cosford. The report then goes on to say: "It is very satisfactory to find that notwithstanding the reductions made to the ratepayers and to the water consumers during the last two years, as well as the largely increased quantity consumed, without charge, for public purposes, the income from water in the year 1880 was £20,028 1s. 9d., or £490 8s. 2d. over that of 1879. The whole of the plant at all the pumping stations has been maintained and remains in good working order and condition."

[Accompanying the report was a tabulated statement of the income and expenditure showing that the income last year from water rents was £20,028 1s. 9d. and £520 4s. 11d. from fittings, giving a total of £20,548 6s. 3d., or an increase of £406 10s. 11d. upon that of the preceding year. The expenditure for the past year was £18,255 19s. 7d. The profit for the year was £2292 7s. 1d. against £1850 18s. 3d. for the former twelve months. The balance of profit from 1868 (when the undertaking was acquired) up to the end of last December, is given at £10,652 15s. 5d. The working expenses during the past year amounted to £3717 17s. 7d., a decrease of over £200 as compared with the preceding year. The percentage of working expenses to the gross receipts was 42·4 per cent., a decrease of 2 per cent. on the year. The coal consumed during the year was 6970 tons, and the water pumped was 1583 million gallons, both being less than in the preceding period. The quantity of coal consumed per million gallons of water pumped, was 4 tons 8 cwt. 2 qrs.; or 1 qr. less than in the former twelve months. The bulk of the water has, however, to be pumped twice before it is distributed, and in order to tell the actual consumption of coal in proportion to water consumed and paid for, the Committee show, by a tabulated statement, that the coal consumed per million gallons distributed was 8 tons 6 cwt. and 2 qrs. The gross cost of each million gallons was £21 17s. 7d.; an increase of 10s. 4d. as compared with the year 1879. In the municipal borough of Wolverhampton there are 15,341 houses, of which 12,912 are supplied with water from the Corporation water-works. There are, therefore, 2429 houses in the borough, the inhabitants of which are still dependent upon wells for their water supply.]

Mr. WRIGHT, when moving the adoption of the report, said he had no doubt the Council were aware that the Committee last year made two very considerable reductions in the charges for water—one in favour of the consumers, and the other in favour of the ratepayers. Notwithstanding these reductions, there had been a large increase in the water-works accounts, and though there had been losses sustained by bad weather during the twelve months ending last December, it was satisfactory to know that the undertaking had yielded a profit of more than £2000. He wished he could speak with equal satisfaction of the quality of the water; but although it had been at times rather dirty, there was not so much cause to find fault with its wholesomeness, as people might be led to suppose was the case from statements made without authority.

Alderman WALKER seconded the motion.

Alderman FOWLER, M.P., said he was glad to find the Committee were proceeding upon the lines which were laid down when he was Chairman, viz., that they should obtain a larger supply of water from the well at Cosford. Their original idea was that they should first make the water-works pay, and having done this, it was due to the ratepayers that they should properly balance their income and expenditure, and afterwards do something for the benefit of the water consumers. A reserve fund of £5000 had been created, and he thought the time had now arrived when they should carry out two further improvements—viz., obtain a larger supply of water from the artesian well, and provide additional reservoir area. If when they were supplying something like 1½ million gallons of water per day, the existing reservoir space was not too much, it must be a great deal too little when they were supplying 3 million gallons per day, in consequence of the increased demand by the general public. He was thus satisfied that the next thing the Committee would have to take up was the question of increasing their reservoir area. He was quite agreed that the time had arrived when they should do something towards creating a sinking-fund, and was glad to find that the sum of £5000 had been appropriated for this purpose.

Alderman MAJOR said he did not think it was exactly the right thing to apply revenue for additions to the mains or extensions of any kind. He thought surplus money derived from profits should be added to the reserve fund. Their plant and machinery were not worth so much as when the Corporation purchased the water-works in 1868, though they might have been kept in a good state of repair. In the balance-sheet, for instance, the sum of £800 was charged for the purchase of meters from the old Water Company, but would any one say that these meters were now worth £800? Besides which a further sum of £719 was charged for additional meters since the original ones were acquired. He thought it was high time they did something towards writing off a certain amount each year for depreciation of plant, &c. Then the Council were giving the Streets Committee the benefit of £300 per year out of the water-works' profits, without any acknowledgment; besides favouring them to the extent of £400 a year, the cost of watering the streets and finding water in cases of fire, without any charge to the ratepayers. He had no objection to the ratepayers being so favoured, but he thought these figures should be shown in such a way that the townspeople might know how the profits of the water-works were applied.

Mr. WRIGHT, in reply, said that it was proposed to apply the £1600 in the way suggested by the Committee instead of borrowing money to this amount, and having to pay interest upon it. Correctly speaking, no doubt, the plant and machinery were not in so good a condition as when the Corporation purchased the water-works, but when any part of it became worn it was replaced by new, and the cost defrayed out of revenue. As to the formation of a depreciation fund the Committee would, no doubt, consider the matter. With regard to the £400 allowed out of the profits for the watering of the streets, &c., the way this was done was approved of by the Council, and if the Council wished it to be shown in the accounts, no doubt it could be managed.

The portion of the report referring to the application of the surplus profits to the extension of the works having been withdrawn, the motion was put and agreed to.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, April 15, 1881.

Business here practically suspended from Thursday last until Tuesday. No material changes from last quotations.

METHODS FOR JUDGING OF THE WHOLESOMENESS OF DRINKING WATER.

By Mr. REUBEN HAINES.

[Abstracts of Lectures delivered before the Franklin Institute, Philadelphia, U.S.A., in December, 1880.]

(Continued from p. 620.)

Let us now consider some of the defects of the two methods of analysis named, and appreciate what may be really learned by their use.

In the first place, by neither of them can we, with certainty, estimate the exact amount of organic matter actually present in water. For this purpose there is no method known, nor can these methods enable us to identify and separate the different kinds of organic substances that may be present. In fact, we know almost nothing as to their nature, except that there is a general impression that much of this polluting material is probably of an albuminoid character. Frankland's method endeavours to estimate the exact quantity of organic matter, but, as will be seen by a candid examination of the essential defects of the process, there is at least a formidable array of probabilities against the possibility of its doing this. Wanklyn, on the other hand, does not undertake to estimate the absolute quantity, but simply attempts to find a factor by which to make a tolerably accurate comparison of the relative purity or impurity of water. By this method we analyze a naturally good water, known beforehand to be wholesome by long experience and absence of any contaminating source, and the results obtained from this are then taken as a standard by which to compare other waters. The opinion is expressed by some chemists that this standard, although practically constant for any one locality, will be apt to vary considerably for different localities, even remote from the seaside.

In comparing the two methods we may say that both are philosophical in some points, and both unphilosophical in other ways. That of Frankland seems theoretically the better, because a combustion is made of the organic matter on precisely the same principle that is employed in the ultimate analysis of an organic compound. By this means the carbonaceous matter not nitrogenous is also estimated, which does not enter into the results of Wanklyn's method. But Wanklyn's method is more philosophical, because it deals with the water itself, and not with merely the solid residue left after evaporating the water. We want to know what is contained in the water, or at least the properties of the water; but we do not necessarily need to know what is in the residue, for it is at best only indirect evidence, and what is shown by it may be only partially true of the water from which the residue came.

The value of Frankland's process depends on the assumption that what is contained in the residue fairly represents what is contained in the water itself, deducting, of course, the nitrates, which must be got rid of in conducting this method. This is really an assumption which Frankland has never clearly proved to be a fact, and which Wanklyn and others, including German authorities, claim as a mistake. It has been shown by German chemists that an appreciable amount of organic matter is lost during the evaporation of the water, especially when originally volatile matter is present. Moreover, we have no knowledge as to whether volatile products may not be formed during the evaporation at the boiling temperature. Frankland endeavours to prevent the latter result by the addition of sulphurous acid, taking advantage of its antiseptic properties. This has, however, been shown to be quite objectionable, causing the inevitable loss of part of the organic matter through the formation of gradually concentrating sulphuric acid. It is claimed that the further addition of sodium sulphite will not sufficiently neutralize the acid; but whether this is correct or not may not have been proved. Several other technical objections have been advanced against the method, which it will be unnecessary to quote here. Finally, the chances of error, and the numerical corrections to be made are so numerous as to make this method quite complicated and difficult. It requires the chemist to be thoroughly skilled in the most delicate gas analysis, on account of the exceeding minuteness of the quantities to be measured, as compared with ordinary analysis. The apparatus is costly and fragile, and considerable time is required for each analysis. Skilful chemists might not consider some of these as really serious objections, but they will certainly prevent the general adoption of this method by city and state boards of health for sanitary purposes.

This method endeavours, also, to determine the character of the organic matter by the proportionate relation of the organic nitrogen to the organic carbon, this relation being found to be, by an average between wide limits, respectively, 1 : 11·9 for waters containing extract of peat, and 1 : 1·8 for sewage. But Frankland has found that oxidation of peaty matter decreases the carbon, while oxidation of sewage decreases the organic nitrogen: "It is thus evident that the proportions of nitrogen to carbon in soluble vegetable and animal organic matters vary in opposite directions during oxidation—a fact which renders more difficult the decision as to whether the organic matter present in any given sample of water is of vegetable or animal origin." Professor Nichols quotes from Sander: "Without a knowledge of the previous history of the water, the relative proportion (between carbon and nitrogen) is not available as a means of deciding as to the nature of the contamination; if, however, the previous history of a water is known, there is scarcely need of so particular an analysis in order to judge of its character."

It has been shown that in the case of very pure waters the experimental error may often be greater than the total amount of organic material to be estimated, and that in the case of waters containing readily decomposable nitrogenous organic matter, together with a large excess of nitrates, the accuracy of the results may be more or less vitiated by the efforts to get rid of the latter. Mr. Wigner says that "supposing that the organic nitrogen yielded by the Frankland and Armstrong process were a positive quantity instead of a quantity needing a heavy correction for personal equation and for impurities in the chemicals used, yet the danger of error involved in the analysis, and the risk of contamination by atmospheric impurities, are in my opinion sufficient to prevent it from ever coming into general use; and unless generally used it is undesirable for reports which appeal to public sense and public understanding."

Wanklyn's method is also unsatisfactory and unphilosophical as a scientific quantitative method, because it assumes that most of the organic material usually found in drinking water is in its general character similar to animal and vegetable albumen. This is an assumption which no one has yet proved to be correct, and it is difficult to perceive how it can be proved until we know definitely what these specific materials are, which it is impossible to determine in the present state of our knowledge. Wanklyn found that pure albumen yielded by this method about two-thirds of its total nitrogen as ammonia, and that this proportion was quite constant. That this is also true of organic matter in water cannot at present be proved. He proposed at first to calculate the total organic matter as ten times the albuminoid ammonia, but this, he has since, evidently, and it should be said rightly, rejected as both unscientific, and really not necessary for the practical judgment of the sanitary character of water by his method. Those who are familiar with the most recent sanitary experience realize that it is the quality rather than the absolute quantity of organic matter that is the most important factor in the sanitary judgment of a drinking water. A water which contains a large amount of one kind of

organic substance may be much more wholesome, or far less unwholesome, than that which contains only a small amount of another kind. It is a matter of actual experience that a water, notwithstanding it contains a large amount of nitrogenous organic matter capable of yielding albuminoid ammonia, may be found to be practically wholesome, or at least may be drunk for a long period without apparently producing any injurious effects; while, on the other hand, a water which contains even a minimum of organic substance capable of yielding albuminoid ammonia, may nevertheless contain or develop the *materies morbi* or unknown causal "something," of a specific disease.

While Wanklyn's ammonia method is certainly of very easy and expeditious performance, yet great caution is necessary in the formation of an opinion from the analytical results; and thus it may frequently happen that serious mistakes may be made through hasty conclusions from insufficient data. It is said very truly that a really very bad water will rarely, if ever, escape condemnation, and an exceedingly pure water will undoubtedly be shown to be pure, so far as this is possible by any chemical investigation. But by far the larger number of well waters more especially lie between these extremes, and must take their place under the head of "Doubtful Purity," and it is in the judgment of the latter that the analyst is liable to error, even to the extent of rendering an opinion diametrically the opposite of that of another chemist. One of the precautions necessary to be taken in these, and, in fact, in all cases, is to avoid placing any strict reliance, for purposes of judgment, on the standards of purity which have been published in the treatise on "Water Analysis," by Wanklyn, and quoted in a number of recent works on hygiene. It is impossible to lay down exact standards, or rules for judgment, which will hold good for all countries and all localities in any one country. Such "standards" are, as Professor Nichols observes, only of relative value, and different kinds of water cannot be judged by the same standard.

We must, first of all, discover, by numerous and carefully selected analyses, what are the chemical characteristics of good wholesome water in any given locality. These data then form a standard of purity for all waters of one kind within the particular district. A general knowledge of the geological and mineralogical character of the soil and rock of the region is an important factor in such a standard. A knowledge of the chemical character of the ground-water of the district, entirely free from any artificial conditions, such as polluted soil, is necessary for judgment of the well waters of the same district. As regards different kinds of waters we must distinguish between—

1. Ground waters, which include shallow well waters.
2. Deep well waters, including artesian wells.
3. Surface waters, such as rivers, streams, lakes, and ponds.

These three classes have essentially different characteristics, and one should not be compared with another without making proper allowances for these differences. It is thus incorrect to compare well waters near Philadelphia directly with the water of the Schuylkill River, as is sometimes done.

Upon reflection it will be readily understood that well waters are not commonly subjected to the oxidizing influences to which river waters are so freely exposed, such as direct sunshine, air in motion over the surface, and aeration due to falls and currents in the river. Some mineral salts from factory refuse, from coal mines, &c., have possibly a modifying influence which is absent in the case of wells. Now there is a general feeling, among the medical profession and sanitarians, that organic matter which is more liable to rapid decomposition is more dangerous to health than more stable organic substances. In river waters there are greater chances for this decomposition to have been completed, leaving such substances as may be of the latter class in much greater proportion. Hence a larger amount of organic matter will be allowable in river water in the condition used for drinking than in well waters, provided that the supply is taken at a sufficient distance from the places where polluting material enters the stream.

(To be continued.)

SCHEME FOR THE ESTABLISHMENT OF A GENERAL PENSION FUND FOR GAS COMPANIES' SERVANTS.

At the last meeting of the Société Technique de l'Industrie du Gaz en France, a paper was read by M. Leclerc on the subject of establishing a general pension fund for gas companies' servants. Although the materials upon which M. Leclerc's calculations were based were obtained from foreign sources, the general principles of his scheme would, with some modifications, not be altogether inapplicable to gas undertakings in this country, and, if carried out, might be made to work beneficially alike to employers and employed. It is with this view that the following abstract of the paper is placed before our readers.

M. Leclerc commences his paper by alluding to the fact that for the past three years the Society to whose members he was addressing his observations has awarded certain sums as prizes to those foremen or workmen who have given the longest and best service in gas-works; and he states that during this period twenty candidates presented themselves, of whom twelve only could count more than 30 years' service. This number, he remarks, is small in proportion to the total number of men engaged in the gas industry in France, which is certainly not by any means one of recent creation. Why, then, he asks, do we find so few workmen boasting of long service with gas companies, while so many are to be met with in Government departments and in the large industrial undertakings? Is it not mainly because there is no pension to look forward to in connection with the various departments of gas manufacture—no retiring allowance to guarantee the necessities of life to the servant who is compelled by age or infirmity to give up work? Such a fund already exists in the Government departments as well as in many large manufacturing concerns, and its effect is to secure the services of the workpeople up till the time when they absolutely need to be relieved of their duties, inasmuch as it offers an undeniable premium to perseverance. It facilitates the preservation intact of the entire staff, and at the same time provides for its replenishment, by assuring not only the future of the *employé*, but likewise, in the case of the death of a man having a wife and family, that of his widow and children. The establishment of a pension fund for the benefit of the persons employed in gas-works would have the same results; it would attract to, and specialize for this particular industry a number of reliable and attached servants.

It is within the power of every one, unassisted, to create for himself a pension for his old age, if he will only make a trifling demand on the produce of his years of labour. The various insurance companies and, better still, the public funds, afford facilities for this purpose; but, generally speaking, the ordinary clerk or working man has not the wise foresight to avail himself of them. This is an evil that is remedied in many large industrial undertakings by the establishment of special pension funds, the subscribers to which enjoy all the benefits of mutual insurance. Three different systems have been adopted for supplying the capital for these special funds. In some cases it is created by payments made exclusively by the workmen; in others, the proprietors of the undertaking themselves provide it; while in others, and these cases are the most numerous, it is supplied by contributions from both masters and

men. The latter system, being the most general, furnishes the best and most easily demonstrable example of the constitution of a pension fund; and such a fund, actually in operation, under the conditions above indicated, will, supported by figures, serve as an illustration.

The working capital of the fund alluded to is provided—(1) by a deduction of 4 per cent. from all fixed salaries, and one-twelfth of the amount of each increase; (2) by a donation from the company equal to the amount produced yearly by the above deductions; (3) by voluntary contributions to the fund, and by the addition thereto of the various fines levied upon the workpeople; (4) by the interest on any invested money belonging to the fund. The sums deducted from salaries and wages remain the exclusive property of the *employés*, and the gross amount is paid into the pension fund to their personal credit; the surplus cash being invested in the company's shares, real estate, or the public funds. In order to be in a position to claim a retiring pension, the claimant must be 60 years of age, and have been in the company's employ for a period of 30 years. The retiring pension allowed is equal to as many 60ths of the amount of the salary as there have been years of service, and a portion thereof reverts to the widow of the recipient, or to any of his children under 18 years of age, on his decease.

The fund above referred to was established in 1869, and its position at the end of the first ten years' working was as follows:—There were 15,115 persons participating in the benefits of the fund. The number of current pensions was 898, being equal to an annual sum of 579,907 frs., of which 403,147 frs. had to be paid by the Company, and 176,760 came out of the fund. The assets fund were, in round numbers, 17,500,000 frs., which very greatly exceeded the amount necessary to meet all claims that could possibly be made upon it, while it was every year constantly increasing in large proportions. In the year 1879 alone the excess of receipts over expenditure was more than 1,500,000 frs. These figures show that the resources of the fund were very much greater than its requirements, and it might therefore be concluded that the amounts deducted from the salaries of the subscribers might be considerably reduced, the portion contributed by the company and the general receipts alone reaching 1,900,000 frs.

In the formation of a pension fund for gas companies' servants, it is of importance to ascertain, at least approximately, the number of persons who would contribute thereto. With the object of arriving at some definite conclusion in this respect, M. Leclerc instituted a number of inquiries which enabled him to determine, with sufficient exactness for his purpose, how many persons are engaged in the gas industry in France, and how much they receive annually for their services. The Paris Gas Company having already a pension fund in operation, the *employés* of this Company would not be included among the participants in the fund of which the outline is about to be sketched. Leaving, out of consideration, therefore, the City of Paris and the neighbouring districts lighted by the Paris Gas Company, the author found that there are in France about 650 towns lighted by gas, comprising a total population of about 7,500,000 inhabitants, and that the companies supplying these towns have in their employ about 7500 servants who receive yearly a total sum of 9,200,000 frs., apportioned thus:—The managers, engineers, clerks, &c., numbering about 1100, receive 2,700,000 frs.; the foremen, stokers, yardmen, &c., numbering about 2500, receive 2,800,000 frs.; the outdoor workmen, lamp-lighters, and others, numbering about 3000, receive 2,800,000 frs.; and about 900,000 frs. are paid to 900 workmen engaged in miscellaneous occupations. According to M. Leclerc's calculations, a pension fund supported each year by a sum equal to 6 per cent. of the salaries, would suffice to secure for each servant, on his attaining the age of 60 years and completing 30 years of work, a pension equal to one-half of the amount paid to him when in full employment. This, he considers, may be shown by the following figures:—The total amount of salaries received is 9,200,000 frs., 6 per cent. on which would be 552,000 frs. If we suppose that the length of service entitling a man to a pension is 30 years, then each year, in the course of this period, the fund would receive 552,000 frs. The accumulation of these sums, inclusive of compound interest calculated at only 4 per cent. per annum, would produce at the end of 30 years a capital of 32,200,000 frs., which, together with the continuous annual payment of 552,000 frs., would have to meet the pensions falling due. The revenue of the fund would therefore be as follows:—Interest on 32,200,000 frs. at 4 per cent., 1,288,000 frs.; annual subscriptions, 552,000 frs.—total, 1,840,000 frs. At the end of the 30 years, what sum would the fund have to provide, supposing the pension to be equal to as many 60ths of the amount of wages as the servants placed on the pension list could reckon years of service? It would be 30-60ths, or one-half of the amount of salary for 30 years of service. If the 7500 servants alive at the end of the first year were all living at the end of the 30 years, their pensions would require to meet them one-half of 9,200,000 frs., or 4,600,000 frs. But a portion of these pensioners would assuredly be dead, and what this proportion would be might be ascertained from any of the tables of mortality employed by life insurance companies. Taking the figures these tables supply, M. Leclerc found that out of 7500 men at 30 years of age, 3655 only would attain the age of 60. Thus in the first year of the fund coming into operation, the number of claimants would be 3655, in the second year the number would be 3497. Then there would be the subscribers to the fund, who, having replaced those who had died before reaching their 31st year of service, would themselves have attained 60 years of age. How many of these 30-year servants would have passed away before attaining their 31st year? About 117, and of this number 57 would have attained 60 years of age. So that in the second year the number of pensioners would be 3554, while the numbers in the third and subsequent years might be easily calculated.

According to the foregoing figures, the fund would require, during the first year of its operation, to be capable of meeting demands equal to 2,240,000 frs., while its revenue would be only 1,840,000 frs.; whence there would result a deficit of 400,000 frs. There is, however, one eventuality that must be taken into account—viz., the withdrawal of those contributors who leave the business. Such persons would thus lose the benefit of the pension which their connection with the gas industry would ensure for them, and their departure would certainly relieve the outgoings by this difference of 400,000 frs. The pension funds already in existence prove this beyond doubt. These sums would therefore be in addition to whatever donations might be made to the fund.

Relying upon his calculations, and judging from the working of existing funds, M. Leclerc feels confident that, by an annual levy of 6 per cent. upon salaries, a pension fund could be founded which would work solvently. Without taking too sanguine a view of the matter, it might even be supposed that the capital of the fund thus constituted would be sufficient, after a certain number of years, to allow of a reduction in the number of years' service entitling a subscriber to a pension, when the condition of age had been complied with, and also to allow of a portion of the pension reverting to the widows and younger children of deceased pensioners.

Would this 6 per cent., set aside for a pension fund, be contributed by the *employés* alone, by the owners of works alone, or conjointly by both? This is a question which M. Leclerc considered it was not incumbent upon him to deal with in his paper. It could not, he thought, be denied

that the establishment of a pension fund would not be profitable to the servants only, but also, and to a very large extent, to the proprietors of gas-works, as the carrying on of these undertakings with the aid of more reliable and more experienced officers and workmen would be very greatly facilitated, and as a consequence higher profits would be produced. It would rest solely with owners of gas-works to consider whether they would themselves furnish the funds required for the establishment of a pension fund; but M. Leclerc wished to ascertain what would be the approximate cost to them, compared with the profits, by the exercise of such liberality. Most of the large companies, by means of the accounts presented at their annual meetings, make public the amount of their profits. The population of the towns lighted by these companies is known. Now, there is a direct relation between the population of the towns lighted and the consumption of gas, and between the consumption and the labour employed in connection therewith. Consequently one could easily, by means of the averages obtained from the preceding figures, determine approximately the amount spent for service by those companies whose accounts are published. It has been found that the cost of service is generally four-tenths of the annual profit, or even less in proportion to the size of the works. Consequently, if from this profit were taken each year 6 per cent. of the amount of the salaries and wages paid, in order to constitute the basis of a pension fund, this deduction would represent on an average 2·4 per cent. of the profits. Thus the sacrifice the proprietors of gas-works would make in supplying, unaided by contributions from their servants, the capital required for a pension fund would represent on an average rather more than 2 per cent. of the profits. But whether the 6 per cent. on the salaries were furnished by the *employés*, by the proprietors, or by both conjointly, this amount would be sufficient to provide the means for establishing and carrying on a pension fund.

How could all this money be concentrated, and such a pension fund as is here sketched out be organized? Here, M. Leclerc thinks the French Association of Gas Managers (the *Société Technique de l'Industrie du Gaz en France*) could step in and do good service, its object being the union of all the gas-works in France. From these might be sent at certain fixed periods—say, every month or quarter—lists of the persons employed therein, with the amount of the salary or wages paid to each during the period for which the return is made. The working staff would at the same time pay into the Association a sum equal to 6 per cent. of their salaries—either deducted therefrom, or contributed voluntarily by each person, as might have been previously determined. The Association would keep account of the sums so paid in, invest them, and, when required, commence the payment of the pensions earned. The Association would therefore have to make itself cognizant of the exact age and length of service of each individual member of the gas industry. A few clerks would suffice for this duty, and they might act under the instructions of the Secretary of the Association, subject to the control of a Committee of Management elected at the annual general meeting. This Committee would be invested with the fullest powers for the management of the pension fund. M. Leclerc is of opinion that such work as this assuredly falls to the French Association, the rules of which state that its object is to assist temporarily, as far as its means will allow, those of its members who might find it needful to ask for assistance. The Association could not do this unless it had the support of the great majority, if not of the whole of the gas companies in France. Let the proprietors of gas-works only lend their support and the pension fund would soon be created. It is the author's fervent hope that the day will come when this project will be established, and the Association will then have earned the gratitude of all those who are interested in the gas industry—of the proprietors of works, for ensuring them attached and well-qualified servants; and of the servants themselves, for ensuring them the means of subsistence when, through advancing age, they are no longer capable of discharging their customary duties.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Monday.

In many respects corporations may not inappropriately be likened to a flock of sheep. They tread in the footsteps of their predecessors with painful monotony; but whenever one body more daring than its neighbour, strikes out a new path, its progress is watched with something akin to wonder, and, if danger is not very apparent, the other corporations will rush headlong into the same course. With respect to public lighting, this is peculiarly the case. After the eulogistic outburst which announced the proposal to light up our public thoroughfares by means of electricity, experiments were resolved upon in the Metropolis of the country, whence the contagion radiated to the provinces. Until now, however, the capital of Scotland has been free from its effects. Other towns and cities, at greater distances from the centre, have been attacked. Some with a splutter, such as marks the approach of a faulty bit of carbon to the point of incandescence, have flared up, and then subsided into comparative silence; and others, though oft defeated, have adhered to their scheme with a determination worthier of a better cause. Whilst the Harbour Trustees of Greenock have been, in a tug steamer, sailing about the Tail of the Bank, admiring, with a good deal of pardonable pride, the brilliant lights which last week were erected at different points along the harbour, the Corporations of Edinburgh and Leith have been considering the propriety of spending a certain portion of the public funds in making experiments of a like nature. At the meeting of the Edinburgh Town Council on Monday last, Mr. Landale moved, "That it be remitted to the Cleaning and Lighting Committee to consider and report upon the expediency and cost of applying the electric light in the leading thoroughfares of the city; with power to make such preliminary inquiries as they may deem proper." In moving this proposition, Mr. Landale had not a word to say why the course here indicated should be adopted; but Mr. Reid remarked that the Committee should have power to conduct preliminary experiments "so as to educate the public." As showing the amount of interest in this question in Edinburgh it may be stated that the motion was agreed to without a word of comment. I make bold to say that the public of Edinburgh, as a whole, do not want education on the subject of electricity. What they want is more light, and that in the cheapest and most convenient form. If the mode of satisfying this demand which has been adopted at the Register House, where nine or ten of Bray's flat-flame lamps are in use, were more widely followed, especially in crowded streets, less complaint would be heard, and all grumbling would disappear if a little attention were given to the burners in the common lamps in the less frequented parts of the city. In the Leith Town Council the same question was raised last week. Mr. Steven asked if the Lighting Committee had considered the advisability of introducing the electric light into the burgh. He said he had been much struck, while in London, with the success of the light, and he thought, apart altogether from the controlling power the Council would have over the Gas Companies, the benefits would be very great by introducing this system. Mr. Clark, in speaking to the subject, drew attention to the fine light afforded by the lamps erected at the Register House, Edinburgh. A Committee was appointed to consider the whole matter, and possibly, when they visit the Registry and see the effect of

the lighting there, and take into account the relative cost of the two systems, they may find that the "success" is not all on the one side.

Turning from public to private efforts in the domain of lighting by electricity, I have to report that last week Castle Huntly, the residence of Mr. J. F. White, was illuminated by Swan's system. This, I think, is the first instance in which the electric light has been applied to a private establishment in Scotland. The effect is described as being particularly fine, the light being delicately soft and beautiful. Motive power was supplied by an "Otto" gas engine. As an experiment, this seems to have been altogether successful; but it is not difficult to see the limit to which such experiments may be carried. Like many luxuries which could be named, lighting by electricity is within reach of only a wealthy few.

It is somewhat unfortunate that, at this season, complaints should be heard in various quarters about the quality of gas. The most recent utterances on this point are from Glasgow and Dundee. In the latter place Mr. Blair complained at the Council meeting that, with 23·54 candle gas, the public were not getting the quality to which they were entitled; and to this the Provost made the somewhat ambiguous reply that he had no doubt the result was due to the use of English coal. It was, he added, as easy to make gas of good as of inferior quality, and the public would be no worse off at the end of the year by getting inferior gas instead of good gas. If the Provost really means what he says he introduces a principle which cuts two ways, and which, I greatly fear, will not be generally accepted. Suppose that the Dundee Gas Corporation contract with certain coal owners for a supply of coal—at, say, 18s. per ton—giving, per ton, 10,000 feet of 27 candle gas, and the merchants were to substitute a coal giving a much smaller yield of an inferior quality of gas, the Corporation would not be worse off at the end of the year, according to the principle laid down by the Provost. Hitherto the public of Dundee have been getting gas of a given illuminating power at a stated price, and while the price per 1000 feet is maintained, they are supplied with an inferior article. In such circumstances it is not very apparent that the public will not be worse off at the end of the year. But again this inferiority is attributable to the use of English coal. Mr. McCrae has been for some time employed as Manager of an English works, and it may be that he prefers to work the inferior gas coal produced in that country, but if his object had been merely to supply gas of a lower illuminating power than formerly—which I do not for a moment seriously think—it was not at all necessary to cross the Border to obtain material to attain his end. I can remember some four or five years ago an attempt was made, at one of the meetings of the West of Scotland Association of Gas Managers, to enlist the sympathies of the members in favour of a 26-candle standard for Scotland; but the proposal met with no sympathy. In fact, the general desire seemed to point rather to increasing than diminishing the standard. It would seem, however, that some managers, whatever be their object, are doing what they can to lower the standard, and to sweep away that pure and highly luminous gas for which Scotland has attained a certain amount of notoriety.

When a company proposes to interfere with the amenity of the town in which they conduct their operations a storm of indignation is often raised, and not unfrequently costly litigations ensue. And it is astonishing from what a small point momentous issues are evolved. For some time past the good people of St. Andrews have been agitated by the proposal of the Gas Company to erect coal sheds on a space formerly occupied by a gas-holder. The ground in question was originally feued by the city to the Company for the construction of a gasholder. Larger holders having been erected at another place, the Company now propose to utilize the piece of ground in the manner described, but as the erection is likely to interfere with the view to the east from the Kirkhill, representations have been made to the Directors in order to obviate this objection. The subject has been under the consideration of the directorate, but as yet no definite decision has been reached.

At the usual monthly meeting of the Perth Gas Commissioners last Monday evening it was reported that the offers for coal this year were a little cheaper than the contracts entered into last year. I may add that this is the general experience of managers. It further appeared from the Manager's report that the quantity of gas made during March was 394,100 cubic feet more than was made in the corresponding month last year, and that there was an increase in the quantity of gas made this year to date, over last year, of 2,696,100 cubic feet.

A week or two ago I mentioned that the Edinburgh Gas Company contemplated extensive alterations in their works, and that the first step in this direction was the issuing of schedules for the erection of new purifiers with hydraulic gearing. I have now to state that the estimate of Messrs. C. and W. Walker, of London and Donnington, for the completion of the work, has been accepted.

The difficulty with respect to the lighting of the streets of Banff, to which reference was made in these "Notes" several weeks ago, has now been overcome. Mr. Watson, the Manager of the Gas Company, has had a meeting with the Commissioners of the burgh, and an amicable arrangement has been come to, under which certain additional lamps will be provided, and others removed to more convenient spots than those which they at present occupy.

The Water Commissioners of Perth have agreed to grant a supply of water to the Perth General Prison for five years at the rate of 4½d. per 1000 gallons.

At a meeting of the Edinburgh and District Water Trust on Tuesday it was intimated that the Water Committee had refused to accede to the request of the inhabitants of the parishes of Liberton and Newton that they should be furnished with a supply of water from the Crawley pipe. It should be known that the Crawley springs, at the Pentland Hills, yield a supply of water which, for its crystal-like purity and excellence, was in the past thoroughly appreciated by the people of Edinburgh. Unfortunately these springs could not meet the ever-increasing demand for water, and the Moorfoot scheme was introduced. Now this latter supply is said to be as brown as a coffee-bean; and that, despite the utmost attention to filtration it is, from its colour alone, unrepresentable, especially in a city which hitherto has been so well supplied with a more than usually pure article. In order, therefore, to effect a compromise, the waters of the Crawley and the Moorfoot are mixed in a large reservoir at Liberton, and the colour being thus to a certain extent neutralized, the compound is distributed over the city. The decision of the Committee to allow none of the pure water to go away is wise, and if only a consistent policy had been pursued, I dare say no one would have objected; but it seems that the suburban village of Corsorphine is getting pure Crawley water, and some of the Water Commissioners are not unnaturally raising their voice against this favouritism. When the question was first raised, some lame excuse was made by the officials that this course had been adopted to save some 2½ miles of piping, and this apology proving unsatisfactory, an additional explanation has been made bearing upon the question of pressures. The point is not to be allowed to rest here, because Ex-Provost Wood is to reply to this explanation at the next meeting of the Trustees.

In connection with the scheme for the drainage of Musselburgh, I stated in a recent number of the JOURNAL that three members of the Town Council had resigned, because a number of the inhabitants had, in public

meeting, condemned the scheme. It has now been shown that the vote of the meeting in question did not amount to one of "no confidence," and the resignations have been withdrawn. The scheme is to be proceeded with.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Monday.

It seems that a little correction requires to be made in reference to a statement contained in one of my "Notes" in the JOURNAL of the 5th inst. I am informed that the price of gas at Coatbridge is not 3s. 8d. but 4s. 2d. per 1000 cubic feet, as well as in Airdrie. If I have unwittingly been led into making a mistake, I have to plead that my authority was a letter in a local newspaper, and that the statement there made has not yet, so far as I am aware, been contradicted.

The members of the Waverley Association of Gas Managers—which claims to be the oldest organization of the kind in existence—was held last Thursday, in the charming Tweedside town of Melrose, under the presidency of Mr. John Hall, of Berwick-on-Tweed. At the termination of the business the members and their friends observed the time-honoured custom of dining together.

At last Thursday's monthly meeting of the Glasgow Town Council, the Gas Question was brought up for consideration by Mr. Richmond, a member who is professionally engaged as a manufacturer of malleable iron tubes, and who may therefore be supposed to take a special interest in gas matters. He was anxious to know why the gas supplied to Glasgow was so frequently under the illuminating power which the Glasgow Gas Act provides as the standard or minimum—viz., 25 candles; and he wished also to know if the subject had been under the notice of the Magistrates, or if the Gas Committee could give any reason for what seemed to him to be an alarming state of affairs. The Lord Provost replied that the matter had been under the consideration of the Magistrates that forenoon, and they had agreed to make a representation to the Gas Committee in reference to it. At a later stage of the proceedings, ex-Bailie Walls, Convener of the Gas Committee, referred to the complaint made by Mr. Richmond, and said that from the recent report on the subject he found that the illuminating power was 26.6 candles at Dalmarnock, 25.7 candles at Dawsholm, and 25.74 candles at Tradeston; giving an average of 25.83 candles. But this statement did not satisfy Mr. Richmond, who mentioned that, from information received from Dr. Wallace, the Gas Examiner for the city, between March 1, 1880, and March 1, 1881, the gas made at Dawsholm was 12 days under the standard, 9 days at Dalmarnock, and 17 days at Tradeston—total, 38 days. He also urged that the Glasgow gas, contrary to what had been said, was not better and cheaper than what was supplied elsewhere, particular mention being made of Galashiels, Aberdeen, Dumfries, and Paisley. Speaking with special reference to the gas made at the Tradeston station, which was the gas consumed in his own house, he remarked that it was down as low as 23.27 candles in the month of March, 1880. After some further remarks from Mr. Richmond a reply was made by Mr. Walls, who said that on the whole question he thought there was no legitimate cause of complaint, and that when the gas was as high as 27 or 28 candles they had to complain to their Managers, because when they made gas of this quality they did so at serious loss. Further remarks were made on the subject by Bailies McOnie, Laing, and Finlay, and by Treasurer Hamilton, and Mr. Dron. In a letter by Dr. Wallace since published in the local newspapers, this gentleman states that during the year from March 1, 1880, till March 1, 1881, the average illuminating power of the gas made at the three stations—Dawsholm, Dalmarnock, and Tradeston—was 26.60, 26.30, and 26.16 candles, respectively; and that if the gas had been tested at the works it would have been better still. The last item of business transacted at Thursday's meeting was the unanimous adoption of Mr. W. R. W. Smith's motion, of which notice was given at a former meeting—viz., "That the Gas Committee be instructed to take into their consideration the propriety of expending £500 in an investigation of the best methods of, and machinery for applying gas for lighting, heating, cooking, and motive purposes; with powers, if they so resolve, to employ, outside of their own officials, scientific and machinery experts, and to publish the result of such investigation."

A meeting of the Town Council of Paisley was held last Tuesday evening, when Mr. A. M. Ross, Town Chamberlain, was appointed Treasurer to the Gas Corporation, under the Paisley Gas Act of 1870.

Mr. Carlow finally severed his connection with the Port-Glasgow Corporation Gas-Works on Saturday, the 9th inst.; but when the new Manager is appointed, he will return from Arbroath in order to hand over the plant to the keeping of his successor. At a special meeting of the Town Council held on Thursday evening, a list of six applicants for the vacant post was resolved upon. Amongst the six there are some gentlemen belonging to neighbouring places.

On the 15th inst., at the age of 63 years, Mr. Thomas Granger, who was so long the Manager of the Partick Gas-Works, departed this life. The deceased was high respected, alike by his employers and by his brother officials. It is fully a year since the Partick works ceased to have any existence as a gas-making station.

Business was done on Thursday in Glasgow Corporation 9 per Cent. Gas Annuities at £224.

The pig iron warrant market has been dull this week, and with but a moderate business, the prices have daily marked a slight reduction. The demand from all quarters is light, and the usual development of traffic at this season makes but little progress. Shipping iron is quiet, with little doing. Official prices are only slightly altered, but in second-hand hands prices are lower on the week.

All descriptions of coal come freely to hand, and as the supply is in excess of the demand, stocks are accumulating. Prices are scarcely altered from what they were a week or two ago.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The holidays during the past week have, to a considerable extent, interfered with business, both in the coal and iron trades of this district, collieries and iron works being closed from Thursday evening until this morning. Apart, however, from the holidays, dullness generally prevails throughout both the above branches of trade, the iron market especially being in an extremely depressed condition. For round coals the demand is falling off with the warmer weather, and prices are easing downwards, particularly in the second and inferior classes of coal, which in some cases are now being offered at the rates ruling prior to the recent strike. A few inquiries for gas coal are now coming into the market, but beyond the general statement that in all probability prices during the ensuing season will again rule low, no definite quotations can at present be given. For best Wigan Arleys 9s. to 9s. 6d. per ton at the pit's mouth is still being obtained, but inferior qualities and Pemberton four-feet are to be bought at from 7s. to 7s. 6d., and common round coals at from 5s. to 5s. 6d. per ton. Engine fuel remains steady in price, and the average quotations at the pit's mouth are about 4s. 6d. for common, and 5s. for good burgy, 3s. 3d. to 3s. 6d. for common slack, and 4s. 6d. for the best sorts.

Collieries working the common mines are in the majority of cases running short time, and both of common coal and burgy considerable stocks are being put down.

The advance of miners wages at the Manchester pits has been followed in the Atherton district, where Messrs. Fletcher, Burrows, and Co. have conceded an advance equal to about 7½ per cent. to their men.

There has been an almost complete absence of demand during the week for either pig or manufactured iron, and prices so far as they have been tested have shown decided weakness. Lancashire pig iron delivered into the Manchester district could be bought at from 44s. to 45s. per ton, less 2½ per cent., and common bars at from £5 12s. 6d. to £5 15s. per ton.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade remains flat, and the consumption of manufacturing fuel in the district is much below what it was a month ago. Household qualities, too, are selling slowly, the arrival of milder weather having suddenly checked operations in this department to a considerable extent. The reductions reported a week ago have failed to bring any increase of business, and as the iron trades are in a declining condition the outlook for the spring months is somewhat gloomy. The call for gas coal is also dull, and cokes are plentiful and rates easy. The miners have accepted the reduction in good faith, though employment is not abundant. But few of the collieries in this district are doing more than four days per week.

The prospects of the iron trade are anything but flattering, and there is a scarcity of orders in both the raw and finished departments. The masters' quarterly meetings took place at Wolverhampton on Wednesday, and Birmingham on Thursday. Both meetings were well attended by local and neighbouring makers, as well as buyers from different parts of the country. Business, however, was not good, and though orders and inquiries were more numerous than they have been for the past week or two, there was nevertheless an absence of confidence for the immediate future. New rates were fixed for the ensuing quarter, and gave a drop on all classes of iron. The reduction of 10s. per ton on marked bars given by Messrs. Williams a week ago was announced generally; there, however, being one or two exceptions. The Earl of Dudley's price for Round Oak brand, is £7 12s. 6d., whilst the New British Iron Company and Messrs. John Bradley and Co. hold out at rates as they stood during the past quarter. Unmarked bars are the most saleable qualities, and the business done in bars was principally with known unmarked makes. The demand for hoops, plates, and sheets, to which also the reduction extends, was not good, though perhaps a trifle better. The prices for finished iron during the ensuing quarter will rule as follows:—Marked bars, Earl of Dudley's Round Oak, £7 12s. 6d.; the New British Iron Company, with those of Messrs. John Bradley and Co., £7 10s. 6d.; other makers, £7; unmarked bars, £5 10s. to £6 10s.; sheets (single) £7 10s. to £8 10s.; plates (including girder and boiler), £8 to £9 10s.; hoops, £6 7s. 6d. to £7 10s.; strips, £5 10s. to £6 15s.; best double sheets, £9 to £11 10s.; nail rods, £5 15s. to £6 15s., and puddled bars, £4 10s. to £5 10s. The pig trade, likewise, was unproductive of any sensational business at the reduced quotations; best pigs being offered at £3 and upwards, cinder pigs at £2 to £2 15s. One or two firms are holding out for old rates in respect of best pigs. Iron-stone sold steadily. The manufacturers generally throughout the district are less active, and the demand for the foreign market is less important. Orders on both American and Indian account are somewhat scarce.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade taken as a whole is the reverse of cheering, and although some of the works are fairly off for orders, the majority of firms have plenty to do to keep their hands employed. The demand for pig iron is not so good, nor is the output so large as it was a short time ago. A great quantity of iron ore from North Lincolnshire and other places is being imported into the district where the local supplies are very scanty. The mills and forges are only partly worked, and the same may be said with regard to the foundries, some of which are almost at a standstill. Makers of Bessemer steel rails and axles are in receipt of fair orders, which keep the works going. Engineers and fitters are not over well employed, but one or two firms have some fair orders for gas apparatus and fittings on hand.

The collieries in both South and West Yorkshire are just now rather better off for work than they were a short time ago, but even now nothing like full time is being worked. The business passing in house coal is subject to great competition, supplies being readily procured at low rates. The Silkstone pits are not making full time, and the same remark applies to those working the Barnsley and other seams. There is not more than an average tonnage sent to the Metropolis by any of the lines carrying coal from Yorkshire. The Great Northern, which takes most of the coal from Doncaster, is forwarding only a moderate quantity. With the other leading markets business is only quiet, whilst competition is very keen. The merchants in the Eastern Counties seem to be doing a heavier tonnage than they were a month ago.

The position of the steam coal trade has rather improved, and coal-owners are looking forward to the opening of the Baltic ports with great interest. Many of the Yorkshire collieries doing business with Hull during last quarter sent a much less tonnage than they were accredited with in the same period of last year. Those pits which were set down by the men leaving work suffered severely, and the result is that a good deal of the business done before the strike has left the district. There is rather more coal being sent to Grimsby, from which port the exports have of late been very small. The West Yorkshire collieries are also doing an improved trade with Goole. Prices, however, were scarcely ever lower, and it is feared they will continue, inasmuch as the supplies are in excess of the demand.

The call for gas and locomotive coal does not vary a great deal, owing to the fact that this class of fuel is for the most part supplied by contract. The output is just now fully an average one, and some of the collieries have cause to be glad that such contracts are in existence, although prices are very moderate indeed.

Makers of the best brands of coke find a pretty ready market for their produce in North Lincolnshire and other places. The output, is, however, not so large as it was, owing to some of the collieries and masters being in difficulties; still there is no lack of supplies.

The miners throughout both districts are being agitated with the consideration of the desirability of the South and West Yorkshire Miners Unions being amalgamated. The question has been considered at a joint meeting of the representatives of the two bodies, and will be resumed on the 25th inst. It may be stated that the South Yorkshire Miners Association was formed in 1858, and at one time was a large and powerful union. A West Yorkshire Association was formed in 1844, but was afterwards broken up. In 1858 another was organized in the district, which in 1861 boasted of 1000 members. In 1870 the then existing Association had fallen in numbers to about 500, and it was then suggested that an amalga-

mation with South Yorkshire was desirable. The object was, however, never attained, but there seems to be some prospect of its being now adopted.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coals from the Tyne and other northern coal ports continue to be of the usual average for the season of the year. The demand is falling off coastwise, but it is increasing overseas. The general state of the coal trade is rather dull. Except for very best qualities there are complaints that the trade is not very remunerative. There is great competition between the Scotch, Yorkshire, and our second-class north country collieries for the overseas trade, which tends to effectually keep down prices, or, in other words, to prevent them rising. The exportation of coals, of course, taking it as a whole, is enormously large; but the area of production is equally large. The requirements of colliery owners, too, are such that a market must be found. The changes of seasons and the altered conditions of trade are not able to overcome the effects of the over-production of second-class coals—which latter are not strictly gas coals—but which, nevertheless, compete with second-class gas coals. Hence the gas coal market is ruled by the same conditions as the other branches of the second-class coal trade. Wages difficulties do not prevail in the Durham gas colliery districts; and upon the whole the sliding scale governing the rate of pitmen's wages works well. Since it has been brought into operation it has put a stop to strikes. The coke trade is doing better. The production of coke in the county of Durham is the largest this year which can be remembered. If the iron works were improving, the demand for coke would get better, no doubt. There is more business doing for the Baltic and Mediterranean than there was a month ago, and this trade is increasing.

The rate of freights to countries whither gas coals are shipped over the opening months do not advance materially. Merchants and large gas companies in the Baltic, which have just announced their first shipments in the fulfilment of large contracts that were made a couple of months ago for the Baltic, are likely to find their calculations right, as there are few probabilities of any material advance in freights over the next two months. The coasting business done by steamers is quiet. Rates are low, with not much prospect of a rise. Small sailing vessels have been more plentiful in the coal ports over the last eight or ten days; hence small cargoes of fire-bricks, fire-clay, and material of that sort have been got away readily.

The iron, lead, and other trades in metals are dull. Chemicals do not improve in value. This important industry is in a very depressed state, and some of the manufacturers, if it does not improve very soon, will have to close their works, it is feared.

REDUCTION IN THE PRICE OF GAS AT HASTINGS AND ST. LEONARDS.—It is announced that, on and after the 1st of October next, the price of gas in these towns will be reduced 3d. per 1000 cubic feet—viz., from 4s. 3d. to 4s.

A STRANGE ADVERTISEMENT.—For about a week past there has appeared, in one of the Dublin daily newspapers, an advertisement which it would seem is an ingenious attempt to depreciate the value of the shares in the Alliance and Dublin Consumers' Gas Company. The advertisement was as follows:—"Gas Shares. To be Sold a bargain, Two Hundred and Fifty £10 Shares in Alliance and Dublin Consumers' Gas Company; £16 per share will be taken if bought in one lot. Address, &c." We learn, from a letter that Mr. W. F. Cotton, the Secretary of the Company, has addressed to the Editor of the paper in question, that several applications have been made by letter and otherwise to purchase these shares upon the terms named in the advertisement, but no information can be had upon the subject, beyond the fact that, at the address given, nothing is known about them.

WAVERLEY ASSOCIATION OF GAS MANAGERS.—The fortieth half-yearly meeting of this Association was held at Melrose last Thursday, under the presidency of Mr. John Hall, of Berwick and Tweedmouth. The Secretary and Treasurer (Mr. G. Taylor, of Jedburgh) read the minutes of the last meeting, and submitted the accounts, which showed a balance in favour of the Association. Mr. Hall was unanimously re-elected President for the ensuing year, and Mr. George Taylor was re-appointed Secretary and Treasurer. The principal matter for discussion was the difficulties of the past winter in the way of keeping gasholders and gas meters from freezing. Mr. J. Robb (Haddington) gave some practical advice as to the preventing of the freezing of water in the tank, and the use of glycerine for the same purpose in wet meters. He stated that, owing to the immense falls of snow, he was able to protect his gasholder tanks with a snow wall, so as to prevent the frost from reaching the water; and he found this a very effective method of preventing the freezing of holders. A discussion also took place on the relative merits of wet and dry meters. The members of the Association and friends afterwards dined together—Mr. Hall in the chair—when a pleasant afternoon was spent.

PROFIT FROM CORPORATION GAS UNDERTAKINGS IN THE POTTERIES TOWNS.—In the course of a public meeting at Hanley last Thursday—convened "for the purpose of taking into consideration the largely increased rates of the borough and the desirableness of the loans owing by the borough being consolidated, and the repayment of the same being extended over a greatly lengthened period, and for the consideration of other matters relating to the affairs of the borough"—one of the speakers alluded to the great profits which had been derived from the Corporations of Stoke, Burslem, and Longton purchasing the gas-works in their boroughs, and contended it was desirable that the Corporation of Hanley should have under their control and management the supply of both gas and water. He thought an effort should be made to bring about an alteration of the law, so as to accomplish these objects by arbitration. The Mayor, in reference to this question, said the Burslem Corporation laid rates to the extent of 4s. 1d. in the pound, and profited to the extent of 7½d. in the pound by the gas-works. The Longton Corporation rates were 4s. 6d. in the pound, the profits on the gas-works equalling a rate of 8d. in the pound. The Stoke Corporation laid rates of 3s. 6d. in the pound, and obtained 1s. in the pound profit on the gas-works. Hanley Corporation, on the other hand, laid rates to the extent of 3s. 6d. in the pound, but did not derive any benefit from the gas supply. If, however, they had had the gas-works they would have been in a good position as compared with the neighbouring boroughs.

GAS LIGHTING v. ELECTRIC LIGHTING IN NEWCASTLE-ON-TYNE.—We take the following from last Thursday's *Newcastle Daily Chronicle*:—"The Swan electric lamps, at present burned nightly in Mosley Street, Newcastle, were last night inspected by several thousands of the inhabitants, when the relative merit of gas and electricity was discussed in many groups. The admiration which the new lights had evoked appeared to have been accepted as a challenge by the Gas Company, who in the course of the day had placed at the opposite corner of the street one of Bray's three-light lamps, which was lighted yesterday evening. The effect produced by the lamp—which was obscured at the top—was really

splendid; its illuminating power being excellent. The advocates of gas-lighting claimed a victory for the old over the new mode and power of illumination, basing their claim on the assertion that Mr. Swan assigns to each of his lights the merit of giving double the radiance of an ordinary gaslight; a quality also claimed by the Bray burner. The placing of the new lamp with three burners against those similarly furnished by Mr. Swan, they therefore considered, was a perfectly fair test. In addition to this, they considered that the ordinary one-light burner had a better illuminative effect than any of the electric lamps. Measurements were made across the street, in the midst of interested crowds, from the rival lamps; and whereas the reflection of the new light was asserted to be thrown only five yards, that proceeding from the old one was stated to be at least one yard and a half beyond that distance. Amongst the supporters of Mr. Swan's invention, the flickering nature of the gaslight was pointed to as a drawback to effective illumination; and it was claimed by them that as the full power of electricity was not on from Mr. Swan's premises, the new lamps were seen at great disadvantage. This, we believe, was the case. The carbon is stated to have been somewhat injured by the power placed on the lamps on Tuesday, and the full effect produced then seemed certainly last night in a great measure to be lacking."

PRESENTATION TO MR. SAINSBURY, OF TROWBRIDGE.—To mark the completion of his 25 years' connection with the British Gaslight Company (the last 15 of which he has been Manager of their Trowbridge works), the *employés* under Mr. R. H. Sainsbury, on Tuesday last, presented him with a handsome "Gladstone" travelling bag; the presentation being made the occasion of a very pleasant gathering of some 40 of the workmen and others. Mr. R. M. Couper, in presenting the gift, said Mr. Sainsbury came to Trowbridge 25 years ago, as a lad of 16, to take the position of clerk in the office at the gas-works. He soon earned promotion at the works, grew up to manhood and was soon, very suddenly to him, called to occupy the position of Manager, and from that day to this had continued to keep the post, now some 15 years. He thought it would be interesting to go back and see what the Trowbridge Gas-Works were when Mr. Sainsbury came, and what they were now. For the half year ending June 30, 1855, the quantity of gas distributed was 4,845,000 feet; for the corresponding period of 1880, 15,262,000 feet. In the month of January, 1880, gas was made nearly equal in quantity to that made during the whole half year ending June 30, 1855. For the year ending the 31st of December, 1855, 10½ million feet were distributed; for the corresponding period of 1880, 33½ millions. In 1864 there were 40 retorts at work in the darkest month of the year, and the quantity of gas sent out for that month was 3,200,000 cubic feet; for the half year ending Dec. 31, 1864, the total quantity was 10 million cubic feet. In Dec. 1880, there were the same number of retorts at work, and they produced for that month 5 million cubic feet; for the half year ending Dec. 31, 1880, the quantity was 18 millions. The number of consumers in 1855 was 500; at the present time it was 1500. The number of public lamps in 1855 was 161; but this number had increased since then about 30 per cent., and he thought whatever people might say, on the whole the town was very well lighted, thanks to the Local Board for vigilantly looking after the interests of the ratepayers. He alluded to the increase in the size of the gas-works, hoping they would still make greater advances in the future; and then made mention of the electric light, saying that they were not afraid of being eclipsed by it in Trowbridge just yet. They all knew that this light had great functions to perform, and he believed gas companies had also a great work to do in the future. He referred to his 7½ years' connection with Mr. Sainsbury, during which time they had never had anything approaching dissension, and said his hope, and that of the men, was that Mr. Sainsbury would long continue to be Manager of the gas-works. Any one who knew Mr. Sainsbury saw how he had done his best for the comfort and prosperity of his fellow-men. He alluded to Mr. Sainsbury's connection with the temperance movement, stating that some of the men now engaged on the works were total abstainers, and he only hoped the time would be when all the men were enrolled as such. He then presented Mr. Sainsbury, in the name of the *employés* of the British Gaslight Company, with the travelling bag, which bore the following inscription:—"Presented to Mr. R. H. Sainsbury, Manager of the Trowbridge Gas-Works, on the completion of 25 years' faithful, exemplary service, and as a token of the high esteem in which he is held by the *employés* of the British Gaslight Company, Limited, Trowbridge; April 12, 1881." Mr. Sainsbury, in accepting the gift, and thanking the donors, reverted to the time when he first came to Trowbridge and engaged as clerk with Mr. Tadman, who was then Manager. He spoke of his early duties, and then contrasted the present state of the men with what it was when he went to work first, testifying to their now sober and temperate habits. He remembered the time when there used to be disputes and differences amongst the men, but he was thankful to say they did not hear anything of the sort now. When he came to Trowbridge first, the stokers used to get 12s. a week and a pint of beer a day, and he thought they used to spend more in one week in beer than was spent on the works in three months now. He expressed his thankfulness for these better times, and hoped to see even better still. He did not force the men to be teetotallers, but he should like to lead them to become so.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 1518.—WALLER, G., Southwark, London, "Improvements in gas-valves." April 7, 1881.
- 1528.—SUGG, W. T., Westminster, "Improvements in the mode of and means for uniting gas, water, and other pipes or tubes." April 7, 1881.
- 1541.—BÉNIER, L., Paris, "Improvements in gas-engines." April 8, 1881.
- 1564.—WILD, R., Littleborough, Lancs, and LEDGER, H., Leek, Stafford, "Improvements in and apparatus for treating and purifying sewage and other foul liquids, gases, and noxious vapours, and converting the sludge arising therefrom into fuel, partly applicable to apparatus for carburetting gas or atmospheric air." April 11, 1881.
- 1585.—SOMERVILLE, J., Denmark Park, Surrey, "Improvements in apparatus used in the manufacture of gas." April 12, 1881.
- 1587.—YOUNG, W., Lasswade, N.B., "Improvements in the manufacture of mineral oil and ammonia, part of the said improvements being also applicable to the manufacture of coal gas." April 12, 1881.
- 1590.—LLOYD, T., Winchester, Hampshire, "Improvements in pipe joints." April 12, 1881.
- 1597.—DORV, H. H., Strand, London, "Improvements in and in connection with gas burners and other burners." April 12, 1881.
- 1607.—ALCOCK, A., Sheffield, Yorks, "Improvements in the manufacture of gas for lighting and heating purposes, and in apparatus therefor." April 13, 1881.
- 1609.—KIDD, J. H., Wrexham, Denbigh, "Improvements in the method of and apparatus for raising, forcing, and measuring liquids." April 13, 1881.

1619.—BREWER, W. J., Bombay, India, "Improvements in gas and other lamps, and in reflectors for same." April 13, 1881.

1621.—BREWER, W. J., Bombay, India, "Improvements in automatic gas regulating burners, in part applicable to the regulation of fluids in general." April 13, 1881.

1641.—BLUM, J. H., Bienne, Switzerland, "A new or improved liquid meter." April 14, 1881.

1665.—LEWIS, J., Stepney, London, "Improvements in combined air and gas burners, to increase the illuminating and heating power of gas." April 14, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4196.—LOVE, W., Glasgow, "Improvements in apparatus for heating and ventilating by means of oil or gas, and in part applicable to lighting apparatus." Oct. 15, 1880.

5247.—MACDONALD, J., Queen Victoria Street, London, "Improved means of and apparatus for increasing the illuminating power of coal gas." Dec. 14, 1880.

245.—CLARKE, C. L., and LEIGH, J., Manchester, "Improvements in the construction of apparatus for lighting gas, which improvements are also applicable to other electrical appliances." Jan. 20, 1881.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending April 13, 1881.

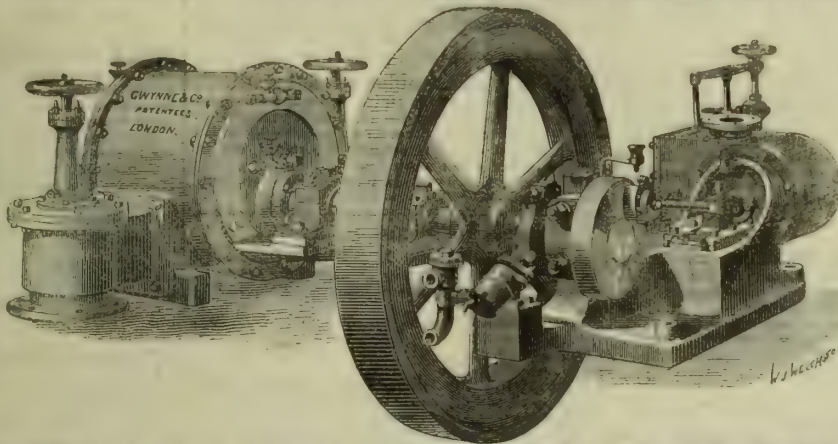
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.9	16.6	17.3	11.0	9.7	10.3	0.2	0.0	0.0	None.	In excess.
	Camden Town	17.4	16.6	17.1	12.3	11.8	12.2	0.1	0.0	0.0	"	"
	Dalston	18.6	16.9	17.4	12.2	9.3	10.6	0.4	0.0	0.1	"	"
	Bow	17.8	16.8	17.0	13.4	11.1	12.7	0.6	0.3	0.5	"	"
	Chelsea	17.1	16.6	16.8	15.8	12.2	14.5	0.4	0.0	0.2	"	"
	Kingsland Road	17.2	16.0	16.8	10.8	9.8	10.3	0.3	0.0	0.1	"	"
	Westminster (cannel gas)	21.7	20.9	21.3	11.4	7.7	9.1	0.3	0.0	0.1	"	"
South Metropolitan Gas Company	Peckham	16.7	16.2	16.5	14.6	11.5	12.4	0.5	0.0	0.3	"	"
Commercial Gas Company	Old Ford	17.6	16.8	17.3	12.5	10.3	11.4	0.4	0.2	0.3	"	"
	St. George-in-the-East	17.9	16.9	17.6	8.6	6.5	7.6	0.2	0.0	0.0	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
Have made the largest and most perfect GAS-EXHAUSTING MACHINE in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

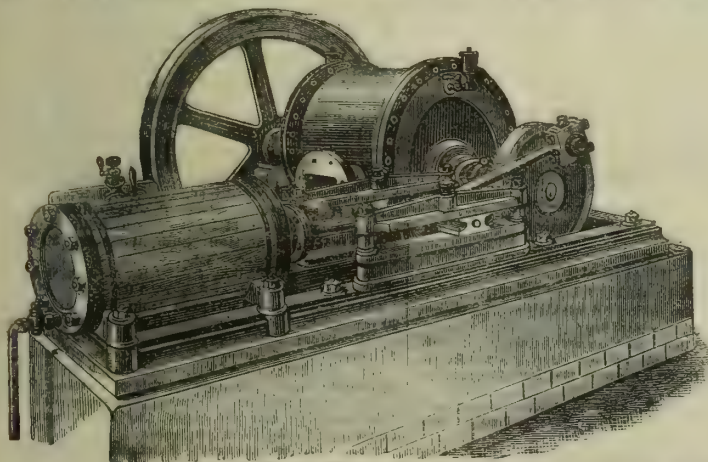
PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, **ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.**

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE
OSCILLATION, FRICTION, AND POWER.
TO WORK BY BELT OR WITH

ENGINE COMBINED.



GEORGE WALLER & CO.,
Makers of **BEALE'S EXHAUSTERS,**
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
SELF-ACTING BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, Masonic Votes—William R. Watson polled 388 Votes on April 11, making with the 234 brought forward 631 Votes. He must have at least 1300 to get into the School next time. Kindly send your Masonic Votes for October (or any Votes for exchange) to **MAGNUS OHREN, SYDENHAM.**

WANTED, a Situation as Manager of Gas-Works, making over 4 millions per annum First-class Gas-Fitter. Can set his own Retorts, and do any work required in Gas-Works. Eight years in present situation. No objection to go abroad. Aged 38. Address No. 740, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Engagement as Secretary, ASSISTANT SECRETARY, or CASHIER. Ten years' experience in Gas undertaking. Good references and security. Aged 38. Address M. R., 202, Monument Road, BIRMINGHAM.

WANTED.—The Advertiser, a young man, aged 31 years, will shortly return from a foreign engagement. Has a thorough Practical Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 13 years. A Situation in a like capacity preferred, either at home or abroad, and security to any reasonable amount given for the due performance of all duties in connection with the Office. Unexceptional testimonials as to character and ability. Understands the Spanish language well. Satisfactory reasons for change. Apply, by letter only, to No. 741, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RE-ENGAGEMENT wanted as Manager or SECRETARY and MANAGER of Gas-Works, or ASSISTANT in large Works, by one who has for the last 12 years been Manager of Gas-Works in a large provincial city. Aged 34; married; abstainer. Can leave present situation at brief notice. Highest recommendations. Address No. 727, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GASHOLDER AND BOILER MAKERS.

THE Advertiser, who has been Foreman for a large firm of gasholder manufacturers for the last four years, seeks a similar appointment. Is well up in the most Economical and Systematic way of Constructing Gasholders, &c. Could introduce improved machinery—machine for punching curves on top sheets and set-out for same. Is well up in Piece-work, Boilers, Girders, Tanks, &c. Address **WILLIAM DENTON, 17, Tulip Street, Moor End, Hunslet, LEEDS.**

WANTED, a Working Foreman for a Gas-Works producing about 16 million feet per annum. Must be thoroughly competent to take charge of the entire plant; and preference will be given to any who may also have experience in Water Supply. The Board provide a house, with gas, water, fuel, and rates free. Address, with testimonials, stating wages required, to **MR. D. SCHOFIELD, Clerk to the Local Board, Atherton, near MANCHESTER.**

BOROUGH OF CARDIFF.

WANTED, in the Water Engineer's Office, a well-qualified ASSISTANT. The person to be appointed must have had considerable experience in a similar appointment, in both indoor and outdoor work. Salary not to exceed £150 per annum. Applications, stating age and experience, and enclosing copies of testimonials of recent date, addressed under cover, and endorsed "Assistant, Water Engineer's Office," to be forwarded to the undersigned, at the Town Hall, Cardiff, not later than Wednesday, April 27. By order, **J. L. WHEATLEY, Town Clerk.** Town Hall, Cardiff, April 5, 1881.

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gasholder. Must be thoroughly sound. Price and particulars to be addressed to **MR. EDWARD BAKER, Engineer, Reading Gas-Works.**

WANTED, Two Purifiers (second-hand), each 9 ft. or 10 ft. square, with Valves and Connections complete. Also CRANE for lifting Covers. Apply to No. 739, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD—A Wrought-Iron Tank, 30 ft. in diameter by 12 ft. deep; also a WASHER, 10 ft. high and 6 ft. in diameter. Both in capital condition. Apply to **MR. GUNDBY, Gas-Works, Stone, STAFFS.**

FOR SALE—A 12,000 feet per hour STATION-METER, Cylindrical Case. In excellent condition, with Tell-Tale, Index, &c. **ALEX. WRIGHT and Co., 55, Millbank St., LONDON, S. W.**

FOR SALE—A Telescopic Gasholder, 75 ft. diameter, two Lifts, 24 ft. each, with cast-iron Tank and Pipes complete to suit. Only been in use a few years; removed for extensions. Plans sent to intending purchasers. Apply, for price and cost of re-fixing, to **ASHMORE and WHILE, Hope Iron-Works, STOCKTON-ON-TEES.**

ON SALE—Four Purifiers, 4½ ft. square, (cast-iron Lids), neat Lifting Gear, and Hydraulic Centre-Valve. Also a STATION-METER, with 6 in. Connections; 16-4 in. Ascension and H-Pipes; and a 12-in. HYDRAULIC MAIN, with Dip-Pipes—all in good condition. Apply at the Gas-Works, ORMSKIRK.

HIGHLY IMPORTANT SALE AT THE OLD GAS-WORKS, COMMERCIAL ROAD, HEREFORD.

MR. SUNDERLAND, Sen, is instructed by the Gas Management Committee of the Hereford Town Council to SELL, by AUCTION, upon the premises, as above, on Friday, the 29th of April, 1881, the following Valuable Lots, viz:—
A GASHOLDER, 80 ft. diameter, by 20 ft. deep, with eight Columns 40 ft. high, and cast-iron open Girders.
A GASHOLDER, 75 ft. diameter, 16 ft. deep, with eight Columns, 16 ft. high, and cast-iron open Girders.
Four PURIFIERS, 10 ft. square, with 10-in. Pipe Connections; wrought-iron Covers and Lifting Gear, and Hydraulic Centre-Valve.
A STATION-METER, capacity 10,000 cubic feet per hour, with Hydraulic Valves and Bye-pass.
A STATION GOVERNOR, with 10-in. Connections.
A CYLINDRICAL EGG-END BOILER, 15 ft. by 3 ft.
A DITTO DITTO, 14 ft. by 2 ft. 6 in.
Two No. 9 PULSOMETERS, to lift 36,000 gallons per hour.
A MORTAR MILL, with 7-ft. Pan, by Smedley Bros.
On view prior to Sale, and any further particulars can be obtained from the AUCTIONEER, 107, East St., HEREFORD. April 14, 1881.

THE Gravesend and Milton Gas Com-pany have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of Westminster. For further particulars apply to the undersigned. **S. Sowood, Manager.**

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned, **R. MORLAND, Engineer.**

TELESCOPIC Gasholder for Sale, 100 ft. by 33 ft., with excellent Guide Framing; only been in use 12 years. Now being removed from a large Provincial Gas-Works to make room for extensions, for which there is no other space. If properly re-erected, will be equal to new, and the cost much less. Particulars on application to **SAMUEL CUTLER and SONS, Millwall, LONDON, E.**

GAS PLANT FOR SALE.

THE Gas Committee of the Corporation of Newbury having ceased to manufacture Gas at their Old Works, have the undermentioned APPARATUS for SALE:—
25 15-in. Circular Mouthpieces, Wrought-Iron Lids and Cross-Bars.
25 4-in. Bridge-Pipes.
25 4-in. Ascension-Pipes.
1 Wrought-Iron Riveted Hydraulic Main, 36 ft. long, and pierced for settings of 5 Retorts.
5 Furnace Frames and Doors.
1 6-in. Double Vertical Condenser, with Tar Boxes, &c., complete.
4 Purifiers, 6 ft. by 6 ft. by 4 ft. 6 in., with Covers, Lifting Gear, Hydraulic Centre Valve, and 6-in. Connections.
12 Brackets suitable for carrying a 12-in. Main Pipe.
1 6-in. Bye-Pass Valve and Connections.
5 6-in. Rack and Pinion Valves.
1 30-ft. Gasholder, with Cast-Iron Tank, 18 ft. deep, Columns, Girders, Syphons, and 8-in. Valves, in good condition.
1 Four-way 12-in. Bye-Pass Valve by Cockey, and a sundry lot of different Pipe Connections.
For further information, &c., apply to the undersigned, **J. G. O'FARRELL, Engineer.**

BOROUGH OF DARLINGTON.

THE Gas-Works Committee of the Dar-lington Corporation invite TENDERS for the Supply of COAL suitable for Gas purposes. Tenders to state the price per ton for the supply of 30,000 tons—the whole quantity required for Three years from the 1st of July next, with the option of stating the price per ton for a shorter period. The Coal to be supplied in such quantities and at such times as required, and to be delivered at the North Road Railway Depot, at Darlington. Further particulars as to rate of delivery may be obtained of Mr. William Smith, Gas-Works Manager, Darlington. Tenders, endorsed "Tender for Gas Coal," to be sent to me on or before Tuesday, the 26th inst. No pledge is given that the lowest or any tender will be accepted.

By order, **HUGH DUNN, Town Clerk.** Darlington, April 13, 1881.

BOROUGH OF DARLINGTON.

THE Gas-Works Committee of the Dar-lington Corporation invite TENDERS for the Supply of CANNEL COAL for Gas purposes. Tenders to state the price per ton for the supply of 3600 tons—the whole quantity required for Three years from the 1st of July next, with the option of stating the price per ton for a shorter period. The Coal to be supplied in such quantities and at such times as required, and to be delivered at the North Road Railway Depot, at Darlington. Further particulars as to rate of delivery may be obtained of Mr. William Smith, Gas-Works Manager, Darlington. Tenders, endorsed "Tender for Cannel Coal," to be sent to me on or before Tuesday, the 26th inst. No pledge is given that the lowest or any tender will be accepted.

By order, **HUGH DUNN, Town Clerk.** Darlington, April 13, 1881.

ROCHDALE CORPORATION.

THE Gas Committee of the Rochdale Corporation invite TENDERS and SPECIFICATIONS for an APPARATUS to MANUFACTURE 3 to 4 tons of SULPHATE OF AMMONIA each 24 hours from the Ammoniacal Liquor produced at the Gas-Works. Any further information required can be had on application to Mr. William Romans, Manager of the Gas-Works. Tenders, endorsed "Sulphate Plant," to be sent to me on or before the 3rd of May next. By order, **ZACH. MELLOR, Town Clerk.** Town Hall, Rochdale, April 14, 1881.

THE Blackrod Gas Company are pre-pared to receive TENDERS for the Purchase of their TAR and AMMONIACAL LIQ. OB. for a term of One, Two, or Three years, from the 30th of September next. Further particulars on application to the Secretary. Tenders to be sent to me not later than Thursday, June 2, 1881. The Directors do not bind themselves to accept the highest or any tender. By order, **BEN. HOWARTH, Secretary.**

TIPTON LOCAL BOARD OF HEALTH.

ERECTION OF GAS-WORKS.

NOTICE is hereby given that the Time for sending in Tenders for the Erection of these Works has been EXTENDED to the 30th inst. Drawings and specifications may be seen upon application to Messrs. Kirkham and Hersey, of 21, Abingdon Street, Westminster, London, S.W., Consulting Engineers to the Board; and copies of drawings with specifications and forms of tender may be obtained on payment of £3 3s. for Contract No. 1, and £2 2s. for Contract No. 2, on application to the Engineer, Mr. Thomas Proud, 103, Icknield Street, Birmingham. The Board do not bind themselves to accept the lowest or any tender. By order, **GEO. M. WARING, Clerk to the Board.** Public Offices, Owen Street, Tipton, April 13, 1881.

HALIFAX CORPORATION GAS-WORKS.

TO OXIDE MANUFACTURERS, MERCHANTS, AND OTHERS.

THE Gas-Works Committee of the Hali-fax Corporation are prepared to receive TENDERS for the Supply of the whole of the OXIDE required at the above Works for a period of Three years, commencing the 1st of September next. Particulars and forms of tender may be obtained on application to Mr. Wm. Carr, Gas-Works Manager. Parties tendering will be required to furnish samples of the Oxide proposed to be supplied. Tenders, endorsed "Tender for Oxide," must be sent to me on or before the 10th of May. By order, **KEIGHELEY WALTON, Town Clerk.** April 16, 1881.

HALIFAX CORPORATION GAS-WORKS.

TO CONTRACTORS.

THE Gas-Works Committee of the Hali-fax Corporation are prepared to receive TENDERS for the WORKS included in the following Contracts:—
CONTRACT NO. 1.—Comprising the Excavation and Masonry connected with the Construction of a Gasholder-Tank, 186 ft. in diameter and 30 ft. deep, and the Erection of a Governor-House adjoining thereto.
CONTRACT NO. 2.—Comprising the Erection of a Timber Frame required for the support of the roof of the proposed Gasholder. Plans and specification may be seen at the Gas-Works, and forms of tender, together with bills of quantities, may be obtained on application to Mr. Wm. Carr, Gas-Works Manager, on payment of Two Guineas (which will be returned to those parties who sent in bona fide tenders). The Committee do not pledge themselves to accept the lowest or any tender, and they may if they see fit let the whole work in one contract. Tenders, properly endorsed, must be sent to me on or before the 28th inst. By order, **KEIGHELEY WALTON, Town Clerk.**

GASHOLDERS, STATION-METER, PURIFIERS, &c., FOR SALE.

THE Directors of the Bishop Auckland District Gas Company invite TENDERS for the following GASHOLDERS and APPARATUS, viz:—
GASHOLDER No. 1, 35 ft. diameter, 20 ft. deep.
GASHOLDER No. 2, 35 ft. diameter, 20 ft. deep.
GASHOLDER No. 3, Telescopic, top lift 32 ft. 8 in. diameter 20 ft. deep; outer lift 34 ft. diameter, 20 ft. deep. [Inlet and Outlet Pipes will be sold with the respective Holders.]
Four PURIFIERS, 10 ft. by 5 ft. by 4 ft.; four tiers of Trays, with Lifting Apparatus; one 8-in. dry Centre-Valve; 8-in. Inlet and Outlet Pipes, &c., complete.
50 RETORT MOUTHPIECES, 14 in. diameter. 95 Iron Lids and 55 Screws. 39 ft. Hydraulic Main, 14 in. diameter and 38 ft. Hydraulic Main, 12 in. diameter. 50 Ascension-Pipes, 3 and 4 in. diameter.
One TAR CISTERN, 7 ft. 6 in. by 3 ft. 6 in. by 5 ft. One Tar Cistern, 3 ft. by 6 ft. by 4 ft.
70 Yards 8-in. Main Pipe from Purifiers to Holders. 20 yards 6-in. Main-Pipe from Hydraulic to Condensers. Condensers, 21 ft. high, with Box 10 ft. long. Washer, 4 ft. by 6 ft. by 2 ft. 6 in. Six 8-in. Valves (Donkin, maker). One STATION-METER, 10-in. Inlet and Outlet, with Hydraulic Valve, Bye-pass capable of passing 10,000 cubic feet of gas per hour. 25 yards cast-iron plate Fencing, 4 ft. 6 in. high and ½ in. thick. 25 Yards cast-iron plate Fencing, 2 ft. high and ½ in. thick. Mr. Field, the Company's Manager, will show the above and tenders for all or any particular part of the Apparatus may be addressed to me not later than May 5, 1881. The Directors reserve to themselves all rights as to the acceptance or non-acceptance of tenders. By order of the Board of Directors, **WM. V. THOMPSON, Secretary.** Gas Company's Offices, Bishop Auckland, April 14, 1881.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 26, 1881.

THE FUTURE OF THE BRITISH ASSOCIATION OF GAS
MANAGERS.

LAST week we dealt in these columns with the present condition of the British Association of Gas Managers, chiefly with reference to its history from the beginning. We showed how it has admirably filled its position down to the present time, and indicated some of the reasons why, in the estimation of many, its functions need re-arrangement in view of the future which now opens before it. The question, therefore, arises—What should be the nature and scope of the necessary reforms? The question may at first appear to answer itself, for if a reform is anywhere felt to be necessary, it may be supposed that its character must be equally apparent. A little reflection upon this point will, however, show that analogous cases, where a vague impression exists that "something ought to be done," without the accompaniment of practical ideas of what is required, are far more general than instances wherein the same want has simultaneously suggested the proper remedy. Therefore, in the present case, if the necessity for action of the kind indicated is universally admitted, opinions may well differ respecting the best course to be taken under the circumstances. We shall probably express the feeling of the Officers of the Association, who have addressed themselves to the arduous task of reform and extension, if we state at once that the most active and antagonistic divergencies of opinion that may be entertained by interested persons in regard to their proposals, will be more welcome, when the discussion on these suggestions is taken, than a dead and unthankful level

of acquiescence; always provided that those who elect to criticize the official propositions shall do so in no carping spirit, but be ready with useful proposals of their own. We would wish all our readers who may be concerned in the matter to utilize the interval between now and the second week in June, in carefully considering the substance of this article, and we promise to give every facility during that time for the public elucidation of any doubtful points on which a consensus of opinion may be desired.

Premising, then, that we have only to exhibit the bare framework of the agreement which has so far been arrived at among the members of the Committee of the Association, it may be relied upon that an official recommendation will be issued in due course, to the effect that the title and scope of the Association should be changed, and its work enlarged. The first part of this project is to comprise the substitution of the style and title of an Institute for that of an Association, the alteration of the term "gas managers" into something less vague, and at the same time more comprehensive, and the formation of a class of "associate members," composed of men intimately connected with the gas industry, but who could not strictly be described as gas managers. The last-named class of members will, of course, still remain the head and front of the society, but they will be supplemented, in order to carry out the idea of an Institute, with another body of men who, it is hoped, will be found earnest and good workers in the cause of gas illumination. The details concerning the relative positions and polity of these two great classes of the proposed Institute, which cannot be deemed complete until all the personality of gas officials throughout the kingdom is embraced in one or the other, are matters to be settled hereafter. The principle being conceded, there should be no great difficulty in applying it satisfactorily. With regard to the second part of the project now before us, it may be said that a new and important means for inciting the members of the Institute to exertion in the more difficult branches of their profession, will be found in the Birmingham medal for the endowment of research. We believe that this prize will be of considerable annual value, and is intended to be awarded to the member of the Institute who, by original discovery and experimental labour, as interpreted in the widest sense, shall be considered to have most enriched his year with new and useful knowledge. Whatever additional proposals may be brought forward at the coming meeting, those here mentioned will probably be the most important.

It has now to be considered whether these proposals are of such a character and extent as will meet the case. In regard to the latter consideration, it may be laid down in such circumstances that, in default of hitting the exact requirements, it is better to go safely than to go far. A field of activity too straitened may at any time be enlarged; but if too large a space is marked off at first, and is afterwards inadequately occupied, the net result is disappointing. This being conceded, it may be urged with much force that, in some respects, the project of reform now before us errs in both ways. On the one hand, it throws open the society to a host of new members, discrimination among whom, if the Institute is to maintain a scientific character, will be as difficult as it will also be imperative; and, on the other side, there is little occupation offered to those young and ardent invaders after they shall have been admitted within the magic circle. Unless great care is taken, there appears every probability of the sudden expansion of the new Institute to unwieldy proportions, without a corresponding elevation of its work. There should decidedly be more organization of the duty of the Institute than has hitherto sufficed for the Association. The difficulty of originating subjects for investigation and useful debate in a technical society of limited range, such as this, is already noticeable, and it will not tend to diminish. We would by no means advocate the imposition of official restraints on the spontaneity of individual action. On the contrary, it may be anticipated that this will be fostered by the foundation of special awards for distinguished merit, such as the Birmingham medal. But could there not be means found for co-operation between the intending authors of what may be called private communications, and a Technical Committee of the Institute? And without infringing on the initiative of willing members with work of their own to communicate, such a Committee might take an active part in indicating and inviting research and information on certain specified subjects. The Committee, working, if not actually sitting in permanence, might invite suggestions as to subjects of technical interest on which information is desired by any of the members; these questions, after being filtered through the Committee, might be referred to suitable

members, either to draw the required information at once, or to incite further investigation should the points involved be unusually obscure. We do not forget the directive action at present exercised by the Committee of the Association, in regard to the communications for which they award premiums; but this action is not yet carried far enough. There are continually arising, in the columns of the JOURNAL and elsewhere, questions of much interest, which perhaps arrest a more or less transient attention, and then, for want of facilities for their full elucidation, are suffered to drop, only to reappear at a future time in a modified form, but still unanswered. And even in the matter of papers to be read at the annual meetings, succinct digests of their more debateable contents could be carefully drawn up and distributed, in order that intending speakers might come properly prepared to contribute usefully to their discussion, instead of, as now, leaving this very important work largely to the accidents of the moment.

There is another branch of work that could usefully be performed under the auspices of the Institute, which does not fall within the power of any Committee that might be formed within the society itself, unless helped materially from without. We allude to the independent examination and adjudication upon apparatus, methods, and principles used or involved in the gas industry, considered as a scientific and commercial art. The world has long ceased to trust implicitly to the assertions of inventors and manufacturers with regard to the merits of their works. The awards of public exhibitions also fail to carry conviction of the deserving of their recipients. Yet, unless advertisements are to gain the day, there must exist some means by which, if required, a man may ascertain the truth of statements regarding alleged facts, without waiting for the slow verdict of time and use. Such means are to be found in an unbiassed examination, like, for example, the Corporation of Glasgow are said to contemplate, at a cost of £500, with respect to the relative efficiency of apparatus for the use of gas for lighting, heating, and cooking. Why could not the Institute take this kind of work in hand, subsidized, of course, by those interested? There would be many advantages in such a procedure, which would be easily struck out if the reformed society could so gain the confidence of the larger gas undertakings as to start with a fair capital, to be kept entirely separate from the ordinary funds. And the Institute must gain this confidence, if it is to aspire by any means to a higher position or to a broader utility. Names are not things. Merely altering the title of the Association will not invest it with any more influence than it may of itself deserve. The change of name will only be commendable if it is made to signalize a real amendment in the constitution of the society in the direction of worthier uses; and this is what all well-wishers of the Association, and of the great industry which it may be held to represent, would like to witness as a fact.

It is not to be supposed that we have exhausted the subject in these brief remarks. We have indeed but opened it up for the deeper consideration of others, to whose ideas we have also attempted to give some point and direction. We are prepared to have it said that the work here sketched out is such as no other technical society has hitherto attempted, or could carry out to a successful issue. With the first objection we are disposed to agree, but not with the second. Apart from the obvious remark that it is not essential that a professional organization should never depart from the stereotyped models of similar societies, we are prepared to maintain, if need be, that no other society occupies a position or has a destiny at all analogous to the one under consideration. Individual cases require independent treatment. A Gas Engineers' Institute would never attain to the doubtful eminence of being able to dispense degrees, to serve as handles to men's names; but there is no reason why it should not fulfil an incomparably more useful purpose, by disseminating knowledge, helping to solve knotty points, exposing imposture, and advancing the truth. If the existing Association cannot be elevated into a beneficent power of this character—a power which may not be attained at the first, nor for many years, although its bases may be laid even now—then it had better remain an unostentatious, semi-scientific, and good-fellowship promoting society.

THE ANNUAL REPORT OF THE PARIS GAS COMPANY.

THE annual report of the Administration of the Paris Gas Company, reproduced in another column, is of a highly satisfactory character. The total consumption of the Company's gas for the past year showed a surprising increase over that recorded for any previous ordinary year, although, from a somewhat high rate of gas unaccounted for, the increased

production was not altogether a source of profit; still, the rental rose very remarkably during the year. A noticeable cause of the increased consumption of gas is declared to be the number of high-power burners erected at street-crossings, and at the entrances to places of public resort, &c., as a consequence of the competition of gas with the electric light. The Company have of late years adopted the plan of supplying separate floors of large houses from special rising services carried up through the buildings, and this method has attained great success, no less than 9284 new consumers having been supplied in this way during the past year. The Company's business is rapidly extending, and there is an imminent need for the expenditure of a large amount of capital in providing for the increased consumption to be expected during the next few years. As a net result of the past year's working, the Shareholders will receive a dividend of 74 frs. per original share of 250 frs., or 29·6 per cent. per annum, after paying all rates and dues to the Municipality. It is stated that the arrangements now pending for a new concession, one of the most salient features of which is to be a reduction in the price of gas, are still incomplete, and the Company are not bound by anything that has yet been done in reference thereto. The entire project will be laid before a special meeting of the Shareholders so soon as an agreement on the subject shall have been arrived at between the Directors and the Municipal Council. It may be hoped, by all who have the interest of gas lighting at heart, that the Municipality will be as ready as the Company have already expressed themselves, to make considerable sacrifices for the purpose of increasing the stability of the undertaking, and providing means by which the consumers may participate in the progress of the Company.

THE SUPERANNUATION OF GAS COMPANIES' SERVANTS.

THE paper by M. Leclerc, on "Pension Funds for Gas Companies' Servants"—a translation of which appeared in last week's JOURNAL—contains many suggestions which should form serious subject of consideration, especially in a country where recent legislation has created a difficulty without providing or indicating any means for getting over it. Many of M. Leclerc's actuarial calculations would, of course, require to be gone through afresh, and most of his statistical conclusions may be considered as strictly limited to the conditions in which they originate; but the principle embodied in the communication in question is not to be gainsaid. We doubt whether the British Association of Gas Managers holds such a position in comparison with the Société Technique de l'Industrie du Gaz en France, that it could hopefully address itself to the consolidation of the superannuation arrangements of all gas workmen in the country. At the same time we have a nucleus at hand in the Benevolent Fund at present administered as an appanage of the Association, which might possibly be expanded to fulfil much of the duty of relieving Gas Companies' used-up servants, to some extent rendered a pressing question by the Employers' Liability Act. The advantage of an organization to assimilate the practice of Gas Companies in the matter of pensions and compensations would be a decided advantage, while the fact is important that by the mere existence of the British Association of Gas Managers, we have a body eminently capable of supplying the fundamental data upon which a relief society might be based, and of co-operating in its subsequent management. At least the subject is one that may very properly be well considered. It is, of course, novel, and comes to us somewhat strangely at first; but it must also be remembered that we are now living under new laws, and with unusual liabilities which must be met in some way; and as, in dealing with such unaccustomed conditions, union is better than isolation, any promising means of securing this concerted action is deserving of careful attention.

THE TOWN COUNCIL OF STOKE ON GAS TESTING.

THE unwillingness of public bodies to appoint gas examiners, when the article to be tested happens to be of their own manufacture, has been frequently noticed, and another example of this particular exhibition of human nature in high places is furnished by the recent action of the Town Council of Stoke. It appears that the Stoke Corporation gas undertaking is a kind of co-operative affair, in which the Fenton Local Board have a large interest. These two public bodies, being near neighbours, are, of course, no very great friends. One Local Board in these modern times seems to entertain, with respect to another Local Board in its vicinity, much of the spirit of jealousy and chronic quarrelsomeness which made the barons of the feudal period, who were in their day the only local authorities, such very warm neigh-

hours to each other. In the present case the Stoke Authorities, having resolved to appoint a gas examiner, made friendly inquiry of the Fenton Board as to whether they would share the expense, as they would partake of the advantages of having a regular inspection of the gas burnt in common in both districts. The Fenton Board replied in the affirmative, and offered to contribute to the expense in proportion to the profit they derived from the undertaking. The Stoke Authorities, however, having previously agreed to devote the heavy annual sum of £5 to pay the official whom they proposed to employ, considered that the Fenton people should pay half of this outlay, irrespective of their share in the undertaking. We are not told what the difference between the £2 10s. required by the Stoke Town Council, and the proportion offered by the other party, actually amounted to; but it has sufficed to quash the whole proposal. The Stoke gas is, therefore, not to be examined at all; at least, until this momentous difficulty is overcome. To render this story of corporate liberality and economy complete, all that is now wanted is for some one to institute legal proceedings against the Town Council of Stoke, to compel them to carry out the requirements of the Act, and so cause an expenditure of the ratepayers' money sufficient to pay the salary of a competent examiner for some considerable time.

WE are desired to call our readers' especial attention to that part of the arrangements for the coming meeting of the members of the British Association of Gas Managers at Birmingham which has reference to the loan collection of objects of interest to gas engineers. It is hoped that possessors of models of apparatus, specimens, examples of improved appliances, rare books on gas lighting, and articles of any kind which may form part of a useful and instructive exhibition, will communicate with the President, Mr. Charles Hunt, at the Windsor Street Gas-Works of the Birmingham Corporation. It is to be particularly understood that the collection is not to be of a trading character, neither is it intended as a means of advertisement, and articles partaking wholly or principally of such a nature cannot be received. It will be, as far as possible, illustrative of the progress of invention in the manufacture, distribution, and utilization of coal gas; and, consequently, examples and models, old and new, of anything connected with the gas industry will be welcomed.

Water and Sanitary Affairs.

AN article in the form of a review, which appeared in *The Times* yesterday, discussing the subject of "Antiseptic Surgery," cites some useful arguments relative to the germ theory of disease. Although the bearing of this question on the subject of water supply is not mentioned, the connection between the two is obvious, and in this respect some of the remarks are very significant. Mr. Lawson Tait, of Birmingham, of whom it is said that "he accepts the germ hypothesis in its entirety," is yet unable to follow Professor Lister and others to the full extent of the deductions which they make from this theory. Mr. Tait observes that all the experiments hitherto made in producing putrefaction by means of the so-called germs have been made upon "dead" matter. "No one," he says, "has as yet pretended that by the admission of germs to living matter he has produced the phenomena of the putrefactive changes which constantly result in matter which is dead." "What we call 'vital action,'" says Mr. Tait, "places living tissue in an altogether different category from tissue in which the phenomena of life are no longer present." Mr. Tait may be said to agree in some measure with Dr. Frankland, though still but partially and indirectly, when he suggests that "the decadence of the vital powers, due to some cause possibly yet unknown, is that which gives the germs their potential ascendancy, and enables them to do what during full vital action they were wholly unable to effect." But he differs from Dr. Frankland essentially when he goes on to say that "if germs could have had the unbounded influence which is claimed for them by many antisepticians, surgery must long ago have been an extinct art, if, indeed, it could ever have struggled into existence." It is this "unbounded influence" which has been introduced into the Water Question, and has served as the basis of an unwarrantable alarm. In surgery the effect has been mischievous to the extent of absurdity, an hour and twenty minutes being consumed in the performance of a simple operation which could have been accomplished with perfect safety in three minutes. As there is much to be said for the

germ theory, it is satisfactory to know that it does not necessarily lead to the extravagant conclusions with which the "rigid antisepticians" have troubled themselves and terrified the British public.

Judging by appearances, we should say that Her Majesty's Government attached but little importance to the doctrines of the sanitarians, however much they may recommend, and even enforce them on ordinary people. It seems to be the peculiar privilege of the members of the Government to carry on the business of the country in buildings which set at defiance all the principles which lie at the root of the Public Health Act. We presume Mr. Dodson takes care of himself, though we have no positive assurance to this effect; but he leaves the Home Office to its fate, although it stands next door to his own official premises. We alluded a short time back to the unhealthy condition of the Home Office, where Sir Richard Cross was tormented with headaches of so severe a character that he meditated flight into lodgings, charging the Treasury with the cost. His clerks also were in a state of rebellion, owing to the "insanitary condition" of the new offices assigned to them. Lord F. Cavendish stated that, with "the exception of the War Office, nearly all the public offices were in an unsatisfactory condition." "The whole system of drainage was bad." A letter in *The Times* explains how this comes to pass. "The health authorities are ignored" by the Government departments. Mr. Robert Rawlinson, Mr. John Simon, "and other eminent sanitarians," are not allowed to have any voice in respect to the condition of the Government offices. The sanitary arrangements of these places "are left to the tender mercies of a department of works." The department has laid down "certain simple regulations," and has so discharged its conscience, leaving the drains—where there are any—to take care of themselves. Thus it would seem as if the Government were very willing to let Mr. Robert Rawlinson, Mr. John Simon, and all the eminent sanitarians, go and worry other people, but had no particular desire themselves to receive the attention of these dignitaries. It is somewhat thus when there is a snowstorm in London. The snow is left undisturbed before many of the Government buildings, while private individuals are expected to make all clear in front of their shops and dwellings. But when a Home Secretary cannot get rid of his headache, nor persuade his clerks to enter the offices provided for them, we may expect to see some signs of repentance. The gentleman who writes to *The Times* proposes the establishment of a Department of Public Health, armed with plenary power. But does it require all this machinery in order to get rid of a cesspool in Whitehall, and to make proper drainage for the Home Office? The Vestry of St. James, Westminster, ought to be good enough for this.

The Lower Thames Valley Main Sewerage Board have been once more discussing their difficulties. In the first place, Mr. Hawksley has been tantalizing them with long delay, before proceeding to the necessary inspection of the district, so that he may advise them what is the best scheme to be carried out in the interests of all the combined places. One member of the Board wishes to know, if Mr. Hawksley is so long in beginning, when he is likely to finish. Three months ago, said the speaker, Mr. Hawksley was engaged by the Board, and all they had received from him thus far was a letter saying he was going to consider the matter. It appears that the Chairman and the Clerk had done their best to rouse Mr. Hawksley to action, but the press of parliamentary work was pleaded by Mr. Hawksley as a reason for his apparent lack of promptitude. It is now resolved that the Clerk shall write once more to Mr. Hawksley, requesting an early reply. The next trouble which besets the Board is that of its unfortunate Indemnity Bill, which Lord Redesdale so summarily dismissed. It is stated that the surcharges have been remitted, but the question, as Sir Thomas Nelson puts it, is "whether their creditors shall be paid." Sir Thomas considers it their "bounden duty to do their best to get authority to pay their creditors," and this, he states, is all that the Board are striving for. We should fancy the creditors have a claim against somebody, whether the Board get authority to pay the debts, or whether they fail to do so. Yet Sir Thomas Nelson, who ought to know the law, states that the question of payment for the outstanding accounts "does not affect any individual members of the Board." If so, it places some other individuals in an awkward position. How is a printer, for instance, who receives an order to execute certain work at the instance of a Drainage Board, to assure himself that the Board are acting within the limits of their statutory powers? He naturally supposes that if the Board are not responsible

in a corporate capacity, he can proceed against the individuals. However, Sir Thomas Nelson promises to do his best to get the question settled satisfactorily, by means of an appeal to the House of Lords to reverse Lord Redesdale's decision. As the Lower Thames Valley Board have been well worried for their indiscretion, it is to be hoped they will now be forgiven.

The Corporation of Walsall have been applying to the Local Government Board for a Provisional Order empowering them to take land compulsorily for the purpose of a sewage farm. As in other recent cases, the project is a combination of two methods—precipitation and irrigation, the former being introduced so as to lessen the area of land required. The population of Walsall is stated to be nearly 59,000, and the area of land required is 140 acres. Accordingly there would be more than 400 of the population for each acre, or about four times the number that could be dealt with if irrigation only were adopted. It has happened that in choosing a site for its sewage farm, Walsall asked for a total of 172 acres, of which only 19 were situated in that borough, whereas 100 were in the adjacent parish of Wednesbury. The Local Board of the latter place, professing that they were also desirous of disinfecting their sewage and rescuing the River Tame from pollution, objected to have any of their land taken away for the benefit of Walsall. Captain R. C. T. Hildyard being sent down by the Local Government Board as the Inspector to conduct an inquiry on the spot, the facts were laid before him, and in the course of the proceedings this gentleman made a suggestion that Wednesbury should withdraw its opposition, if Walsall would consent to unite with Wednesbury in the purchase of the land requisite for the sewage of the two parishes. Ultimately it was agreed between the contending parties that application should be made to the Local Government Board for a Provisional Order to form the parishes of Walsall and Wednesbury into a united drainage district for disposing of the sewage of these two places. Thus the Inspector had the happiness of killing two birds with one stone, and delivering the Tame from the sewage of two towns instead of only one. The lawyers and others have at the same time lost the chance of a little spoil, such as accrues when the ratepayers allow their representatives to indulge in the excitement of parochial warfare.

A STUDY ON GASHOLDER CONSTRUCTION.

(Continued from p. 657.)

WE must now return to the consideration of the strains within the holder itself.

Junction of the Sides and Dome.—When the holder is working, its weight is balanced by the pressure exerted upon the crown by the gas. A portion of this pressure is taken up by the weight of the crown itself, the other part is directed to counterbalancing the weight of the sides and the internal trussing, by the elastic forces developed by the tension of the crown at the top curb. In reality, this tension, which takes an inclined direction, cannot come to an equilibrium with the vertical force representing the weight of the cylindrical portion of the shell, without producing a considerable compression in the piece which unites the two parts of the shell. To determine the amount of this compression strain, which, from the symmetry of the structure, is clearly equal for all points of the circumference of the curb, we will suppose the shell divided into two equal parts by a vertical plane through its centre, and the part to the right of this plane removed. (Fig. 2.) To re-establish equilibrium, we must apply to each of the points A and A' a force, C, equal to the reaction which is exerted by the part taken away upon the other half in the sections A and A', and we will assume that the sum of the vertical and horizontal projections of these forces is nothing.

If we make D = the diameter of the cylinder; P = its weight ($\frac{1}{2}$ P being the weight of each half); T = the tension per unit of length of the circle of the base of the crown; α = the angle with the horizontal made by the first elements of the dome, we shall find that $T \times D \times \sin. \alpha = \frac{1}{2} P$; and $T \times \frac{D}{2} \times \cos. \alpha \times 2 = 2 C$;

whence $C = \frac{P \cos. \alpha}{4 \sin. \alpha} = \frac{P}{4 \tan. \alpha}$. When P = 190,000 kilos; $\tan. \alpha = \frac{18.20}{90.09}$; C = 235,130 kilos., to which must be added the reaction

of the guides to the pressure of the wind, or 235,130 + 6352 = 241,482 kilos. total compression.

Although this pressure is distributed over all the section of the holder sheeting, it is better to reckon only upon the resistance of the crown sheeting and of the top curb. The sectional area of the angle

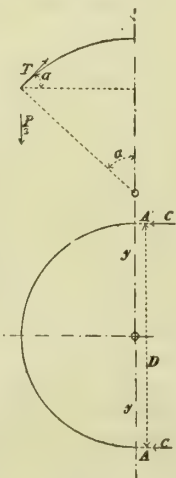


FIG. 2.

iron of the curb is 28,348 square millimètres, while that of the crown sheets is 146,578 square millimètres, the half of which, or 73,289 square millimètres, added to the former, makes a total sectional area of 101,637 square millimètres. Whence it will be seen that the working compression of the curb and the crown sheeting is 241,482

$\frac{101,637}{241,482} = 2.4$ kilos. per square millimètre, which is a very good condition. The angle-iron alone would resist this compression, because the material composing it would only be subjected to a strain of $\frac{241,482}{28,348} = 8.5$ kilos. per square millimètre, which is greatly

below the limit of elasticity. It may be observed here that the deformation of the curb is provided against by 36 gussets ranged at equal intervals round the circumference. Finally, the 18 vertical posts and girders forming the framing of the dome act like the spokes of a wheel in maintaining the solidity and rigidity of the whole structure.

To complete the study of this part of the holder, it now remains for us to determine whether the thickness of 10 mm. ($\frac{3}{8}$ in.) given to the first flat ring of the crown is sufficient to prevent the deformation of the parts under the vertical action of the internal pressure of the gas. This ring is divided, by the gusset before mentioned, into 36 segments, each of which may, without error, be likened to a rectangular plate supported at the four sides. According to Rankine, the greatest bending moment for a plate under such conditions, and uniformly loaded, is in a plane parallel to its width. The value of this greatest moment may be approximately expressed for practical

purposes as $M = \frac{W l^2 b}{8(l^2 + b^2)}$, in which W = the distributed load,

l = the length, and b = the breadth of the plate. Wherefore, taking for b and l the width and length of the rectangle contained in the segment to be considered—that is, making l = 3.35 m. and b = 1 m. The load on the plate being equal to the pressure exerted by the gas (250 kilos. per square mètre), less the weight of the plate itself (78 kilos. per square mètre), we have W = (250 kilos. - 78 kilos.) $\times 3.35 \text{ m.} \times 1 \text{ m.} = 543$ kilos. The resistance of the plate

in a plane parallel to its least dimension is $\frac{T b e^2}{6}$, wherein T = strain on the most loaded fibres; e = the thickness of the plate = 10 mm. Wherefore—

$$\frac{W l^2 b}{8(l^2 + b^2)} = \frac{T b e^2}{6}$$

whence—

$$T = \frac{6 W l^4}{8(l^2 + b^2) e^2} = 3.97 \text{ kilos. per square mm.;}$$

the thickness of 10 mm. being, therefore, more than sufficient from the present point of view.

Strains at other Parts of the Shell.—We have already seen that under the action of the wind the reaction of the guides upon the intermediate rollers (at the upper part of the second lift) may attain $12,922 \times 2 = 25,844$ kilos.; and upon the lower $6570 \times 2 = 13,140$ kilos. These strains being divided over two sections of the holder, it will be seen that by only reckoning upon the resistance of the row of sheets upon which the carriages are fixed, the material will be found submitted to a compression strain of 2.3 kilos. per square millimètre for the top row, and of 1.2 kilos. per square millimètre for the lower row, without taking into consideration the resistance of the iron in the U of the hydraulic joint, or of the angle-irons at the bottom of the second lift.

Vertical Stays.—In order that the bodies of the two cylindrical shells may not be deformed by the action of external blows, and to give them sufficient stiffness when on the rest-stones, they are each provided with 36 vertical stays of double T-iron. Those of the top lift are connected in the middle by a band of single T-iron, and at the bottom by an angle-iron curb. For the vertical stays of the outer lift it is impossible to adopt the same provision, because of the small space between the two lifts; the necessary stiffness has therefore been obtained by means of two angle-irons fixed outside the cylinder. As these vertical stays have to support the weight of the holder to which they are attached when grounded, it is necessary to be assured that their dimensions are sufficient. The weight of the outer lift being 55 tonnes, every one of the 36 vertical stays must carry 1530 kilos. The section of these irons being 1346 sq. mm., the compression will be 1.14 kilos. per square millimètre, which is too much if the stays are only fixed at their extremities, but is below the limit of safety for a stay riveted to the side sheets. The stays of the upper lift have every one to carry 5250 kilos., their section being 3600 sq. mm.; they are therefore subjected to a compression of 1.45 kilos. per square millimètre.

Strength of the Cup.—The vertical plate of the cup, which has to lift the outer holder, being 8 mm. ($\frac{5}{16}$ in.) thick, the weight of the outer lift cannot be overcome without throwing a compression of 0.144 kilo. per square millimètre on the horizontal section of this plate. Considering the plate as a single support, the height of which is equal to 56 times the least dimension, this load corresponds to 0.5 kilo. per square millimètre for the net compression. The two half-round irons riveted on the top edge of this plate having a total section of 1800 sq. mm., and the plate itself a section of 3600 sq. mm., the maximum stress of the wind will produce a compression of 13.038

$\frac{5400}{13.038} = 2.41$ kilos. per square millimètre of the vertical section of the cup plate. Finally, the total force of traction on the vertical side at the junction of the dome being 190,000 kilos., as the horizontal

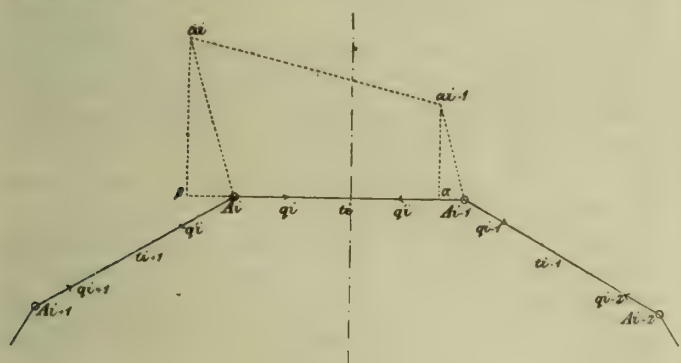
section of the holder at this point is 1,206,400 sq. mm., the sheeting is therefore only strained to the extent of 0.28 kilo. per square millimètre, reckoning the weakening due to the rivets.

Framing of the Dome.—This framing is quite independent of the spherical crown-sheeting, in order to leave the latter free to take, under the pressure of gas, the regular curvature most convenient to it, which cannot be given in construction, notwithstanding the exercise of every care in putting the work together. There are 18 girders corresponding in plane to the 18 guide-columns; they converge to a central pipe situated in the axis of the holder, and at the circumference they are joined, by gussets, to the double T vertical posts previously described. The dimensions of the various pieces of the framing have been determined with reference to the assumption that it will have to carry a load of 150 kilos. per square mètre of the crown. This is the weight of an ordinary roof. The details of these calculations need not be reproduced here; suffice it to say that every part of the framework is only strained to an extent well within the limits of elasticity of the material.

Inlet and Outlet Pipes.—As already stated, it was decided from the commencement to employ for these pipes the articulated model adopted by the Paris Gas Company. This is believed to be the first time that the system of articulated pipes has been applied to a telescopic gasholder. The regularity with which these pipes have worked since their construction is held to fully justify the preference of the system in the present case.

GUIDE FRAMING.

The guide-columns are disposed in the points of a regular polygon, the number of sides of which was determined by the condition that the distance between two guides should be between 6 and 8 mètres. For a tank of 40 mètres diameter this condition is fulfilled by fixing the number of columns at 18. They are tied together at their summits and also at mid-height, and fixed at their bases into shoes of cast iron solidly attached to the tank. Their dimensions must be sufficient to resist the action of the holder exerted against them under stress of the most violent wind. As to the horizontal moment of the weight of the holder, it is generally so feeble in proportion to the power of the wind, that there is no necessity to calculate it. The design contemplated the employment of both *normal* and *tangential* rollers; we have therefore to determine the condition of stability of the columns for each of these systems acting alone—which will at the same time permit of their respective merits being discussed. In the study of this question, the designer of the work made use of the memoir of M. Maurice Lévy, published in the *Annales des Mines* (7 série, tome V.), some essential portions of which are reproduced here.



Let $A_{i-2}, A_{i-1}, A_i, A_{i+1}$ (fig. 3), be a part of a regular jointed polygon formed by the horizontal girders uniting the columns of the guide framing. At the points $A_{i-2}, A_{i-1}, A_i, A_{i+1}$, let certain forces, $F_{i-2}, F_{i-1}, F_i, F_{i+1}$, of any power and direction, be applied. Let $A_{i-1}A_i$ be a side of the jointed polygon which, after the elastic deformation of the system, takes up the position $a_{i-1}a_i$. The length $a_{i-1}a_i$ may, by reason of the smallness of the elastic displacement, be regarded as equal to its projection $\alpha\beta$ in its original direction $A_{i-1}A_i$. Then the elastic extension of the side $A_{i-1}A_i$ is $\overline{\alpha\beta} - \overline{A_{i-1}A_i} = \overline{A_i\beta} - \overline{A_{i-1}\alpha}$. In virtue of the principle of the superposition of the effects of elastic forces, the displacement of the point A_i , estimated on the line A_iA_{i-1} , is the sum of the projections on this line of all the forces acting at the summit of the column A_i . These forces are: (1) The tensions of the two sides of the jointed polygon adjoining A_i ; we will call these tensions t_i and t_{i+1} , reckoning them negatively if they are compressions. (2) The force F_i , directly applied to the top of the column A_i . Let us decompose it into two portions, following the two sides of the jointed polygon starting from A_i , and let them be called q_i and q'_i , which we will reckon positively or negatively, according as they fall upon the sides of the polygon or their prolongations; q_i is, moreover, the component following $A_{i-1}A_i$; and q'_i that following A_iA_{i+1} . It results from this that if m indicates

the cosine of the angle of contingence of the polygon, the sum of the projections on the line $A_{i-1}A_i$ of all the forces applied to the summit of the column A_i will be—

$$mt_{i+1} - t_i + mq'_i - q_i.$$

In virtue of these principles, of the mathematical theory of elasticity or of the resistance of materials, the elastic displacement of $A_i\beta$ is proportional to this sum. We therefore have—

$$A_i\beta = \mu(mt_{i+1} - t_i + mq'_i - q_i),$$

μ being a coefficient depending on the length and section of the columns. This coefficient may be immediately obtained if we are content, as will suffice perfectly in practice, with the result furnished by the resistance; but in any case it is essential to remark that the columns being circular in section and all precisely similar, the coefficient μ is the same for all, and it will be seen that this remark practically dispenses with the necessity for calculating it. It will be found, by an analogous method of reasoning—

$$\overline{A_{i-1}\alpha} = \mu(t_i - mt_{i-1} + q'_{i-1} - mq_{i-1})$$

whence for the elastic elongation of the girder $A_{i-1}A_i$,

$$\overline{A_i\beta} - \overline{A_{i-1}\alpha} = \mu[(mt_{i+1} + 2t_i + mt_{i-1}) + m(q'_i + q_{i-1}) - (q_i + q'_{i-1})]$$

But this elongation is proportional to the tension t_i of the girder in question; it is, therefore, $2Kt_i$, designating by K a new constant which may be found without difficulty. Consequently we have—

$$\mu[(mt_{i+1} - 2t_i + mt_{i-1}) + m(q'_i - q_{i-1}) - (q_i + q'_{i-1})] = 2Kt_i,$$

which is thus abridged—

$$1 + \frac{K}{m} = a$$

$$t_{i-1} - 2at_i + t_{i+1} = \frac{q_i + q'_i - 1}{m} - (q'_i + q_{i-1}) \quad (A)$$

Such is the relation which exists between the tensions of three consecutive girders. If the girders are to be regarded as incapable of extension, we must make $K = 0$, and then $a = \frac{1}{m}$; the coefficient μ disappearing. We have now to apply the relative (A) to the particular conditions of the present design, for each of the systems of rollers, *normal* and *tangential*, adopted.

(To be continued.)

Notes.

TESTS FOR STEEL.

The extended use of steel in the construction of gasholders, as in other structures which were made wholly of iron but a short time since, renders of the greatest importance a general knowledge of its qualities and the proper methods of testing it. Steel rails are frequently used for the guides of gasholder columns, as well as in their normal capacity. A recent number of *Iron* gives some useful extracts from steel specifications as adopted by the leading railway companies and others, and from these we extract the following particulars:—A flat-bottomed 41 lb. rail, rolled from solid ingots of Bessemer cast steel of the best quality, cut in 5-foot lengths, and supported on solid bearings 3 feet apart, should be tested with a dead load of 10 tons applied at the centre, when the deflection after 10 minutes should not exceed $\frac{1}{8}$ -inch, nor the permanent set exceed $\frac{3}{8}$ -inch. A weight of 1800 lbs. dropped thrice, in proper guides, through a fall of 6 feet, should not crack or break the rail so supported. Under the first blow the rail should bend not more than $2\frac{1}{2}$ inches, and the second blow should not increase the deflection beyond $4\frac{1}{2}$ inches, and the third blow, the rail being turned over, should reduce the deflection to $2\frac{1}{2}$ inches. The steel should show a tensional breaking strain of at least 30 tons per sectional inch, with 15 tons per sectional inch as the minimum limit of elasticity. The Midland Railway Company's double-headed rails, weighing 70 lbs. per yard, are required to support, with a 3 ft. 4 in. bearing, a frequently applied load of 20 tons without injuring the elasticity, or producing permanent set; also, without breaking, three blows of a 20-cwt. ram, 12 feet fall. Lloyd's tests for steel plates, beams, and angles to be used in shipbuilding—which would indicate a quality of material suitable for gasholders, girders, &c.—consist in cutting strips lengthwise or across plates and from angles, which must show an ultimate tensile strength of not less than 27 or more than 31 tons per square inch of section (framing angles and beams being allowed 33 tons per square inch) with an elongation equal to at least 16 per cent. on a length of 8 inches before fracture; and strips cut from the same steel, heated

to cherry red, and cooled in water at 82° Fahr., must stand bending double round a curve of which the diameter is not less than three times the thickness of the plates tested. Steel rivets must stand the same tests as the plates, or may be required to show an elongation of 20 per cent. in an 8-inch length before fracture. The best practice appears to militate strongly against the use of iron rivets or bolts in connection with steel bars or plates. It is maintained by many eminent builders of ships that when all steel is adhered to, the material does not corrode more than iron.

THE PRESSURE OF WIND.

In a communication to the American Society of Civil Engineers, Mr. C. Shaler Smith gives the results of many years' observations of wind pressure and its effects. He has personally visited the tracks of destructive storms as soon as possible after their occurrence, for the purpose of determining the maximum force and the width of the path of the storm in every instance. The most violent storm in Mr. Smith's records was at East St. Louis, in 1871, when the wind overturned a locomotive, the maximum force developed in so doing being no less than 93 lbs. per square foot. At St. Charles, in 1877, a gaol was destroyed, the wind force required being 84·3 lbs. per square foot. At Marshfield (Mo.), in 1880, a brick mansion was levelled, the force required being 58 lbs. per square foot. Below these extraordinary pressures there were sundry cases of trains blown off rails, and bridges, &c., blown down by gales of wind of from 24 lbs. to 31 lbs. per square foot. Mr. Smith observes that in all his examples he has taken the minimum force required to do the observed damage, and has considered this as the maximum force of the wind, although, of course, it may have been much higher. Some of the hurricanes were very destructive, the one at Marshfield having cut down everything along a path 46 miles long and 1800 feet wide, killing 250 people. Mr. Smith has formed the conclusion that notwithstanding these examples, 30 lbs. per square foot is sufficient wind pressure to allow for in a working specification. As reasons for this conclusion, Mr. Smith expresses doubts as to whether a direct wind or gale ever exceeds this pressure. Whirlwinds may exceed it, but the width of the pathway of maximum effort in these is usually very narrow. Mr. Smith has only found one example, already quoted, wherein the path of pressures over 30 lbs. per square foot exceeded 60 feet wide. This pressure is in itself very unusual, and, referring more particularly to railway bridges, it is stated that a loaded passenger train will leave the rails at this pressure of wind, and consequently not much could be gained by making the bridge strong enough to resist a storm which would blow a train off it.

THE "ORIGINAL" WATER GAS.

We have at last learnt the name of the great genius to whom many thousands of ruined speculators in this kingdom and elsewhere owe the invention of the original form of water or petroleum gas. He is presumably an American gentleman, for he gives an address at Washington, and his name is Crutchett. According to the circular issued by this gentleman, his process, first patented many years ago, consists in making gas from any kind of refuse coal dust and steam, and from these unpromising materials good 16-candle gas is to be produced and sold to the public at from 25 cents to 50 cents per 1000 cubic feet. Mr. Crutchett alleges that the Strong, Allen, Tessié du Motay, and other systems of making water gas are all infringements of his own patents. This ill-used gentleman only asks to be trusted to the extent of 100 million dollars, or say a trifle of about 20 millions sterling, to be devoted to buying up existing gas-works or for the erection of new works for the supply of the Atomic Steam Coal Gas, in order to expose the iniquity of coal gas operators,

who wish to persuade the world that they are doing right in only making about 10,000 cubic feet of 16-candle gas per ton of coal, nine-tenths of the coal used, according to Mr. Crutchett, being converted into coke, tar, and other troublesome residuals! This gentleman's remarks are not bad reading, if rather difficult in parts to construe. For example, we are told, what we certainly did not know before, that—

"The 'Atomic Steam Coal Gas' improvements have been published to several Governments. The results are, references to the most intelligent who have examined it fully are now proclaiming its merits, and adopting it in the manufactures of iron, steel, and other industries, besides its use for power, and domestic heat and light. All such will be so far in advance of those who do not.

"Such being the facts as to the new, good, and cheap gas, corroborated by the highest authorities on chemical technology in Europe and the United States, many whose names are given in the scientific, gas, and engineering journals, with scores of columns describing its chemical composition, heating and illuminating power, as also some of the most intelligent engineers, in practical tests and comparisons with all kinds of fuel, gases, and even Siemens's blast mode (which is reported over 40 per cent. less use than the 'Atomic').

"Why, again, are these improvements not being adopted for the benefit of the public, and progress of industries and comfort in the United States? The teaching of this branch of knowledge, so necessary for comforts, uses, and general industry, should be adopted in colleges, the erection of works, and operating them in all; also by the Smithsonian Institution, to spread knowledge among men, &c., in preference to many others of comparatively much less use. The make and supply of good and cheap gas will affect most industries, from the rocking of the cradle, propelling machinery, all carriages on land and water, even to the saving of animal labour with the plough and other cultivation of the ground; yea, and the dissemination of gases beneath to cause increasing production of vegetation, health, as also the propelling of aerial machines above the earth."

Certainly; by all means.

SOUTH METROPOLITAN GAS CONSUMPTION.

We are enabled, by the kindness, of Mr. G. Livesey, to illustrate by the following table—which was compiled from particulars obtained from all the distributing stations of the Company—how the greater part of the population of South London require their gas to be supplied. As will be seen, the consumption of every complete hour of the day and night, throughout an entire week, is given in thousands of cubic feet, and, in addition, the percentage of every hour's consumption to the total quantity sent out is shown. This column—the last in the table—is particularly interesting. It is there indicated that the time between 10 and 11 A.M. is that in which the smallest rate of gas consumption is recorded; from this time it increases somewhat considerably during the next hour (we are referring to the figures for the week days), which is perhaps to be traced to the lighting up of gas-cooking stoves. In connection with this observation it should, however, be noticed that the figures for Sunday are dissimilar to those for the week. On this day there appears to be some cooking by gas going on between 8 and 9 A.M., and between 10 and 11 in the morning. Some of the increased consumption noticeable on Sunday morning may also be due to the common custom of lighting up churches and chapels before morning service, in order to warm them. The table covers too limited a time to enable anything like a general trustworthy deduction to be drawn from it. It will, however, be noticed that although there is not a large day consumption, what there is of it is tolerably regular, and makes altogether no mean proportion of the whole, although, of course, there is an increase in consumption during the working hours of darkness. The difference between the daylight and dark business hours would naturally have been greater if the figures had been taken from a week in the depth of the winter, when such factories as there are in South London are in full operation by gaslight.

STATEMENT OF GAS SENT OUT DURING EACH HOUR OF SEVEN DAYS, MARCH 27 TO APRIL 2, 1881.
Summary of all Stations.

Time.	Sunday, March 27.	Monday, March 28.	Tuesday, March 29.	Wednesday, March 30.	Thursday, March 31.	Friday, April 1.	Saturday, April 2.	Total.	Percentage of Total Consumption.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
6 a.m. to 7 a.m.	154	185	200	213	181	170	116	1,219	1·77
7 " " 8 "	98	139	143	157	155	90	119	901	1·31
8 " " 9 "	101	173	177	125	142	147	102	967	1·41
9 " " 10 "	78	101	143	128	101	113	125	789	1·14
10 " " 11 "	114	71	102	118	117	102	89	713	1·03
11 " " 12 noon	92	117	110	116	133	105	126	799	1·16
12 noon " 1 p.m.	67	116	116	158	125	109	120	811	1·18
1 p.m. " 2 "	83	103	127	140	110	126	141	830	1·22
2 " " 3 "	82	108	111	142	117	145	115	820	1·19
3 " " 4 "	89	94	136	171	116	125	114	845	1·22
4 " " 5 "	94	140	136	143	131	158	151	953	1·39
5 " " 6 "	100	274	261	217	212	201	252	1,517	2·20
6 " " 7 "	441	701	694	624	617	584	494	4,155	6·02
7 " " 8 "	1,187	1,639	1,870	1,719	1,616	1,596	1,600	11,227	16·27
8 " " 9 "	1,092	1,727	1,714	1,778	1,763	1,740	1,846	11,660	16·90
9 " " 10 "	1,082	1,484	1,586	1,394	1,571	1,662	1,759	10,538	15·28
10 " " 11 "	861	1,033	1,081	1,086	1,016	1,097	1,600	7,724	11·19
11 " " 12 night	351	665	605	584	585	656	890	4,336	6·28
12 night to 1 a.m.	216	250	337	307	313	298	301	2,022	2·93
1 a.m. " 2 "	133	188	147	187	169	178	180	1,182	1·71
2 " " 3 "	112	160	155	203	182	201	194	1,237	1·79
3 " " 4 "	148	224	177	194	185	183	144	1,255	1·82
4 " " 5 "	171	204	168	181	202	155	141	1,222	1·77
5 " " 6 "	149	192	180	207	187	209	133	1,257	1·82
Total Thousands	7,125	10,088	10,426	10,292	10,046	10,150	10,852	68,979	100·00

OUR Glasgow correspondent writes, in regard to Messrs. D. Bruce Peebles and Co.'s letter published last week, expressing his regret that through a slip of the copyist the award of the Jurors on the

exhibits of this firm at the recent Glasgow Exhibition was omitted. On inquiry, he finds that the award in the Jurors' report is the same as was announced during the currency of the exhibition.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

GAS VERSUS ELECTRICITY.

SIR,—I have read somewhat, in your JOURNAL and elsewhere, for the last two years, of electricity taking the place of gaslight; and I saw the electric light doing good duty, some 16 years ago, at the South Foreland, in lighting our mariners on the sea-path to London. I then examined all the machinery—magnets, steam-engines, and boilers—all in duplicate; and as I had the contract for supplying the coke burnt for those steam-boilers, I said, "Beautiful."

The light was not absolutely steady; but this did not matter. It was a good enough light for the purpose; and was certainly a better light than the oil lamps previously employed. My prayer, therefore, was, "May your shadow never grow less."

After that I saw very large gas-burners, formed of concentric rings of light, also for lighthouse illumination. They were supplied by Messrs. J. Edmundson and Co., of Dublin, and they seemed to me a considerable improvement on the electric light. I was told that, when full on, they could penetrate farther through a fog than the electric light; and they had this economical advantage, that a third, or a half, or the whole power could be turned on, and thus the cost could be regulated to the density of the fog. This spoke to my mind common sense, and I again said, "Beautiful."

But our electricians, and our mechanicians, have of late discovered that, with the machines of 16 years ago, we did not know properly how to convert force into light so economically as we can do now; that, with improved machinery, and a nicer mode of automatic adjustment of the carbons, electricity can now be brought to take the place of gas; and from America we have been told that the expense will only be about one-fortieth part the cost of gas.

We have everywhere seen the results of their most recent endeavours, and to-night I have viewed the last grand coup—the lighting of part of the City of London. When the City does a thing, it generally does it well; and I feel we are all indebted to the City Authorities for a sight of this last experiment.

On the same principle that I never visit a theatre on the first night of its pantomime, so I let about a fortnight pass before going to see the electric lighting in the City—so that all the little details might be properly adjusted, and the thing got into thorough working order. Taking a hansom at Westminster, I drove by way of the Embankment into the City, having another look at the electric lighting that has illuminated a part of the River Thames for the last year or so. When we arrived at the Bank we were in the midst of the new experiment, and I find great difficulty in telling you what it was like. I discharged the cab, and walked to London Bridge; then back to the Bank, along Cheapside, and down Ludgate Hill to the Circus, in order that I might accustom myself to it.

Well, as to my impressions. Have you seen the Bay of Naples by moonlight, with Vesuvius in the distance? Well, it was not like that. Or the Colosseum at Rome, where the moon peers into the various vomitories with a full flood of light? Well, it was not like that either. Or the glorious Parthenon at Athens, where

"Heaven's ebon vault,
Studded with stars unutterably bright,
Thro' which the moon's unclouded grandeur rolls,
Seems like a canopy which love has spread
To curtain her sleeping world;"

where the whole air is full of silver light, save where a huge column intercepts her rays, and behind is a deep shadow. Well, it was not at all like that either—not in the least. Perhaps you have taken a sail in a higger, on a fine night, when the moon runs in the first quarter, and there was an intricate passage and lots of craft about; and just as you have got into a happy train of thought, while the moon's rays kissed the waters, all at once the helm was reversed, the sails fluttered loose for a moment, and you were in darkness till you had done the tack. That is more like the electric light among the omnibuses, cabs, and passengers, that make up the present night scenery of the City. You have a flood of light at one place, with almost total darkness at your next change of position; for while you are in an insufferable glare of light, an omnibus passes between you and it, and you are thrown into the darkness of an intense shadow.

There is immense light near the lamps, but they are so far apart that if anything intervenes between you and the nearest light, the next one is so far distant that it gives no effective light. This may be partly owing to the action of our eyes. The pupil contracts and dilates, and accommodates itself to the quantity of light; but not instantaneously. For example: Take a cat on your knee, hold a lighted candle at a distance, and look into its eye. You will see the pupil a beautiful circle of considerable size in the centre of the eye; but, approach the light, and the circle becomes an oval, and eventually, if you bring the light near enough, the oval has become a mere slit. It is the same with the human eye. In a glare of electric light the pupil is small; but, when a 'bus passes, you are for the moment, and before the pupil of the eye has dilated, thrown into darkness; and thus the effect is most disagreeable. If the lights were trebled in number—even if only of one-fourth the power each—there would be a far better diffusion of light.

There is also a terrible ghostliness about the whole street. I do not know if every one will understand what I mean by this term, as some people are not believers on ghosts; but, in other words, if you have ever crossed a graveyard on a windy moonlit night, with the branches of tall trees moving in the blast, and fitfully eclipsing the moon's rays—when your imagination conjures up all the tales of your childhood—you will faintly realize what I felt in creeping to-night among the shadows of spectres like myself. Getting down to Ludgate Circus, the light there was much more satisfactory. There were three lights in a triangle, at the respective distances of about 33, 34, and 48 yards apart. They were sufficiently near to destroy those disagreeable shadows, and the effect was the best I had seen.

Here, however, the spectacle ended. I took "a walk down Fleet

Street," amid gaslights, at once experiencing a sense of relief. I felt myself expand, and I said, "Thank goodness that is over; I have seen as much of the electric light as I want to, till it is greatly improved."

When I got to the Strand there were still shops sending a flood of gaslight on to the pavement, reminding me that I was still of this world; but when I reached Charing Cross, and turned down Whitehall, it was paradise. There the old single-jet lamps have been removed, and lamps with four or five fishtail burners substituted. These give a perfect bouquet of light—a general diffusion of light, without either the intense brightness or intense darkness I had seen in the City. And when I got to the bottom of Parliament Street, the blaze of gas near the Houses of Parliament was magnificent; while around Palace Yard there were again a few electric lights—at which all the gaslights seemed to be laughing, so cheery was it where the gas was, so dismal where the electric moons were.

In passing Charing Cross, I walked into the railway station, and saw a display of electric light far superior to anything I had seen in the City. Here the lights were more numerous, and each of smaller power. If this turns out as cheap as gas, there is no reason why other places of the kind may not be similarly lighted.

The City have done well in contracting to try the experiment for a year. To-night the weather was mild and calm; but I am not sure what might not be the effect of a sharp shower, with a strong west wind on those large glass globes, the east side of the globe remaining unattacked. A year's trial may prove all this.

The electric light has done very well so far. The whole of the present outcome may be said to be the practical work of two short years; but it has a great deal to do before it can take the place of gas. The lights have to be put closer to each other, to produce a more equal diffusion, and the ghastly appearance has to be changed, which perhaps may be done by coloured globes. When the practical effect is satisfactory, the next question will be the cost. Not having any shares in the electrical companies, I am not likely to know this; and I do not pay any attention to the price now charged for one year's lighting—it may yield a profit or a loss to the company, and sometimes a loss to the shareholder is a gain to the speculator. This we have known of in gas, and may know of in electricity.

35A, Great George Street, S.W.,
April 20, 1881.

GEORGE ANDERSON.

THE RATING OF GAS-WORKS.

SIR,—I feel that some apology is needed in criticizing Mr. George Livesey's "hurriedly prepared" sketch for rating gas-works; but I venture to differ from him as to the policy of rating structural value, or capital expended, instead of on a "hypothetical tenancy."

Rating on the capital account may suit such a Company as the South Metropolitan, where there is a large consumption of gas within a moderate-sized area; but in the case of a Provincial or Suburban Company, the principle of basing the rating on the capital employed would be cruelly disastrous. Thus the South Metropolitan Company's capital expended on plant is about £4 12s. 6d. per ton of coals carbonized; Brighton and Hove Company, about £7 15s.; Bromley (Kent), West Kent, and Lea Bridge Companies, about £11 10s.; while with the Walton-on-Thames Company it is £14.

I give a few cases where the mileage of main, and cost of distribution are necessarily great; and it would certainly be very unfair to Companies so circumstanced to apply Mr. Livesey's theory in preference to the old law for rating—viz., on what a concern will let for to a tenant, whether real or hypothetical.

Sydenham, April 23, 1881.

R. HESKETH JONES.

REGENERATOR FURNACES.

SIR,—Referring to your remarks on the 15th of March last, with regard to regenerator furnaces, perhaps you will allow me to say that we are constructing furnaces in our new house on the regenerator principle, and after the plan of those at the South Metropolitan works. They are in all stages of erection, from the bottom arch to the complete furnace, and will therefore afford any one in the neighbourhood, who may wish to do so, an opportunity of judging them.

For some years past I have watched the development of regenerator furnaces, and have seen them at work both here and on the Continent, and for simplicity I think the principle adopted here will recommend itself.

From general observations I found that the great difficulty in connection with these furnaces was the proper regulation of the draught. To effect this we have a distinct chimney to each furnace, by which means we can as readily and reliably regulate the discharge from the furnace as the supply of air. This, which might at first sight appear an expensive mode, is in reality much cheaper than the usual system of attaching more than one bed to a single shaft, and connecting by lateral flues. I am fully convinced that if regenerator furnaces are to come into general use, it will be necessary to have full control over the discharge of the waste gases.

Separate shafts have been in use some years here with furnaces constructed on the old principle, with a manifest saving in fuel and increased comfort in working.

Ramsgate, April 23, 1881.

WILLIAM A. VALON.

STREET LIGHTING BY GAS.

SIR,—It is gratifying to find a gentleman like Mr. Arthur Silverthorne coming to the assistance of gasmen, with suggestions as to street lighting. The truth of his remarks, as to the economical views of lighting authorities, we all know; but of his suggested remedies many will have doubts. The carburetting process involves large first outlay, with continuous cost of filling and maintaining the apparatus; but the use of petroleum and other oils for enriching gas—whether in the form of gas, as tried by Mr. R. P. Spice; or absorbed as vapour, as tried by the late Mr. G. Lowe, and many others since—deserves the consideration of all concerned; for I find (as doubtless do others) that these oils are greater competitors with gaslight than electricity has yet shown itself to be. Then, in the usual street lamps, cheapness has been pushed to the extreme; but it will surely pay to have im-

proved lamps with greater gas-power in each, by which the usual flickering shadows may be destroyed, and the light be better diffused. Only by the use of better-constructed lamps, with more powerful burners, if less in number, can better lighting be obtained at the same annual cost. The richer and larger authorities, however, are not likely to ignore the intensity of the new light; and will afford the luxury of illumination when it is pressed upon them. To meet this, gasmen can fall back on oxygen, which is becoming less costly, to give intensity to gaslight. A few powerful lamps, with second tubing to bring oxygen to the flames, would show that gas can supply all the illumination desirable, in a more economical, steady, and agreeable way than any other agent yet tried.

Gosport, April 22, 1881.

G. B. IRONS.

Legal Intelligence.

WEST DERBY QUARTER SESSIONS.—TUESDAY, APRIL 19.
(Before the EARL OF DERBY, Chairman, and a Bench of Justices.)
THE ACCOUNTS OF THE ORMSKIRK GAS COMPANY.

This was a case in which two gas consumers and ratepayers in the Ormskirk district petitioned the Court to appoint an Accountant, or some other competent person, to inquire into the concerns of the Ormskirk Gas Company, with the view of ascertaining whether the price charged for gas was in excess of that allowed by Act of Parliament.

Mr. SEGAR appeared for the petitioners; Mr. LERESCHE represented the Company.

Mr. SEGAR, in addressing the Court in support of the petition, said they were probably aware that gas companies were empowered to make certain charges for the supply of gas until the amount of revenue thus raised was sufficient to enable them to pay a dividend of 10 per cent. on the capital invested. They were also allowed to form a reserve fund to the extent of 10 per cent. of the capital; but beyond this the whole of the revenue derived from the business was available for reducing the price of gas. For many years past the Ormskirk Gas Company had paid a dividend of 10 per cent., and last year they even paid 12 per cent., in order to make up for deficiencies of dividend in the year 1866 or 1867, when the Shareholders did not receive their statutory 10 per cent. In the course of their operations the Company had spent, on capital account, large sums of money which had been derived from the sale of gas, and these, the petitioners contended, should have been applied in reductions of price, which they considered to be too high, while the quality of the gas was inferior.

Mr. LERESCHE, on behalf of the Company, opposed the application, and eventually

The Court dismissed the petition, on the ground that one of the petitioners was not a gas ratepayer within the meaning of the Act.

Mr. SEGAR proposed to amend the petition by substituting the name of another gas ratepayer, but the Court would not allow this to be done.

LIVERPOOL CITY SESSIONS.—WEDNESDAY, APRIL 20.
(Before Mr. J. B. ASPINALL, Q.C., Recorder.)

APPOINTMENT OF A PUBLIC ACCOUNTANT OF THE LIVERPOOL UNITED GAS COMPANY'S ACCOUNTS.

On the opening of the sittings of the Court this day, Mr. LEWIS WILLIAMS renewed an application made at the last sessions, on behalf of certain gas consumers in the city, for the appointment of an Auditor to examine the accounts of the Liverpool United Gas Company.

The RECORDER said he thought the request was a reasonable one, and, on the suggestion of the learned Counsel, Mr. P. B. McQuie, who was entrusted last year with a similar undertaking in regard to the water accounts, was appointed to give effect to the desire of the applicants.

MIDDLESEX SESSIONS.—WESTMINSTER, SATURDAY, APRIL 23.
(Before Mr. P. H. EDLIN, Q.C., Assistant-Judge, and a Bench of Magistrates.)

THE POLLUTION OF THE THAMES.

At the sitting of the Court to-day, Mr. G. Payne, on behalf of the Conservators of the River Thames, appealed against an order made by the Justices of the Uxbridge Division, dismissing a complaint of the Thames Conservancy Commissioners against the Uxbridge Sanitary Authority, that the Authority had suffered offensive matter to flow into the River Thames, contrary to the provisions of the Thames Conservancy Act. It appeared that a certain portion of the drainage of the town of Uxbridge had made its way into the Thames, and for this the Thames Conservancy Commissioners sought to recover penalties amounting to £100. The case was heard before the Uxbridge Magistrates, who dismissed the case, and hence the present appeal. In the first place, a preliminary objection was taken by the respondents on the sufficiency of the notice of appeal, but this having been overruled by the Court, a further one was taken that no appeal could be made in this case, inasmuch as the appeal was brought against a decision in a criminal matter, in which the Justices of the Uxbridge Division, after fully going into the merits of the case, had dismissed the case, and consequently had decided that no penalty should be recovered by the Thames Conservancy Commissioners.

Mr. CRUMP appeared for the appellants; Mr. GREENE represented the Uxbridge Magistrates.

Mr. GREENE, in support of the decision of the Magistrates, contended that no court of appeal could review the determination of the tribunal who had tried the case, and being of a criminal nature they had given a verdict of acquittal. It was not to be supposed that the law ever empowered the Thames Conservancy Commissioners to take their chance of a conviction before the district Magistrates, and, failing in that, to be able to renew the same charge before another tribunal, in the hope of getting a conviction between the two. In the whole course of his experience he had never heard of an appeal against an acquittal. If a man was tried before a body of magistrates and acquitted of the charge preferred against him, it was contrary to the well-known maxim of English law that he should be again put in peril and tried again, on the same facts, for the same offence of which he had been already acquitted. This was altogether a new principle in jurisprudence, and therefore he held that no man who had been once acquitted by a competent tribunal could be tried again for the same offence.

Mr. CRUMP, for the appellants, quoted the 64th and 106th sections of the Thames Conservancy Act, and contended that if the arguments of the respondents' Counsel were to prevail, the whole intention of the Legislature would be done away with.

The ASSISTANT-JUDGE remarked that large powers were given by the Summary Jurisdiction Act, and embraced cases giving the right to appeal against the decisions of magistrates in any case, thereby widening the process to appeal against any determination of local magistrates. The decision of the Court in this case was that the appeal should be allowed,

and that the case should be tried by a jury, to be summoned for the purpose on a day to be fixed hereafter.

Mr. GREENE thereupon asked the Court to grant a case for the opinion of a Superior Court on the point raised by him—that is, that neither the Court of Quarter Sessions nor any other Court have power to impose a penalty which had been sued for before the Justices in Petty Sessions, and had by such Justices been determined upon, and decided that no such penalty should be imposed, or that any conviction should lie. It was an old maxim of law that no person should be tried twice for a criminal offence upon the same facts, when once they had been acquitted by a competent tribunal. This was so entirely new a view that he hoped a case would be granted upon it for the decision of a Superior Court.

Mr. CRUMP said he should leave the matter entirely in the hands of the Court, and should not give an opinion either one way or another on the application that his learned friend had just made.

The Magistrates retired, and, on their return into court,

The ASSISTANT-JUDGE said they were all of opinion that a case should not be granted, and that they should fix a day for the case to be tried by a jury. He suggested that the matter should be mentioned at the May sessions, when a day could be fixed for the trial to take place. This would give the respondents ample time to consider and take any course upon which in the meantime they might be advised, any question of costs to stand over until the case was finally determined.

Miscellaneous News.

ORMSKIRK GAS COMPANY.

An Extraordinary General Meeting of this Company was held on Saturday, the 16th inst., for the purpose of considering what steps should be taken in view of a threatened application to the Court of Quarter Sessions for the appointment of a public Auditor of the Company's accounts. Mr. ALTY presided.

The SECRETARY (Mr. W. Parr) having read the notice convening the meeting,

The CHAIRMAN said it would be remembered that at the annual meeting of the Company on the 9th ult. Mr. Bradley objected to the accounts being passed as they stood, as they were not, he said, in conformity with the Gas-Works Clauses Act, 1871, and intimated his intention to apply to the Court of Quarter Sessions that a competent Accountant be appointed to examine the accounts. Subsequently, the attention of the Directors having been called to a decision in the Court of Queen's Bench in the case of the Dudley Gas Company, they resolved to re-model the accounts in conformity with the Act referred to. They had employed a firm of Accountants who ranked high in their profession, and they, with the Company's Auditors, had examined the accounts, and the Shareholders would find their report on the balance-sheet now presented. He might say, in passing, that the Accountants happened to be the same for whose appointment Mr. Bradley was going to apply to the Quarter Sessions. Perhaps after seeing the report that gentleman might think proper to withdraw from any action he intended to take. As Directors, they had nothing to conceal. They wished to satisfy all, but more particularly the consumers. They had from time to time reduced the price of gas, until at the present time it was 4s. per 1000 feet, which he did not think unreasonable for a town like Ormskirk; but they would be glad to make a further reduction in the ensuing year if they could do so. The Auditors were present, and would answer any question that might be asked concerning the accounts. He moved the adoption of the accounts, together with the Auditors' and Accountants' report.

Mr. R. C. WELSBY seconded the motion, and it was carried.

The SECRETARY remarked that an intimation had been made to him that it was the intention of some gas consumers to make an application at the Quarter Sessions on the following Tuesday for an order for the appointment of an Accountant to go through the Company's accounts. Who the gas consumers were he did not know, but the question was whether the meeting had anything to say on the subject.

Mr. BROMLEY moved—"That as proceedings are threatened at the Kirkdale Quarter Sessions by some gas consumers, the Directors be authorized to take such proceedings thereon as they think proper."

Mr. FREEMAN seconded the motion, and it was carried.

This being the whole of the business, Mr. HUTTON moved a vote of thanks to the Chairman, which was seconded by Mr. BRADLEY, and at once agreed to.

The CHAIRMAN, in returning thanks, said he hoped that in the ensuing year they would go on satisfactorily, and he felt persuaded that the gas consumers would reap the benefit if the Directors were allowed to remain on the Board for a few years longer. As he had said before, he considered 4s. per 1000 feet a very reasonable price for gas in a small town like Ormskirk. He trusted litigation would be prevented, for he did not think it would benefit either shareholders or gas consumers, but would have the contrary effect. They must spend a lot of money if litigation were entered into, but he hoped they had now seen the end of it.

Mr. BRADLEY intimated that the result of the meeting had not made any alteration whatever in his determination.

The proceedings then terminated.

PARIS GAS COMPANY.

The report and accounts of the above Company for the year ending Dec. 31, 1880, were presented by the Board of Directors at the annual general meeting of Shareholders, which, as announced in the JOURNAL of the 12th inst., took place on the 29th of March.

The Directors commenced their report by stating that the results of their labours during the past year were of such a nature as, they hoped, to give entire satisfaction to the Shareholders. The experiment of lighting up the Rue du Quatre Septembre by means of improved burners and lanterns, and the substitution, at several points in the city, of similar appliances for those of the ordinary type, appeared, they said, to have engendered a desire for more light, and this desire had grown gradually till in the past year a considerable increase was shown in the total consumption of gas. This circumstance, in conjunction with the exceptionally favourable conditions under which the manufacture of gas and the sale of residuals were carried on during the year, had brought about a considerable increase in the profits, which appeared to be all the larger, inasmuch as the working for the year 1879, when taken in comparison with that for the year 1880, had been somewhat hampered by the difficulties attendant upon an extremely rigorous winter, as well as by the depreciation in the value of the masses of coke which had for years encumbered the yards at the Company's stations.

The Directors expressed their pleasure in being able to offer the Shareholders such a dividend for the past year as would, while testifying to the continued progress of the undertaking, compensate them in a measure for the shortcomings of previous years; at the same time remarking that it must not be forgotten that from 1875 to 1879 the profits remained almost stationary, while, in order to meet the growing demands of the consumers,

the Directors were compelled to expend on capital account close upon 28,000,000 frs. (£1,120,000).

Having made these preliminary observations, the Directors proceeded to give their usual detailed account of the Company's operations under the customary headings, as follows:—

GENERAL REVIEW OF THE COMPANY'S OPERATIONS.

Consumption of Gas.—During the year 1880 there was sent out from the Company's works a volume of gas equal to 244,345,324 cubic metres (8,625,390,000 cubic feet), being 25,531,499 cubic metres (901,260,000 cubic feet) more than in 1879. This is undoubtedly a great increase; but when it is considered, on the one hand, that in the year 1879 the consumption of gas did not reach its normal limit, and, on the other, that in 1880 the loss by leakage considerably exceeded that in the previous year, it becomes obvious that the average increase of these two years does not to any great extent exceed that for the four years preceding them.

The day consumption of gas, which arises principally from the use of gas for industrial and domestic purposes, figures to the extent of 60,973,383 cubic metres (2,152,361,000 cubic feet), or about one-fourth of the total consumption.

Receipts for Gas.—The receipts from the sale of gas, which in 1879 were 55,619,588 frs. (£2,224,783), in 1880 reached the sum of 61,030,715 frs. (£2,441,228). These receipts may be apportioned as follows between the two great divisions of the Company's area of supply:—

	Francs.	Sterling.
In Paris proper.	56,902,903	£2,276,116
In the outskirts	4,127,812	165,112
Total	61,030,715	£2,441,228

Consumers.—The number of consumers on the 31st of December, 1880, was 148,514, exceeding by 9284 the number at the corresponding date in 1879. Of these 9284 new consumers, about two-thirds are supplied from the house services; and if anything in the way of eulogy of these services were still required, the result here shown would, the Directors consider, be a complete justification for the sacrifices made during the past ten years with the object of increasing their number.

Public Lighting.—The number of public lamps in use on the 31st of December, 1880, was—

In Paris proper.	41,921
In the outskirts	7,233
Total.	49,154

exceeding by 3022 the number in operation on Dec. 31, 1879. Of these 49,154 lamps used for lighting the public thoroughfares, 179 are of the pattern of those fixed in the Rue du Quatre Septembre, which consume 1400 litres (50 cubic feet) of gas per hour, and 152 are similar to those in the Place de la République, which consume 875 litres (30·9 cubic feet) per hour. These 331 high-power burners represent 2740 burners consuming 140 litres (5 cubic feet) of gas per hour, and to the former must be added 697 similar burners, of different kinds, placed by private consumers at the entrances of warehouses, cafés, theatres, and similar establishments.

House Services.—The number of house services laid on during the year 1880 was 1526, or 273 more than in the previous year, thus bringing up the total number in use on Dec. 31, 1880, to 14,415, distributed over 11,819 houses. Of these 1526 new services, 458 were fixed upon the application of landlords, who undertook, at their own expense, to fit up a minimum of three burners in three apartments; and the remaining 1068 were fixed for the supply of apartments of which the occupants were willing to contract at once for a supply of gas for at least three burners. These 14,415 house services, exclusive of the branch-pipes, fittings, meters, &c., which are subject to a special charge, cost 8,734,512 frs. (£349,380), being equivalent to an average cost of 605 frs. (£24 4s.) per service.

The receipts arising from the sale of gas consumed by means of these services in the year 1880 amounted to 9,425,891 frs. (£377,036), showing an increase of 1,196,785 frs. (£47,871), or 14·5 per cent. on the analogous receipts for the preceding year, which amounted to 8,229,106 frs. (£329,164).

With regard to the number of consumers supplied from the house services, which, on Dec. 31, 1879, stood at 39,788, on the same date in 1880 it had reached 45,717, representing more than 30 per cent. of the total number of consumers.

Principal Results of Working.—During the 25 years over which the Company's operations have extended—viz., from 1855 to 1880—the consumption of gas, which in the former year was only 40,774,400 cubic metres (1439½ million cubic feet), has increased about sixfold. During the past six years the yearly increase has been very irregular, for while from 1855 to 1874 it fluctuated between 6 and 8 million cubic metres (212 and 282½ million cubic feet), in 1875 it rose suddenly to 15 million cubic metres (530 million cubic feet), and reached 25½ million cubic metres (900 million cubic feet) in 1880, while it did not exceed 2 million (70½ million cubic feet) in 1877, and 6,800,000 (240 million cubic feet) in 1879.

Manufacturing Power.—The manufacturing power of the Company's works, which, on Dec. 31, 1879, was 239 million cubic metres (8436½ million cubic feet) was raised to 261 million cubic metres (9213½ million cubic feet) during the year 1880. This enabled the Directors to meet all the requirements of the past winter, with a reserve of 6 per cent. available in case of accident or any sudden increase in the consumption. They estimate that in order to provide for next winter, the manufacturing power will have to be raised in the course of the present year to 285 million cubic metres (10,000 million cubic feet).

Canalisation.—During the year 1880 some important main-laying work had to be executed in order to improve the supply and convey into the centre of Paris the gas manufactured at the Company's new station at Clichy. A 40-inch main had, with this object, been laid from the works to the Place du Théâtre-Français—a distance of about 3½ miles—at a cost of over 1,000,000 frs. (£40,000). The total length of new mains laid during the past year was 35,171 metres, apportioned as follows:—

	Mètres.	Yards.
In Paris proper.	14,439	15,787
In the outskirts	20,732	22,667
Total.	35,171	38,454

The total length of mains laid under the public roadways was therefore increased from 1,829,037 mètres under Dec. 31, 1879, to 1,864,208 mètres on Dec. 31, 1880, apportioned as follows:—

	Mètres.	Yards.
In Paris proper.	1,303,968	1,425,694
In the outskirts	560,220	612,508
Total.	1,864,208	2,038,202

Most of these extensions were made either at the request of the Municipal Authorities, or in conformity with the terms of agreements entered into by the Company. The remainder were undertaken with the view of meeting demands for additional supplies of gas, to which the Directors deemed it advantageous to accede.

* These house services (*conduites montantes*) are pipes carried from the bottoms to the tops of buildings, for the supply of flats and separate apartments.

New Contract.—A contract, similar in every respect to those under which the Company supply gas to the other communes, has been concluded with the Commune of Thiais. The new contract will expire with the Company's general concession in 1905, and on coming into operation the number of communes lighted by the Company in the departments of the Seine and Seine-et-Oise will be 53.

EXPENSES OF FIRST ESTABLISHMENT.

The manufacture and distribution of gas on the scale of the Company's present operations require an outlay upon works and mains equal to 80c. or 85c. per cubic metre of gas sent out for consumption (from 17s. 6d. to 19s. per 1000 cubic feet). The entire length of mains, as stated above, is over 1864 kilometres (1156 miles), while the works cover an area of more than 100 hectares (about 250 acres). If the consumption remained stationary, all that would be required would be to maintain the plant and apparatus generally in good working order; its development need not occupy the attention of the Directors. This, however, is not the case. The consumption of gas constantly tends to increase, and in order to be equal to meet the growing demands of consumers, it is necessary to extend and re-lay mains, and erect additional works, entailing further expenditure on works of first establishment. Plant capable of producing and distributing millions of cubic feet of gas cannot be constructed piecemeal as it is needed. If the works are to be always in a condition to meet the requirements of the consumers, it is necessary to look forward for several years, and ascertain to what extent the plant should be extended so as to be equal to any emergency.

When the loan of 1878 was contracted, the Directors supposed—judging from what had taken place in the three preceding years—that the consumption of gas would increase by about 350 million cubic feet per annum, and that consequently the supply likely to be required in the year 1882 would be afforded by increasing the manufacturing power of the works to the extent of 1765 million cubic feet in the course of five years. The accounts show that at the end of 1880 the consumption had exceeded the limit which it was not expected to reach till two years later.

The foregoing observations will explain how it is that the Directors were obliged to push on with the extension works more rapidly than in the past, and to incur thereon an expenditure exceeding by 4,500,000 frs. (£180,000) the amount laid out for a similar purpose in 1879; also why they took steps to acquire, without further delay, the land necessary for the erection of works equal, for a certain number of years, to all the requirements of the service.

The following statement shows the several sums expended during the year 1880 on works of first establishment, the total of which amounted to 10,098,459 frs. (£403,938):—

Purchase of Land.

	Francs.	Sterling.
For extension of chemical works at La Villette	72,972	£2,919
For extension of coal and coke stores at Ivry	246,000	9,840
For extension of coke stores at Clichy	470,926	18,837
For new works at St. Denis	551,372	22,055
Legal and other incidental expenses	106,998	4,280
	1,448,268	£57,931
Less value of land sold.	1,292,078	51,683
Total	156,190	£6,248

Works and Plant at the Company's Stations.

	Francs.	Sterling.
La Villette	121,115	£4,845
Les Ternes	32,500	1,300
Passy	25,131	1,005
Vaugirard	174,783	6,991
Ivry	143,913	5,757
St. Mandé	40,596	1,624
Boulogne (Paris)	17,853	714
Maisons-Alfort	81,004	3,240
Clichy	4,863,006	194,520
Tar-works (La Villette)	677,505	27,100
Chemical-works (do.)	126,300	5,052
Miscellaneous	78,580	2,943
Total	6,377,286	£255,091

Mains, Services, Fittings, &c.

	Francs.	Sterling.
Extension of mains	1,506,064	£60,243
House services	1,007,637	40,305
Pipes and fittings	403,373	16,135
Meters	387,686	15,507
Vehicles	65,413	2,616
Tools and material	92,292	3,692
Miscellaneous	102,518	4,101
Total	3,564,983	£142,599

Total expenses of first establishment 10,098,459 frs. £403,938

The general position of the account of expenses of first establishment may be thus stated:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1879.	180,881,805	£7,235,272
Ditto during 1880	10,098,459	403,938
Total on Dec. 31, 1880	190,980,264	£7,639,210

To meet which there is a capital of—

	Francs.	Sterling.
In shares	84,000,000	frs.
In bonds	111,745,739	frs.
	195,745,739	7,829,829
Balance in favour of the Company	4,765,475	£190,619

Out of the capital of 195,745,739 frs. there had been paid off on Dec. 31, 1880, in shares, 10,888,000 frs.; in bonds, 11,431,266 frs.—total, 22,319,266 frs.—leaving 173,426,473 frs. to be redeemed.

Loan of 1878.—The loan of 26,600,000 frs. (£1,064,000) authorized by the Shareholders in 1878, was intended to be applied in increasing the annual productive power of the Company's works from 228½ million to 261 million cubic metres (8066 million to 9213½ million cubic feet), inclusive of the necessary reserve plant, and in providing the mains, house services, branch-pipes, fittings, and meters that would be required with an extended consumption of gas. The necessary outlay it was estimated would be as follows:—

	Francs.	Sterling.
Purchase of land, extension of works, &c.	12,150,000	£486,000
Mains, services, fittings, meters, &c.	12,450,000	498,000
Miscellaneous	1,285,291	51,412
Total	25,885,291	£1,035,412

As far as the first item is concerned, the expenditure has not exceeded the amount estimated; but this is not the case with the others. During the past three years, as already remarked, the increase in the consumption of gas has exceeded all expectations; and although the Directors have advanced by two years the completion of the additional works in course of construction, they have not even now sufficient manufacturing power to meet the requirements of next winter. It is therefore intended

to commence at an early date a number of extensions which will place the Company in a position to satisfy all demands upon them for several years to come. The Directors consequently ask to be furnished with the necessary capital to enable them to carry out those works which are the more urgently needed, at a cost estimated at 12,000,000 frs. (£480,000). This sum they propose raising by the issue of 24,000 bonds of 500 frs. each, payable in two instalments, on similar conditions to those under which previous loans have been raised.

WORKING ACCOUNT FOR THE YEAR 1880.

EXPENDITURE.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1880	15,591 ..	£624

Materials used in Manufacture.

Coals carbonized	19,927,086 ..	£797,083
Coke and tar for heating purposes	3,978,345 ..	159,134
	<u>23,905,431</u>	<u>£956,217</u>

Manufacturing Charges.

Salaries and wages	3,232,766 ..	£129,311
Maintenance of works and plant	1,824,314 ..	72,972
Incidental expenses of distillation	1,324,880 ..	52,995
Purifying material	325,834 ..	13,033
General expenses	104,867 ..	4,195
	<u>6,812,661</u>	<u>£272,506</u>

Cost of Distribution.

Salaries of Engineers and Officers	1,143,383 ..	£45,735
Repair and maintenance of mains and service-pipes	707,902 ..	28,316
Allowances, premiums, stamps, &c.	24,608 ..	985
Printing and advertising	182,675 ..	7,307
Miscellaneous	57,230 ..	2,289
	<u>2,115,798</u>	<u>£84,632</u>

General Management.

Board of Direction and Executive Committee	150,000 ..	£6,000
Salaries	813,817 ..	32,553
Office and other expenses	188,572 ..	7,543
Service, accidents, relief, &c.	153,601 ..	6,144
Law and other charges	9,790 ..	391
Rents and insurances	191,103 ..	7,644
Interest on loans	5,653,321 ..	226,133
Loan redemption fund	1,813,000 ..	72,520
Share redemption fund	1,438,750 ..	58,350
Cost of experiments, &c.	57,352 ..	2,294
Contribution to pension fund	85,500 ..	3,420
Do. to provident fund	129,872 ..	5,195
	<u>10,704,678</u>	<u>£478,187</u>

Municipal Charges.

Tax of 2 c. per cubic metre of gas	4,158,319 ..	£166,333
Rating of subsoil	200,000 ..	8,000
Lighting, extinguishing, and maintenance of public lamps	502,052 ..	20,082
	<u>4,860,371</u>	<u>£194,415</u>

State Charges.

Taxes	507,496 ..	£20,300
Stamps	123,089 ..	4,924
	<u>630,585</u>	<u>£25,224</u>

Total expenditure 49,045,115 .. £1,961,805

REVENUE.

Produce of the sale of gas	61,030,715 ..	£2,441,229
Value of gas in store on Jan. 1, 1881	28,292 ..	1,132
Retort coke	15,790,189 ..	631,608
Furnace coke	564,405 ..	22,576
Tar	3,185,111 ..	127,404
Ammoniacal liquor	382,378 ..	15,295
Rent of meters on hire	1,371,590 ..	54,864
Rent of fittings, &c., on hire	1,228,765 ..	49,150
Fire-bricks	276,393 ..	11,056
Chemical products	1,283,825 ..	51,353
Sundry works	301,448 ..	12,058
Interests and discounts	861,777 ..	34,471
	<u>86,304,888</u>	<u>£3,452,196</u>

Balance in favour of revenue, being profit made during 1880 37,259,772 .. £1,490,391

Add balance of profit from 1879 182,156 .. 7,286

37,441,928 .. £1,497,677

Deduct reserve to meet claims outstanding on Dec. 31, 1880 241,928 .. 9,677

Balance, being profit available for distribution 37,200,000 .. £1,488,000

Deduct for share dividend 12,400,000 .. 496,000

Balance, divisible equally between the Company and the Municipality of Paris 24,800,000 .. £992,000

The total amount available for distribution among the Shareholders is therefore as follows:—

	Francs.	Sterling.
Dividend, as per above account	12,400,000 ..	£496,000
Moiety of balance, ditto	12,400,000 ..	496,000
Eighth payment by the Municipality, in partial reimbursement of working expenses	50,000 ..	2,000
Balance of profit to the credit of Shareholders	12,578 ..	503
	<u>24,862,578</u>	<u>£994,503</u>

Deduct 1 fr. per share for special reserve fund, authorized at the general meeting on the 25th of March, 1875 336,000 .. 13,440

24,526,578 .. £981,063

Deduct interim dividend of 12 frs. 50 c. per share paid in October last 3,728,537 .. 149,141

Balance 20,798,041 .. £831,922

Deduct final dividend of 61 frs. 50 c., making a total dividend for the year of 74 frs. per share (250 frs.) 20,664,000 .. 826,560

Net balance to carry forward 134,041 .. £5,362

COALS, RESIDUAL PRODUCTS, ETC.

Coals.—During the year 1880 the price of coals did not fluctuate to any great extent, and the Directors were enabled to renew for long periods, on advantageous terms, several of their important contracts.

Retort Coke.—The great extension of the use of gas for heating purposes does not appear to have affected in any way, up to the present time, the sale of coke for industrial and domestic operations. Although during the past year 1,547,287 hectolitres (4,255,040 bushels) more coke were produced than in the previous year, the stock in hand on the 31st of December last exceeded by only 12,793 hectolitres (35,181 bushels) the quantity in store at the corresponding date in the preceding year. This stock, which amounted to over 900,000 hectolitres (2,475,000 bushels), would have been very much less if, during the greater portion of the month of December, the mildness of the weather, by obviating the necessity for fires, had not contributed to reduce very materially the number of orders for this residual. In ordinary years—those, that is to say, when the winters are of the normal severity—the two methods of heating, by coke and by gas, are about equally in use, and there is consequently little, if any, observable competition between them; but when the winters are mild and damp there is scarcely any sale for coke, which soon begins to encumber the yards, where it has to be stacked at considerable expense. The amount produced by the sale of coke in 1879 was 12,611,732 frs. (£504,469); in 1880 it was 15,790,189 frs. (£631,608). There is very little difference between the latter amount and that obtained in 1875 for a production of coke equal to barely two-thirds that of last year; showing clearly that an increase in the consumption of gas is not necessarily followed by a proportionate increase in the receipts from the sale of the residual products. The amount received for metallurgic coke was 564,405 frs. (£22,576), being an increase of 108,457 frs. (£4,338) on the sum produced by the sale of this material in the preceding year.

Heating Appliances.—The number of appliances for heating by coke sold by the Company in 1880 was 2570, bringing up to 52,189 the total number of these appliances which have been sent out of the Company's works, and nearly the whole of which are in use in Paris.

Tar and Ammoniacal Liquor.—The amount produced by the treatment of these products in the past year was 4,468,936 frs., divided as follows:—

	Francs.	Sterling.
Tar	3,185,111 ..	£127,404
Ammoniacal liquor	1,283,825 ..	51,353
Total	<u>4,468,936</u>	<u>£178,757</u>

This result is very satisfactory, but it accords little with the idea formed by the public generally as to the value of these residuals. This sum of 4,468,936 frs. represents, in effect, only 1·8 centimes per cubic metre (6d. per 1000 cubic feet) of gas manufactured, while the total cost of manufacture is 20 c. (4s. 8d. per 1000 cubic feet), exclusive of the amount claimed by the Municipality as their share of the profits. It is, therefore, far from being the fact, as is pretended, that the treatment of the tar and ammoniacal liquor reduces considerably the manufacturing expenses; and the opponents of the Company, who for some time past—either from ignorance or bad faith—have promulgated this singular theory, are guilty of a strange abuse of public credulity.

Gas-Engines.—During the year 1880 the Company sold 77 horizontal "Otto" gas-engines. The quantity of gas consumed by these engines in Paris is not very great, being only about 1,500,000 cubic metres (about 53 million cubic feet).

Compressed Fuel.—Some few years since the Directors announced that they had commenced the manufacture, from their breeze, of an artificial fuel which might be used as a substitute for coke in the heating of boilers and retorts. The result of this operation is to give to the breeze—the employment of which is very limited—a market value almost equal to that of coke itself. During the past year there were manufactured 21,738 tons of this compressed fuel, which consumed 323,500 hectolitres (890,000 bushels) of breeze and 2330 tons of pitch.

PROVIDENT AND OTHER FUNDS.

Pension Fund.—This fund was instituted in 1858 for the purpose of providing pensions for those servants of the Company who, having attained a specified age, and been in the service a certain number of years, might become incapable of discharging their duties. The capital of the fund consists of donations from several of the Directors, who felt desirous of assisting so useful an institution, as well as of an annual grant from the Company, the interest on which is capitalized. The Company's servants do not contribute in any way whatever. The amount placed to the credit of this fund up to the 31st of December last was 2,101,653 frs. (£84,066), represented by 20 shares and 3926 bonds of the Company, and 640 of the 3 per cent. bonds of the Eastern and Western of France Railway Companies. The 4500 frs. (£180) deducted each year from the amount placed to the credit of the fund, for the purpose of affording temporary assistance and allowances to those of the Company's servants who are deemed specially worthy thereof, has for some time past been found to be insufficient. The Company therefore had to supplement it last year by a grant of 73,139 frs. (£2925), thus forming a total of 77,639 frs. (£3105). In 1879 this subsidiary grant amounted to 74,450 frs. (£2978). The pension fund came into operation on the 1st of January of the present year.

Provident Fund.—The object of this fund is to ensure to each of the Company's servants who, on account of sickness or accident, may be temporarily incapacitated from work, the medicine and medical attendance they require; to provide them with funds during their illness; to defray the expenses of their interment in the event of death; and to assist the widows and children who may be left. The fund is supported by a deduction of 1 per cent. from the salaries and wages of the men, with the addition of an equal amount given by the Company. There are now 22 doctors and 66 chemists upon the medical staff in connection with this fund. During the year 1880 the medical men visited 1753 patients at their homes, and attended 27,185 consultations. The medical fees, medicine, and other expenses connected with the fund amounted last year to 270,608 frs. (£10,824). The account of the fund stands thus:—

Receipts.

	Francs.	Sterling.
One per cent. on salaries, &c.	129,872 ..	£5,195
Company's contribution	129,872 ..	5,195
Interest and sundry receipts	7,509 ..	300
Total	<u>267,253</u>	<u>£10,690</u>

Expenditure.

Medical fees, medicine, &c., as above	270,608 ..	10,824
Excess of expenditure	3,355 ..	£134

Consequently the balance to the credit of the fund has diminished from 38,531 frs. (£1541) to 35,176 frs. (£1407), represented by 65 fully-paid bonds of the Company, and a cash balance of 2134 frs. (£85).

Savings Fund.—This fund, which was instituted only a few years since, was started with the object of encouraging saving habits among the Company's servants, by affording them facilities for putting away, without expense or loss of time, whatever they might be able to save out of their earnings. The sums deposited bear interest at the rate of 5 per cent. per annum, and must not exceed a total of 500 frs. When they reach this limit, the Company undertake, with the consent of the depositor, and without expense to him, the purchase of some absolutely safe securities,

the certificates for which are at once forwarded to him. From July 1, 1876, the date of the formation of this fund, down to Dec. 31, 1880, there had been 3253 accounts opened, the deposits amounting to 731,691 frs. There are now 1790 depositors, and the account of the fund stands as follows :—

	Francs.	Sterling.
Amount received on deposit	731,891	£29,276
Out of which there has been repaid—		
In cash to 2435 depositors, some of whom have left the Company's service	362,988 frs.	
In vouchers to 237 depositors whose payments exceeded 500 frs.	151,414 frs.	
	514,402	20,576
Balance in hand on Dec. 31, 1880	217,489	£8,700

Special Reserve Fund.—This fund was instituted in March, 1875, for the purpose of providing, at the termination of the Company's concession, on Dec. 31, 1905, a sum equivalent to the share in the undertaking that will then be claimed by the Municipality; thus affording security to the holders of the fully paid shares. On Dec. 31, 1880, the account of this fund stood as follows :—

	Francs.	Sterling.
Amount paid into the fund	2,352,900	£94,080
Interest	875,535	15,021
Value on Dec. 31, 1880, of the eight annuities advanced to the City of Paris, repayment deferred till 1888	2,009,094	80,364
Total	4,736,629	£189,465

The first two items are represented by 3095 of the Company's fully-paid bonds, by 2621 bonds on which 400 frs. have been paid, by 310 three per cent. bonds of the Eastern and Western of France Railways, and by a cash balance of 108,013 frs. (£4320). All these bonds being repayable at par, they constitute in reality a value of 2,750,000 frs. (£110,000), exceeding by 181,878 frs. (£5255) their purchase price; so that the actual total of this fund is 4,868,007 frs. (£194,720.)

REDUCTION IN THE PRICE OF GAS.

The report concludes with a reference, at some length, to the action taken by the Syndical Chambers of Paris with the view of obtaining a reduction in the price of gas. The circumstances in connection with this movement have been from time to time referred to in the JOURNAL, and need not now be repeated. As the Directors state, a proposition—the result of much inquiry and deliberation both by the Company and by the Authorities—is now under the consideration of the Municipal Council, and therefore any discussion thereof would be premature and inopportune. All they could do was to inform the Shareholders of the fact officially, reserving to themselves the right on some future occasion, if necessary, and at a specially convened meeting, to explain the advantages of the scheme; at the same time they assured the Shareholders that they were not pledged in the slightest degree by the draft convention submitted to the Council, and they would always have the power, when it came to be submitted to them, of giving or refusing their assent to its provisions.

THE GAS SUPPLY OF KINGSTON (JAMAICA).

The report of the Engineer of the Kingston (Jamaica) Gas-Works, (Mr. G. N. Cox, Assoc. M. Inst. C.E.), for the financial year ending Sept. 30, 1880—presented to the Managing Commissioner (the Hon. H. J. Kemble) early in the present year—has recently come to hand, and the following extracts therefrom will show the progress made by the undertaking in the period reported upon, as compared with the preceding year.

During the twelve months ending Sept. 30, 1880, the total make of gas was 7,171,020 cubic feet, to produce which 495 tons of common, and 246 tons of cannel coal were carbonized, costing £1184 14s. The cost of production was as follows :—Coals, £1184 14s.; wages and renewals, £842 4s. 7d.; management and incidentals, £722 7s. 8d.; lime for purifying, £70 4s.—total, £2819 10s. 3d. This, the report states, would be equal to 7s. 10d. per 1000 feet of gas made, whereas the cost of production in 1878-9 was 10s. 6d. per 1000 feet. This difference arose from the fact that although considerably more gas was made during the year under review than in the preceding twelve months, the wages, cost of renewals, management expenses, &c., were no higher, the only extra outlay being for the larger quantity of coal used. The quantity of gas made per ton of coal carbonized was 9677 cubic feet—a somewhat smaller proportion than that made in the previous year.

With regard to residuals, the report states that the quantity of coke produced during the twelve months was 496 tons, of which 282 tons were consumed in the retort-house, 32 tons in the engine-house, 60 tons in lime-burning, and the remaining 116 tons were sold, producing £135. The demand for coke was scarcely equal to the supply, and the prices obtained were rather lower than in the previous year. The quantity of tar made was 8200 gallons, of which 4321 gallons were sold, realizing £133 14s.; the prices charged ranging from 5d. to 1s. per gallon. The quantity sold in the previous year was 2351 gallons.

During the year 63 meters, supplying 986 lights, were fixed. The value of fittings supplied, including labour, amounted to £972, being a trifle under 20s. per light. Ten cooking-stoves were supplied, and a gas-engine was fitted up at the Government Printing Office. The report refers to this in more detail further on.

A good demand existed throughout the year for lime, and a considerable quantity was sold on the sugar estates for tempering cane juice, for which purpose lime burnt with coke was found to be much better adapted than that burnt with wood. The amount realized by the sale of lime was £461 2s. 4d., and in addition to the quantity sold, upwards of 936 barrels of slaked lime were used in the purification of gas. There was altogether a profit of £156 on the lime account.

The stock of coal in hand on Sept. 30 last was 70 tons of cannel, and 480 tons of common; the former being valued at £154, the latter at £660. It has been determined to try Trinidad bitumen in place of cannel, as being equally efficient as an enriching material, besides being considerably cheaper. The total value of the general stores—coal, coke, plant, meters, fittings, &c.—in hand on Sept. 30 last was £4245, as compared with £4982 at the end of the previous twelve months.

The total consumption of gas during the year was 3,328,700 cubic feet, against 2,289,800 and 1,463,000 cubic feet in 1878-9 and 1877-8 respectively. It will thus be seen that the increase in the use of gas by private consumers has been satisfactory, and has justified the action taken by the Commissioners in August, 1879, when they reduced the price 20 per cent. The distribution of the total quantity of gas made was as follows :—

Public and private consumers	3,328,700 cubic feet.
Street lamps	3,119,850
Consumed on works	144,000
Unaccounted for	578,470
Total	7,171,020 cubic feet.

The loss by leakage was equal to 8 per cent. of the quantity made—a low proportion, considering the great length of mains as compared with the

number of consumers. An analysis of the whole of the gas consumed by meter showed that the public institutions used 34 per cent.; factories, printing offices, bakeries, &c., 18 per cent.; shops, stores, and taverns, 17 per cent.; private residences, 14 per cent.; churches, chapels, and schools, 13 per cent.; the balance—4 per cent.—being consumed for illuminations and in places of public entertainment.

The total receipts for the year were £6311 11s. 6d., as compared with £6085 1s. 6d. for the year 1878-9. The expenditure was £4057 16s. 3d., as against £3507 18s. 1d. in the previous year; the increase being caused chiefly by the purchase of coals and meters, and the extension of the mains, 1000 yards additional having been laid. There was thus a sum of £2253 15s. 3d. available for interest and the repayment of advances.

The gas-engine fitted up at the Government Printing Office, already referred to, is said to do its work in the most satisfactory manner. It drives two printing machines, the average consumption of gas being 5000 cubic feet per month, costing £9. Previous to its erection two men were required to do the work of one of the machines, their wages amounting to £4 per month, and the number of impressions then struck off did not reach 500 per hour. Now the number struck off is 900 per hour, and so well satisfied is the superintendent of the establishment with its working, that a larger engine is being imported to drive new machines to be erected.

Mr. Cox concludes his report as follows :—"I would urge upon the Commissioners the desirability of extending the sale of gas for cooking purposes. A good many small cookers, suitable for boiling one kettle at a time, have been sold, and they have proved very desirable acquisitions in a household. Their consumption of gas is very small. To boil one tin kettle of water every morning, for instance, would consume 150 feet of gas per month, worth 1s. 10½d. The cookers vary in price from 4s. to 12s. each. Gas-stoves containing an oven and three ring burners for boiling may be imported for £5 each. The quantity of gas used in a stove of this description per hour is from 20 to 25 feet, and the stoves are sufficiently large to cook a meal for any ordinary household. The great advantages of gas for cooking to a family are its cleanliness, the nicety with which the heat may be adjusted, its constant readiness for use, and its superiority for baking over the ordinary pot or oven. In England and America gas is now largely used both for cooking and heating, not only to the convenience of the consumer, but to the great benefit of the gas companies, who are thus enabled to a certain extent to gain a day consumption. So anxious are some companies to promote the use of gas in the daytime, that consumers using it for cooking get their gas at a cheaper rate than that supplied for lighting purposes, it being always a desideratum to a gas manager to increase the day consumption in order to equalize as much as possible the quantity of gas made and delivered at all times of the 24 hours. To promote the use of gas for cooking, I would suggest that a small stock of gas-stoves be imported, and that they be advertised for sale or hire, so that persons wishing of making use of them could get them at a reasonable cost.

"The increase in the number of private householders taking gas has been less than could be desired, but the great drawback I find is not so much in the comparatively high price of gas as in the objection that householders have not only to lay out a considerable sum of money in gas-fittings, but to have their houses turned upside down by the gas-fitters. Parties becoming gas consumers usually take advantage of the time when they are repairing and painting their residences to have the gas laid on, and for this reason the increase in the number of private consumers is sure to be a slow but gradual one.

"As a proof that it is not the comparatively high price charged for gas that deters householders from having it laid on, I would mention that when a house already fitted up with gas fixtures has been relet, the incoming tenant invariably becomes a gas consumer. Owing to the early habits of the population, the consumption of gas per household is very small, only averaging 800 cubic feet per month, worth 10s.; whereas the average consumption per month by public institutions is 6700 feet; by factories, &c., 3600 feet; by churches, schools, &c., 2000 feet; and by shops, taverns, &c., 1000 feet. Private householders form 30 per cent. of the total number of consumers, but their consumption of gas is only 14 per cent. of the quantity sold by meter. To further promote the use of gas by private consumers, arrangements have been made to rent out gaseliers, &c., the rent to be paid monthly with the rates. By adopting this system, a householder desirous of having the gas laid on need only pay down the cost of labour, together with the value of the pipes, &c., the cost of which averages 10s. per light. Thus a ratepayer wishing to fit up his premises with, say, 10 lights, would only have to pay £5, and 1½ per cent. of the value of his gaseliers per month, the gaseliers becoming his absolute property when their full value is paid up."

SINGAPORE GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held at the City Terminus Hotel, Cannon Street, E.C., on Tuesday, the 19th inst.—H. P. STEPHENSON, Esq., in the chair.

The SECRETARY and ENGINEER (Mr. Robert King) read the notice convening the meeting, and the following report and accounts were submitted :—

The Directors have to report continued progress in the lighting of Singapore, for particulars of which they refer to the report annexed to their Engineer and Manager, Mr. E. J. Wells, dated Feb. 7, 1881.

The Directors going out of office by rotation are Messrs. Frederick Alexander Malcolm Nicol and Alexander Erskine Stephenson; and these gentlemen, being eligible, offer themselves for re-election. The present Auditors, Messrs. William Thomas Morrison and Alfred Williams, retire from office according to the Articles, and, being eligible, offer themselves for re-election.

The balance-sheet to Dec. 31, 1880, appended to this report, shows the financial position of the Company. The Directors have written off for depreciation of works and plant at the rate of 1 per cent. per annum, and £250 for depreciation of fittings. The profit for the half year, after writing off these sums, amounts to £2576 3s. which together with £878 5s. 2d., the unappropriated profit of the preceding half year, makes the available balance £3454 8s. 2d. Out of this sum, the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum, less income-tax, on the preference capital, and at the rate of 8 per cent. per annum, less income-tax, on the ordinary capital; the balance of £1022 7s. 5d. to be carried forward to the profit of the succeeding half year.

Report of Engineer and Manager.

Gas-Works, Singapore, Feb. 7, 1881.

Gentlemen,—By this French mail I have the honour of forwarding to you the several balance-sheets and statements of accounts, showing the working for the half year ending Dec. 31, 1880. You will also find the bankers' voucher, showing the balance at the bank here on Dec. 31, 1880. I trust all the documents will reach you safely, and be found correct. It gives me great pleasure to be able to lay before you statements showing a satisfactory increase in the gas-rental over the two previous half years. The residual products have also met with ready sales.

The details connected with receipts and payments being fully detailed, it is quite unnecessary for me to quote figures connected with any of the accounts.

The loss on exchange on £3900 remitted during the half year amounted to £726 3s. 7d.; the average rate has been 3s. 9½d. per dollar on four months' bank bills. The present rate is 3s. 8½d. per dollar on the bill sent by this mail.

During the half year the expenditure on the works and apparatus has only been what was necessarily required for their maintenance. They are in a sound working condition. The gas has been sent out from the works free from impurities, and the illuminating

power has been kept up to the standard. The Engineers' report for the half year will furnish you with all the particulars and details of the working.

The extension of mains mentioned in my last report has been completed, with 19 public lamps erected upon them. Further extensions of mains have been carried out in Kein Sengs and Kallang Roads, on which 14 public lamps have been erected, so that we have now burning nightly 528 public lamps. Further orders for the erection of 20 public lamps in Scott's Road, extending to the entrance of the European Barracks at Tanglin, have been given by the Municipal Commissioners. The 5-inch main is being laid to the above extremity, and will open up a district for lighting in which are situated a number of European houses, and also the barracks. The order sent to England on Dec. 8, 1880, for 3-inch mains is for a further extension of public lighting in the South Campong Malacca district, where 30 public lamps are to be erected. These mains I have no doubt will arrive about the time when we have finished the Orchard Road extension, so that the staff of men will be at once turned over to the new proposed extension, and before the end of the present half year we shall have about 580 public lamps burning. The fitting staff during the half year has been very fairly employed; 20 houses have been fitted up with 273 burners, and one boiling-stove, and 33 public lamps have been erected.

(Signed)

E. J. WELLS, Manager.

Dr.	Balance-Sheet, Dec. 31, 1880.	Cr.
Capital—		
2,000 preference shares, £5 paid	£10,000 0 0	
10,597 ordinary shares, £5 paid	52,985 0 0	
12,597 shares	£62,985 0 0	
Debiture bonds	100 0 0	
Sundry creditors	488 17 4	
Insurance reserve fund	265 19 6	
Profit and loss	3,454 8 2	
	£67,294 5 0	
		£67,294 5 0

Profit and Loss Account, from July 1 to Dec. 31, 1880.

Coal carbonized	£2,426 5 11	Balance at profit and loss, June 30, 1880	£3,310 5 11
Lime and oxide	24 0 6	Less amount declared as dividend	2,432 0 9
Trade and general charges	374 2 1		
Rent, rates, and taxes	105 9 4		
Directors and Auditors' commission	310 10 0		
Salaries and Collectors' commission	843 7 5	Gas and meter rental	£878 5 2
Wages	432 14 5	Products, profit on fittings, and sundries	7,276 16 4
Interest on loans and debentures	25 4 6		
Loss on exchange	726 3 7		
Bad debts and allowances	121 14 6		
Travelling expenses	90 0 0		
Retort account	200 0 0		
Meter repairs and renewals	81 19 2		
Depreciation on works, plant, and fittings	477 9 7		
Office furniture	5 0 0		
Balance, profit	3,454 8 2		
	£9,698 9 2		£9,698 9 2

The CHAIRMAN, in moving the adoption of the report, said he should only call the Shareholders' attention to two facts—that the gas-rental was about £670 more than in the June half year, which had been obtained by spending £135 more on coal, and that the Directors had written off more than hitherto. Altogether they had reduced their stocks by £1563, and he hoped the reduction would in future be continued. The accounts were more favourable than they had been for some time, and he thought the Company were gradually getting out of that lack of trade which had been experienced all over the world. He therefore hoped that better times would come.

Mr. R. S. FOREMAN having seconded the motion,

Mr. W. H. SMITH drew attention to the item of £90 for travelling expenses, which he said he had not noticed in previous balance-sheets. He also observed that the item of bad debts and allowances was in excess of that of the corresponding period of 1879.

The CHAIRMAN stated that he could not give any explanation of the bad debts being greater by £15 as compared with June, and £41 as compared with the corresponding period of the previous year. The return came from their Manager. Perhaps the increase in the item was attributable to the bad state of trade which had existed in Singapore as elsewhere. It was not correct to say that the item of travelling expenses appeared now for the first time—it had been in previous accounts. The Company's principal fitter and sub-manager under Mr. Wells died, and they were under an engagement to pay his travelling expenses home. They would also have had to pay his wife's expenses home, but she preferred remaining at Singapore; and they thought it only fair to allow her the £180, which had been spread over two half years.

Mr. RICE said there were two very good features in the report—the rates and taxes were lower; and as to the carbonizing of coal, they had used less coal and made more gas. The products and fittings seemed to be the worst feature. He, however, thought that the balance-sheet was very favourable.

The CHAIRMAN, in reply, stated that the decrease in rent, rates, and taxes was in consequence of the allowance for rent made to the deceased officer having ceased, and no one having as yet been appointed in his place. He (the Chairman) did not think the carbonizing had improved, but coal had been bought cheaper. The decrease in products and fittings was not a loss, but want of profit. There was less profit on the item than in the previous half year, arising from the fittings having been done at a less price, and the realization from the coke being rather less. It was not through any depreciation in stocks on hand. The Directors had looked most carefully after their stocks, and by writings off they had placed them on a sound basis.

The motion was then put, and carried unanimously, and the dividends recommended in the report were declared.

The retiring Directors and Auditors having been re-elected,

The CHAIRMAN moved a vote of thanks to the Engineer and Manager at Singapore (Mr. E. J. Wells) for his attention and energy in conducting the affairs of the Company, and also to the Local Committee at Singapore. The Company had, he said, now arrived at paying a dividend of 8 per cent., and he could assure the Shareholders of this—that as soon as the Directors saw their way clearly to increase the dividend and maintain it, they would do so; but to his mind nothing could be so pernicious to a Company as to go up in dividend, and then have to come down.

Mr. ALFRED WILLIAMS seconded the motion, and it was carried unanimously.

Mr. RICE quite agreed with the Chairman that there was nothing worse than a fluctuating dividend, and rather than incur such a risk the Directors had better wait a half year or so before increasing the dividend. He moved a vote of thanks to the Chairman and Directors for their able management of the Company during the past year.

Mr. SMITH seconded the motion, which was carried unanimously.

The CHAIRMAN, in acknowledging the compliment, expressed his belief that the increase that was going on in the extension of Singapore—a matter which he entered into more fully at the last meeting—was very likely to lead to a considerable advance in the lighting there. The public lighting was increasing pretty rapidly, and he thought the private lighting was likely to increase.

On the motion of Mr. MAINWARING, seconded by Mr. WILLIAMS, a vote of thanks to the Secretary was passed, and the proceedings terminated.

SHEFFIELD WATER-WORKS COMPANY.

The Annual General Meeting of this Company was held on Thursday, the 14th inst.—Mr. P. SMITH in the chair—when the following report was presented:—

After payment of all expenses of the Company, interest on debentures, and dividends on preference shares chargeable against revenue account, and £4618 10s. paid on the 1st of November last as a dividend after the rate of 2 per cent. per annum on the ordinary capital of the Company for the half year ending the 30th of June last, and after adding the balance of £23,621 17s. 9d. brought forward from the year 1879 and appearing in the accounts published with the report of that year, there remains the sum of £55,029 17s. 6d., being the balance of the Company's undivided revenue. The Directors recommend that out of this balance a dividend on the ordinary capital of the Company, after the rate of 3 per cent. per annum for the half year ending the 31st of December last, shall be paid on the 1st of May next. This payment will absorb £6927 15s., leaving a balance of undivided revenue of £28,102 2s. 6d. to be carried to next account. The dividend for the whole of the year 1880 will then be at the rate of 2½ per cent., as against 2 per cent. for the year 1879.

The Directors consider that this increase of dividend is warranted by the satisfactory growth of the Company's revenue, but they cannot on this occasion recommend a greater increase, as the time is probably very near when the Company's Engineer will be able to certify that the Damflask reservoir is fit to be filled; and when, in accordance with the order of the Court of Chancery, the interest arising from the expenditure thereon will cease to be chargeable against and defrayed out of capital, although the demand for water may not for some years be sufficient to enable the Company profitably to utilize this large additional reservoir. To prevent retrogression, therefore, in the rate of dividend on the ordinary capital during that coming period, the Directors deem it very desirable that a considerable balance should be kept in reserve.

The number of houses supplied with water by the Company in 1880 exceeds by 1443 those supplied in 1879. The Company now supply 60,678 houses, besides other property. The income of the Company derived from water-rates in the year 1880 shows an increase on that in 1879 of £3224 4s. 8d. which fact will be regarded by the Shareholders with special satisfaction at a time when the trade of Sheffield and its district has only partially revived.

The working expenses of the year 1880, compared with those of 1879, show a diminution of £741 19s. 5d., and are as low as, and even lower than they have been in some previous years, when the business and revenue of the Company were far less than in the year 1880. This result is due not merely to the exertions of the Directors, but also, and in a greater degree, to the vigilance and zeal of their General Manager and his leading assistants. The Directors, however, think it right to say that they believe the expenses of the different departments to be now reduced as low as a wise economy will justify, and that as the Company's gross revenue further increases there must of necessity be some increase of expense, though, of course, not in a like proportion.

The Directors are happy to state that the interest on the whole debenture debt of the Company, excepting £1455, has been reduced to 4 per cent. per annum. The reduction of the rate of interest from an average of nearly 4½ per cent. has effected a considerable annual saving.

In November last the action of the *Sheffield Water-Works Company v. Bingham* was heard by the Master of the Rolls, who decided that the Company have the right, under section 81 of the Act of 1853, to be paid for the water used in private baths according to the rates specified in that section, as amended by the Act of 1864. Against this decision the defendant has entered an appeal, and as this appeal has not yet been heard, the Directors are unable to announce the settlement of this long-disputed question.

The Company have promoted a Bill in the present session of Parliament to extend the time within which they can exercise their powers to make the Broomhead, More Hall, and Wadley service reservoirs, and also to enable them to raise further capital for the construction of those reservoirs when required, and for other purposes of their undertaking for which their present capital may be inadequate. The Bill was approved by a special meeting of the Shareholders, held on the 28th of January last. It has not been opposed in Parliament, and is now in progress in the House of Lords.

A special meeting of the Company was held on the 24th of January last, to confirm the appointment, previously made by the Directors, of Mr. B. P. Broomhead to the clerkship of the Company, rendered vacant by the death of Mr. R. Blakelock Smith, on the 1st of August last. On the 8th of October last, Mr. W. Cockayne, who was Chairman of the Directors, and whose local knowledge, experience, and influence had often been of great value to them, retired from the Board on account of advanced age. Mr. W. C. Waterfall was elected to fill the vacancy in the directorship, and Mr. P. Smith was appointed Chairman of the Directors.

The Company's Engineer-in-Chief reports as follows:—

"To the Directors of the Sheffield Water-Works Company.

"30, Great George Street, Westminster, S.W., March 21, 1881.

"Gentlemen,—I have the honour to report that I have made my annual inspection of the impounding reservoirs of the Company, with the following results:—(1) The Agden, Dale Dyke, and Strines reservoirs are all in excellent condition, and are overflowing. (2) The two Rivelin reservoirs are also perfect, with the slight exception that a small amount of stanching is required at the weir of the upper reservoir. These reservoirs are also filled. The depositing-pond, in the same valley, is likewise in good order. (3) The three Redmires reservoirs are full and in good condition, with the single exception of the south weir of the middle reservoir, about three courses of the masonry of which appear to have been somewhat moved by the frosts of the past winter. I recommend that this work be forthwith strengthened in the manner I have indicated to your Superintendent. The cost will probably be about £150. The quantity of water in stock is such as will secure the Company and the public against the effects of any probable drought, and still leave a large residue.

(Signed)

"T. HAWKESLEY."

The outgoing Board is composed of the following gentlemen—Mr. Percy Smith, Mr. John William Hawkesley, Mr. Henry Crookes, Mr. Thomas Cole, Mr. Francis William Colley, Mr. William Isaac Greaves, Mr. Samuel Roberts, the younger, Mr. Henry Jubb, and Mr. William Cowley Waterfall, all of whom are eligible, and offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report, said the Directors had pleasure in meeting the Shareholders on this occasion, because they believed the report had been received with some satisfaction. To his mind, the report was the most satisfactory one the Directors had been able to issue for many years—perhaps he might say since 1864. The large increase of revenue during the past year was in itself an encouraging feature; but the most satisfactory thing of all was that the Company seemed at last to be entering upon a period when the large outlay of capital incurred during the past 12 or 15 years, in placing beyond risk the water supply of the district, would no longer be found incompatible with a reasonable profit to the Shareholders. If they examined the accounts they would see that the revenue had now reached such dimensions that even if the whole of the interest on the non-productive works of the Company were to be charged against it, there would still be a substantial balance to the good—not, it was true, a large balance at present; but a balance which they hoped to see annually increased, and which, added to the funds held in reserve, would, the Directors trusted, be sufficient not only to maintain the present rate of dividend, but gradually and safely to augment it. The Bill promoted in the present session of Parliament, and which, he was happy to say, was only waiting for the Royal Assent, would prevent the necessity of a further larger premature outlay of capital, while it would preserve intact all those valuable rights conferred upon the Company by previous Acts. While they had, so far as human foresight enabled them, fulfilled the first condition of their existence as a Company, by providing an ample and enduring water supply to the whole of their parliamentary district, the time was not far distant when those who many years ago embarked money in the undertaking would receive some

reward for their long patience, and for the courage with which they had stuck to the Company during a period of unprecedented adversity. The report contained the well-considered account by the Directors of their labours in 1880, so far as these labours had been productive of results, and if any Shareholder thought it was not perfectly clear, and wished for further information, he (the Chairman) should be glad to hear his questions, and to answer them so far as might be practicable.

Mr. J. W. HAWESLEY seconded the motion, and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. HAWESLEY, a dividend for the half year ending the 31st of December was declared, making with that declared on the 1st of November 2½ per cent. for the year, free of income-tax.

Mr. J. SMITH said, considering the circumstances under which the Shareholders then met, he believed their position was a very happy one, especially when they remembered that they were getting one-half per cent. more dividend. This was a matter upon which they must all congratulate the Directors, and they must feel grateful to them for having worked so hard in their interests. For the income of the Company to have increased last year by the sum of £3224 in the present state of trade was, he thought, a very hopeful and happy sign, and the debenture debt was a feature they should not overlook. They were now, it appeared, getting the whole of the debenture debt at 4 per cent., which was a material saving. There was one paragraph in the report which he was glad to notice, and that was the graceful allusion which was made to the vigilance and zeal of the Manager and his assistants, which had been so largely instrumental in bringing about the satisfactory result that had been attained. In conclusion he moved the re-appointment of the outgoing members of the Board.

Mr. J. WILSON seconded the motion, and it was carried unanimously. On the motion of the CHAIRMAN, seconded by Mr. HAWESLEY, the remuneration of the Auditor was increased from £70 to £100.

A vote of thanks was then passed to the Chairman and Directors, and the proceedings terminated.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns—furnished to him by the London Water Companies—of the average daily quantity of water supplied to the Metropolis during last month. From them it will be seen that 140,244,738 gallons, or 637,196 cubic metres of water (equal to about as many tons by measure, tons by weight), were supplied daily; or 232 gallons (105·4 decalitres), rather more than a ton by weight, to each house, and 32·7 gallons (14·9 decalitres) to each person, against 33·2 gallons during March, 1880:—

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	Mar., 1880.	Mar., 1881.	Mar., 1880.	Mar., 1881.
Totals supply	579,126	603,689	136,331,201	140,244,738
From Thames	277,326	290,317	69,280,779	69,653,569
„ Lea and other Sources	301,800	313,372	67,050,422	70,591,169
THAMES.				
Chelsea	29,945	30,662	8,453,300	8,641,800
West Middlesex	53,917	56,562	10,710,676	10,845,414
Southwark and Vauxhall	89,188	93,113	23,650,294	21,982,298
Grand Junction	40,825	43,341	12,212,109	12,274,257
Lambeth	63,451	66,639	14,254,400	10,909,800
LEA AND OTHER SOURCES.				
New River	129,792	132,809	27,392,000	26,664,000
East London	122,746	128,582	31,551,500	35,626,700
Kent	49,262	51,981	8,106,922	8,300,469

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for March, 1881, as compared with that for the corresponding month of 1880, shows an increase of 24,563 houses, and of 3,913,537 gallons of water supplied daily.

GLASGOW CORPORATION WATER SUPPLY.

At the Meeting of the Glasgow Water Commissioners last Thursday—the Lord Provost presiding—the Water-Works Sub-Committee on Finance submitted an estimate of revenue and expenditure for next year, in the course of which they stated that they had “agreed to recommend the Water Committee to report to the Commissioners that they are of opinion (1) that the sum to be set apart as a sinking fund for the said year, 1881-82, should be £24,066 (that is £22,500 for the ‘Glasgow Water Account,’ and £1566 for the ‘River Supply Account’), being at the rate of 1½ per cent. on the money borrowed; (2) (a) that the amount of the domestic water, rate to be assessed and levied, under the limits of compulsory supply, for the said year, 1881-82, should be continued at 8d. in the £; (b) that the amount of the domestic water-rate to be levied for the same period upon and from the occupiers of all dwelling-houses, and of such parts and portions of all shops and buildings as may be used as dwelling-houses beyond the limits of compulsory supply, but included within the limits of the Glasgow Corporation Water-Works Act, 1855, should be continued at 1ld. in the £; (c) and that the public water-rate should be continued at 1ld. in the £; and (3) that no alteration be made on the present table of rates and charges for supplies of water for other than domestic purposes.”

Mr. RICHMOND called attention to the fact that in the estimate of revenue and expenditure there was a deficiency on the river supply works amounting to £8896. He wished to know whether the Committee had considered how they might utilize the works to a greater extent, so that they should not be such a burden on the ratepayers. The amount of water sent in from the works was very small compared with what it might be, and he thought if the Committee were laying their heads together, even to the extent of agreeing to give the water to the manufacturers at cheaper rates, they might make the works more productive.

Mr. TORBENS said the Committee at present had this matter under their consideration; but they had no pipes for the distribution of water on the north side, and they must have the whole subject looked into, and endeavour if possible to get the water disposed of on the north side of the river. It was from this source that the Committee expected to be reimbursed.

Mr. SMITH said that there was a sum of £8896 absolutely going out of the possession of the Trust. He believed it would be far wiser to give Loch Katrine water to the manufacturers and save the £8000. The works, it was promised, would give a profit of £5000, and instead they were entailing a loss of £8000.

Mr. COLLINS said the time had gone past when this proposal could be looked at. They were now too near the margin of their supply to talk of giving water at less than the ordinary rates. He had sometimes been reckoned a false prophet, often unjustly; but he was opposed from the commencement to the formation of the river supply works, and he took upon himself to denounce the estimates as fallacious. The Trust would

observe that there was a deficiency of £4000, which was very much the sum he predicted before the works were commenced.

The Lord Provost said this matter would be considered by the Committee. He dared say the Committee would find a solution of the question that would be satisfactory to the Council.

The minutes were then approved.

EXETER CORPORATION WATER SUPPLY.

THE WATER ACCOUNTS.

At the Meeting of the Exeter Town Council on the 13th inst.—the Mayor (Mr. W. Pring) in the chair—the financial position of the water undertaking was under consideration. It appears that, on the 29th of September last year, the Council directed the City Treasurer to prepare and present to the Council a balance-sheet of the water undertaking for the two years ending March 25, 1880, so as to show—(1) capital, and how expended; (2) revenue and expenditure; (3) profit and loss; (4) assets and liabilities. This return, on being presented, was referred to the Finance Committee, and by them to a Sub-Committee, who reported that, on capital account, the money borrowed by the Corporation from the West of England Fire and Life Insurance Company was not brought into the account, but being of opinion that this was an omission, they directed it to be inserted. This sum was borrowed for twelve months only, and was then repaid, but the necessity for the loan was solely attributable to the water undertaking, the object being to redeem certain of the city water annuities, and the redemption of the annuities had the effect of reducing the capital debt of the undertaking by £6000. Each share of the old Water Company was, by the Exeter Corporation Water Act, converted into a Corporation Water Annuity of £2, the market value of which would ordinarily have been £50, but power was given to the Council to redeem each annuity within a fixed period on payment of £47, and, in order to obtain this advantage, notice was given to redeem at Christmas, 1878, and a loan was negotiated for the purpose; but as a sufficient sum was not then in hand, £20,000 was borrowed to enable the Council to carry out the arrangement. The interest on this sum was also, in the opinion of the Committee, fairly chargeable against the water undertaking; but *per contra* it must be credited with the interest on the sum lent to the Gas Company, and the interest allowed by the bankers on the balance in their hands. They also observed that the sum paid to the Water Company for stock and moveable plant—£997 18s. 6d.—and the costs of the Company's Solicitor in connection with the sale of the undertaking to the Corporation—£296 19s. 8d.—had not been entered in the capital account; but this omission they had corrected. The principle which guided the Committee in adopting this course was that all expenditure connected with the purchase of the water undertaking should be charged to capital. They were also of opinion that all expenditure on account of which additional capital could be raised should be charged against capital; they had, therefore, inserted the following additional items—viz., cost of new extensions, £346 3s.; cost of waste-water meters, £169 7s. 4d. The Committee were supplied with details of various items. The trading account had been amended by the transfer to and from it of the various items dealt with in the report on the capital account, but as no sum had been inserted in respect of the services rendered by the City Surveyor's Department, the Committee rectified this omission by inserting the sum of £180, an amount which appeared to them to be a reasonable proportion of the total cost of the department. The Committee appended an amended balance-sheet, and at the meeting of the Finance Committee the report and balance-sheet, as amended, were adopted.

Mr. WREDFORD (Chairman of the Finance Committee) moved the adoption of the report. In so doing, he remarked that the trade account on the water undertaking for the second year showed an adverse balance of £917 19s. 8d. It was fair to say that, during the last two years, the Committee had bought plant out of revenue to the amount of £1369, which plant remained in hand at the time of stock-taking. This did not appear on the assets side in the trading account. Had it so appeared there would have been a balance in favour of the undertaking. The Finance Committee desired to call attention to the fact that the Urban Sanitary Authority's estimate had been rather exceeded during the seven months of the year that had just expired. The estimate of receipts was £27,000. Out of this they had received nearly £19,000, including £2000 odd arrears from the water undertaking. So that about two-thirds of the year's income had been spent in the seven months. On the other side, they had paid all the year's interest on improvement bonds, and three quarters' salaries, while one or two matters had been brought up to Lady-day. They had also paid £2600 on account of capital, which would at some time come back to the revenue fund. He therefore hoped that with economy they would be able to bring the year's expenditure within the estimate, and carry over something to the good.

Alderman RICHARDS said he did not see how the Council could adopt the report for they had already, in June last, adopted another set of accounts presented by the Water Committee. He would move that this portion of the account be referred to the Water Committee to report. He did not understand the Finance Committee's remark with reference to the sum of £20,000. It read as if the raising of this £20,000 had enabled the city to save £6000. He contended that the money borrowed of the West of England Insurance Office had nothing to do with the water undertaking. The city had ten years in which to pay off the money on which this saving was effected, and gave notice that they would pay off a certain portion at a specified time. The Water Committee had nothing to do with paying off this money. He saw on the trading account a sum of £4700 for interest; and there was an amount as interest on the loan to the Gas Company. The Water Committee had nothing to do with this or with the loan and interest to the bank. He contended that it was utterly immoral on the part of the Finance Committee to attempt to mislead the Council, into making such a charge on the water undertaking. If the Finance Committee wanted to see what the water undertaking had really done, surely it was not fair to saddle them with charges with which they had nothing to do. The accounts now presented ought to be sent back, as, on the face of them, it appeared that the Water Committee's accounts were incorrect, and that it was necessary that the Finance Committee should come forward to save the city from an unfortunate mistake. Another reason for objecting to this account was that it seemed, instead of looking back, to be a sort of guide for the future. He moved as an amendment—“That the report be referred to the Water Committee, and that they be requested to report thereon.”

Alderman HIRTZEL seconded the amendment, and drew attention to the fact that in the trading account for the year ending March, 1879, the Water Committee were charged with £406 16s. 6d., one year's sinking fund. This, he said, had nothing to do with their trading—it was a redemption of capital, and it could not be charged as a matter of expenditure against revenue.

Mr. OWEN thought the account presented so incomplete that it must be rectified, and who, he asked, could possibly do it better than the Water Committee? The Sub-Committee of the Finance Committee had presumed to dictate to the Council what was the proper thing to do, and, not having

increased the salary of the Surveyor by one penny, they debited £180 a year as the salary of the Surveyor to the water undertaking. If there was to be a debit against the Water Committee of £180, there should be a credit to the Council of this sum in some other account.

Mr. HEXTER said the balance-sheet caused some consternation, and he thought it arose in this way. The former Chairman of the Water Committee had said there was a profit on the undertaking of £1300; but if they took the whole of the credits, they would not make up the debit balance of £917 19s. 3d.

Alderman RICHARDS said the last speaker's remarks were a challenge of what he (Mr. Richards) said a few meetings ago. He then said that the profit on the undertaking in two years had been about £1200. If Mr. Hexter would look at the profit and loss accounts, and to the various amounts the Finance Committee had given the Council credit for, add the charge of £180, and the West of England interest, which he (Alderman Richards) contended the Water Committee were not liable for, he would see that they had made a profit of £1328 13s. 9d.

Mr. DARKE had no doubt the Water Committee had acted to the best of their ability, and in the interest of the city. The Finance Committee had not dealt with the report of the Water Committee; they presented their reports as a Committee of the Urban Sanitary Authority, and it was their duty to see that no charges were made on the district-rate that did not properly belong to it. The charge of £180 was made because when the Surveyor's duties were increased by the taking over of the water undertaking, an Assistant Surveyor was engaged to enable him to perform the duties. The Act of Parliament said that all charges connected with the undertaking must come out of the water-rates, and in making these charges in the way they had done they had acted strictly on the lines of the Act of Parliament. He maintained that the charge of £20,000 and the interest was a proper charge on the water undertaking. This was a business different to anything else the Council had undertaken, and being a business, it should be conducted on business principles. Every charge in connection with the undertaking ought to appear in the accounts; but the Water Committee had never presented a single account showing what capital was engaged in the undertaking.

Alderman BUCKINGHAM suggested that a meeting of the Sub-Committees of the Finance and Water Committees would facilitate matters, and enable them to bring up a satisfactory account. The arrangements for borrowing the money and the arrangements for meeting the expense of this, that, and the other, had been made by the Urban Sanitary Authority, and not by the Water Committee. He thought these things should be kept distinct, as then the Council would have before them a record showing what was the annual expenditure and receipts of the undertaking.

Alderman RICHARDS said he preferred that the report should go first to the Water Committee, whatever the Council did afterwards.

After some further observations, the amendment was put and agreed to, the Water Committee to have instructions to confer with the Finance Committee, with a view, if possible, of a Joint Committee. It was also resolved that in case the Joint Committee could not agree, they should be empowered to call in a professional accountant.

OPENING OF THE WOKINGHAM WATER-WORKS.

The works recently constructed by the Wokingham District Water Company, Limited, for the supply of the district of Wokingham with water, were formally opened last Tuesday by Mr. J. WALTER, M.P. The works have been carried out by Mr. T. M. Quill, C.E., of Hammersmith, the Engineer being Mr. J. W. Grover, C.E., of Westminster. The total outlay up to the present time has been between £12,000 and £13,000, and the capital of the Company—£20,000, of which about £14,000 has already been subscribed—allows plenty of margin to extend the works as may be found necessary.

The works consist of a well and pumping-station near the Finchamstead Road, and a reservoir at Buckhurst, on a site high enough to supply water by gravitation to Wokingham and nearly all the surrounding district. The well is 408 feet deep, 260 feet being a brick and cement shaft, and the remainder a 16-inch artesian boring. It passes through 270 feet of clay, and then through the Woolwich and Reading sands, until the upper chalk is reached, and the boring penetrates this 68 feet. Wokingham is over a great basin in the chalk, and there can be no doubt that a practically unbounded supply of water will be secured from this boring. The water has been analyzed by Dr. Shea (Public Analyst of Reading and Newbury), and found to be soft, although from the chalk, and very free from any organic matter. The softness of the water is due to the mixture of the water from the sands immediately above the chalk, which finds its way down to the fissures in the upper chalk, and also to the fact that the water contains a considerable proportion of alkaline chlorides. A 20-horse power engine is erected, and has been pumping regularly for some time, at the rate of 10,000 gallons per hour; while if necessary almost double work could be had from it. The covered reservoir at Buckhurst holds 100,000 gallons, and thus a continuous supply, day and night, will be afforded. To test the supply, the engine has been pumping day and night for three or four days; and the lowest point to which the water level has been reduced below the surface by this severe test was 50 feet; while, should any emergency require it, the Company can pump another 350 feet below this level. There are facilities for doubling both the pumping power and the storage accommodation at Buckhurst. An 8-inch main has been laid from the pumping-station to the reservoir, and from Buckhurst to the centre of the town, the various streets being supplied by 6-inch, 4-inch, and smaller mains. The pipes have also been taken to Bracknell and Binfield; and the district over which the Company have powers also includes Broadmoor, Wellington College, and York Town. It is stated that the Governors of Wellington College, the Royal Military College, and of Broadmoor, have asked on what terms water can be supplied to those institutions; and a considerable number of consumers have already had the water laid on.

A numerous company assembled at the pumping-station at one o'clock, and viewed the engine and pumps at work, and a fountain jet showing the pressure from the reservoir. They also inspected a section of the well, with illustrations of fossils found in the sinking, and a plan of the district within the Company's powers. At a quarter past one a jet of water about 100 feet in height was raised from a hydrant at the railway station; and some members of the Volunteer Fire Brigade took hose up to the roofs of houses in the Market Place, and also to the top of the Town Hall, to show the pressure from the reservoir, which enabled a considerable jet of water to be thrown a height of 75 feet; and as the hall stands on ground higher by 40 feet than some parts of the town, the pressure is all that could be desired for extinguishing fires and for every other purpose.

At two o'clock luncheon was served in the Town Hall—Mr. W. LANS-
DOWNE DEVLIN (the Chairman of the Company) presiding. After the usual loyal toasts had been duly honoured, the Chairman called upon Mr. J. Walter, M.P., to propose the toast of the occasion—"Prosperity to the Water Company"—which was cordially received, and a few other toasts having been given and responded to, the company separated.

THE DEFEAT OF THE GAS "BEARS."

[From Money, April 20, 1881.]

The majority of those amiable persons who live by falsely and premeditatedly depreciating other people's property must have felt, within the last few days, that their gas operations have again been very beneficial to them in a certain sense; because if the only experience of any value is that which has been well paid for, they must be much wiser, if not richer men than they were a fortnight ago. At that time we ventured to suggest that there was every probability of their burning their fingers, as they had done on former occasions within the last two or three years, and the JOURNAL OF GAS LIGHTING has been good enough to compliment us, and to concur in our regret that the law cannot more effectually deal with people who cause to be made and published market quotations which, in many cases, they know full well refer to purely fictitious transactions concocted between two or more persons for deliberate purposes of moral if not legal fraud. The same journal in last week's number concurs in the view we have all along held, that lighting by electricity would be occasionally employed in large establishments, and by rich corporations like the City of London, to whose ratepayers expense was a secondary consideration; but that the interference with the regular business of gas makers, by reason of those exceptional instances, would be very trifling, and abundantly compensated by the increase of customers in other directions. We say exceptional, because being told on good authority that the expense of the new light in the City will be five times that of gas, we have only to wait till the vast funds now manipulated by the wealthy London Companies are restored to their original objects, and the City tradesmen, already driven nearly to desperation by free trade from abroad and co-operative stores at home, have to pay the additional rate out of their own diminished profits, and we shall soon see a "Lighting Reform League" started. And if even the scheme for extending the Government of London to the whole metropolitan area be carried, it will not make much difference. A vast majority of the busy citizens are away at their suburban homes long before dark in summer, and in winter within two or three hours after; and they will naturally want to know why they are to be heavily taxed for the ghostly, but useless illumination of silent and deserted highways, that for the other long hours of the night are but as a city of the dead.

Our contemporary, after alluding to the failure of the late gas scares, further calls attention to what will prove a much more real scare—namely, that the electric enthusiasts are about applying for parliamentary powers to enable them to dig up, break up, and, worse than all, stop up the streets and roads of London, whenever they please, at their own free will. If this delightful prospect is a novelty to some minds, it is not our fault. Some three years ago, when apostles of the new light began to frighten timid holders of gas stocks, we endeavoured to reassure the latter (and successfully, we believe) by pointing out some apparently insuperable obstacles to the displacement of gas by electricity for very many years to come, if ever. Not one of those difficulties has yet been solved, and amongst others we pointed out the absurdity of the oft-repeated assertion that "the existing gas-pipes could be utilized." We showed then that the old-established chartered companies would not stand idly by while their pipes were being utilized and themselves ruined; and that, unless some very great and clearly defined positive public benefit were proved, infinitely beyond letting a score of Russians, Poles, Germans, and Yankees make fortunes out of our pockets, no Parliament would sanction the 150 square miles of London thoroughfares being thrown into a state of frightful chaos for the next 20 or 30 years, even if any electric light company could find the necessary millions to cover the cost. These, and other similarly consoling reflections, we have always kept before our gas-investing friends and readers, and the result of the last glaring and widely-spread organization for "bearing" gas stocks, shows clearly that they have at length penetrated the minds of those chiefly interested to a sufficient extent to render any future combinations or conspiracies of this kind highly dangerous and unprofitable enterprises. On Tuesday, the 12th inst., The Gaslight and Coke Company's shares were quoted 175½-6 in the official list—a rise of 5 from the artificial price to which they had been knocked down by the "bears" within the previous few days. But there came a day of reckoning for these gentlemen, and it happened to be the very next day, which was the "settling-day" on the Stock Exchange, and the state of affairs was speedily disclosed by a rise on that morning to 179½-80, notwithstanding all the recent glorification of the electric light by *The Times* and other disinterested anti-gas journals. We congratulate "Messieurs the Bears" on the state of their books that evening. *The Times*, of course, knew what was going on as well as anybody, or better; but the City Editor was content on Thursday to let this rise pass unnoticed. The very same page of their paper, however, contains the half-yearly report of the London Gaslight Company, showing that they had not only paid the maximum dividend of 10 per cent., as usual, but had made their customers a present of £18,000 a year in the shape of a reduction of 3d. per 1000 feet in the price of gas. These figures are not good for "bears."

THE OXIDATION OF SULPHUROUS ACID.

By HAROLD B. DIXON, M.A.,

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[A Paper read before the Chemical Society, April 21, 1881.]

It is a fact well known to chemists that a solution of hydrogen sulphite in water is very slowly oxidized to hydrogen sulphate, when left standing in contact with air at ordinary temperatures. The oxidation of hydrogen sulphite is effected more rapidly, but still slowly, when the aqueous solution is agitated with oxygen at the ordinary temperature.

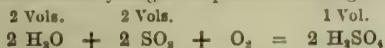
When sulphurous acid gas, mixed with a large excess of air, is passed over a surface moistened with water, more or less of the sulphurous acid is oxidized, and is retained on the moist surface in the form of hydrogen sulphate, in proportion as the contact-time is greater or less. The rate of oxidation is accelerated by an increase of temperature. When an alkaline solution is used, instead of water, to moisten the surface, the oxidation of the alkaline sulphite formed takes place much more rapidly than that of the aqueous hydrogen sulphite. This fact is taken advantage of in the Gas Referees' apparatus for estimating sulphur in coal gas, in which the products of combustion of a small coal gas flame, mixed with ammonia and excess of air, are passed through a cylinder packed with a number of moistened glass balls. The sulphurous acid produced by the burning of the sulphur compounds in the gas is arrested by the aqueous ammonia on the balls, and the solution of alkaline sulphite is then rapidly oxidized by the current of hot air passing over it.

It is also stated that when dry air or dry oxygen is mixed with dry sulphurous acid gas at ordinary temperatures, no sulphuric acid is formed, but that the sulphurous acid remains mixed with, and unacted on by the air or oxygen.

But though there is no doubt that, at ordinary temperatures, dry oxygen has little or no action on dry sulphurous acid, and that in presence of water oxygen does unite with sulphurous acid, there is still a conflict of opinion on the question whether oxygen, sulphurous acid, and steam in the gaseous state enter into combination to form hydrogen sulphate. The question has excited most interest in relation to the formation or non-

formation of hydrogen sulphate by the oxidation in the air of the sulphurous acid produced by the burning of coal gas. On the one hand, it has been urged that the three bodies unite in the gaseous state to form hydrogen sulphate, because paper steeped in iodic acid and starch solution is not coloured blue in a room where coal gas is burning, and because water left standing in such a room is found to be impregnated, not with hydrogen sulphite, but with hydrogen sulphate. On the other hand it is contended that, although sulphurous acid cannot be detected in a gas-lighted room, it nevertheless does not undergo aerial oxidation, because hydrogen sulphate is only found deposited on damp and hygroscopic materials, and not on dry substances. Were aerial oxidation to take place, a cloud of liquid particles of hydrogen sulphate would be formed in the air, and they would be deposited indiscriminately on all articles in the room, and not only on damp surfaces and on those of a hygroscopic nature. Those who advance this opinion consider that the proportion of sulphurous acid present in the air of a gas-lighted room is too small to be detected by means of iodic acid and starch papers.

I have endeavoured to decide between these conflicting views by bringing together (in a glass tube) known volumes of sulphurous acid, oxygen, and steam, the latter being insufficient in quantity to saturate the space occupied by the gases. If oxygen, steam, and sulphurous acid unite in the gaseous state to form hydrogen sulphate according to the equation



then for every two molecules of hydrogen sulphate produced, there will be a disappearance of five gaseous molecules, and a corresponding diminution in the volume of the mixed gases. If, therefore, the volume of mixed gases is found to be less than the sum of the three gases measured separately, or if the volume of the mixed gases is found to diminish slowly, it will afford distinct evidence that union has taken place, either directly, or indirectly through the medium of the glass vessel. But if the volume of the mixed gases is found to equal the sum of the volumes of the individual gases measured separately, and if this volume remains constant, it will afford distinct evidence that, under the conditions of the experiment, no reaction has taken place between the three substances.

It was necessary, before any conclusion as to the occurrence of the reaction written above could be drawn from a contraction observed in the volume of the three mixed gases, to determine with what degree of accuracy measurements could be made of sulphurous acid and steam in presence of a third gas, where no chemical change took place; and also to make sure that no chemical action occurred, under the conditions of the experiment, when any two of them were mixed together.

As a preliminary, therefore, I repeated the experiment of mixing dry oxygen and sulphurous acid, and of determining whether any contraction occurred on standing at ordinary temperatures and when heated to, say, 100° C.

In making the experiments I employed McLeod's form of gas analysis apparatus. The whole was dried by drawing air through two drying tubes connected with the interior of the laboratory tube by means of a bent glass tube passing beneath the mercury in the trough, thence through the capillary connecting tubes and cap into the eudiometer, and then up through the barometer. The flexible tube and upright glass tube connected with the mercury reservoir were dried in the same manner. To ensure greater accuracy, all the readings were made at one line in the eudiometer. The gases also were always measured under very nearly constant conditions of pressure and temperature, and thus no corrections were needed to compensate for deviations from the laws of Boyle and of Gay-Lussac, which the condensable steam and sulphurous acid would have shown, if these conditions had been varied at the time of measuring. By attaching a piece of oil-paper to the bottom of the dark screen, and illuminating it by an Argand burner, I have been able to obtain more concordant readings than when the measurements were made by daylight varying in intensity.

In the first experiment dry oxygen and dry sulphurous acid were mixed in the dry eudiometer, and their volume was measured. After the gases had been allowed to stand for 12 hours at the temperature of the room, their volume was read and was found unaltered. The water surrounding the eudiometer was then heated by blowing steam into it, and was kept at about 50° C. for two hours. On cooling and re-measuring the gases, no diminution in volume was found. The water jacket was then heated to 100° for two hours. On cooling and re-measuring the gases, no diminution in volume was found. The gases were kept under a pressure of 500 mm. The following were the readings made:—

	Line in Eudiometer.	Reading of Barom.	Temp. Deg. C.
Dry vacuum	4	455.5	—
Dry sulphurous acid	4	690.0	7.8
On adding dry oxygen	4	923.3	8.4
After standing 12 hours	4	925.0	9.3
After being heated to 50° C. for 2 hours	4	921.8	7.5
After " " 100° C. " "	4	923.5	8.4
After standing 24 hours	4	924.1	8.8

[Contents of eudiometer to line 4 = 63.08 c.c.]

On reducing these tensions to volumes in cubic centimetres at 0° C. and 760 mm. pressure, the following numbers are obtained:—

Volume of sulphurous acid	18.92 c.c.
" oxygen	18.75 c.c.
Total	37.67 c.c.
Volume after standing 12 hours at ordinary temperature	37.68 c.c.
" after 2 hours at 50°	37.67 c.c.
" " 2 " 100°	37.68 c.c.
" " 24 " ordinary temperature	37.68 c.c.

This experiment shows that dry oxygen and sulphurous acid do not unite in a glass tube at temperatures varying between 8° and 100° C. It was necessary in the next place to show that sulphurous acid and steam could be mixed together without condensation.

In the second experiment, therefore, measured volumes of sulphurous acid and steam were brought together in presence of nitrogen.* A quantity of dry nitrogen was brought into the eudiometer and measured. Dry sulphurous acid was then introduced, and the volume of the mixture was determined. The measured mixture was then passed over into the laboratory tube, which was then detached. A second laboratory tube was attached to the eudiometer, and a second quantity of nitrogen was thus introduced into the eudiometer and measured. A small quantity of aqueous vapour, insufficient to saturate the space, was then added, by letting the nitrogen stand over a drop of water in the laboratory tube, and the volume of mixed nitrogen and steam was determined in the eudiometer. The first laboratory tube was then re-attached, and the previously

measured mixture of dry nitrogen and sulphurous acid passed over into the eudiometer. The total volume was found to be equal to the sum of the two mixtures measured separately. After standing for 12 hours at the ordinary temperature and under 500 mm. pressure, and also after being cooled down to -5° C., no diminution in volume was found. The following were the readings made:—

	Line in Eudiometer.	Reading of Barom.	Temp. Deg. C.
Dry vacuum	4	455.5	—
1st mixture—			
Dry nitrogen	4	598.4	8.7
On adding dry sulphurous acid	4	609.0	8.6
Dry vacuum	4	455.5	—
2nd mixture—			
Dry nitrogen	4	616.5	8.5
On adding steam	4	618.8	8.2
On adding together 1st and 2nd mixtures	4	771.2	7.6
After 12 hours under 500 mm.	4	771.0	7.4
After being cooled to -5° C.	4	771.6	7.9

On reducing these tensions to volumes in cubic centimetres at 0° C. and 760 mm. pressure, the following numbers are obtained:—

1st mixture—		
Volume of nitrogen	11.49 c.c.	
Volume of sulphurous acid	86 c.c.	
Total	97.49 c.c.	12.35 c.c.
2nd mixture—		
Volume of nitrogen	12.96 c.c.	
Volume of steam	20 c.c.	
Total	14.96 c.c.	13.16 c.c.
Sum of 1st and 2nd mixtures		25.51 c.c.
Volume found on mixing 1st and 2nd mixtures		25.50 c.c.
Volume after 12 hours, under 500 mm.		25.50 c.c.
After being cooled to -5° C., "		25.50 c.c.

This experiment shows that sulphurous acid and steam do not unite in the gaseous state at ordinary temperatures to form hydrogen sulphite. It also shows that accurate measurements of sulphurous acid and steam, when mixed with nitrogen, may be made.

In the third experiment measured volumes of oxygen, sulphurous acid, and steam were brought together in presence of nitrogen. As in the previous experiment, dry nitrogen and sulphurous acid, after being measured in the dry eudiometer, were passed into the laboratory tube, which was then detached. Through the second laboratory tube dry oxygen was brought into the eudiometer and measured. It was then mixed with aqueous vapour, by letting it stand over a drop of water in the laboratory tube, and the volume of the mixture was determined. The measured mixture of dry nitrogen and sulphurous acid was then introduced from the first laboratory tube, and the volume of the whole was determined. It was found to equal the sum of the separate mixtures. After standing for two hours at the temperature of the room under 500 mm. pressure, no diminution in volume was found. Again, after 12 hours, the mixture was measured, and no diminution in volume was found. By heating the water-jacket the gases were next kept for three hours at 40° C. On cooling and re-measuring the gases, no diminution was found. The gases were then kept at 100° C. for two hours; no diminution in volume was produced. The following were the readings made:—

	Line in Eudiometer.	Reading of Barom.	Temp. Deg. C.
Dry vacuum	4	455.5	—
1st mixture—			
Dry nitrogen	4	640.1	7.0
On adding dry sulphurous acid	4	706.8	7.1
Dry vacuum	4	455.5	—
2nd mixture—			
Dry oxygen	4	606.5	7.4
On adding steam	4	608.5	7.4
On adding together 1st and 2nd mixtures	4	860.3	7.5
After 2 hours at ordinary temperature and 500 mm.	4	861.3	8.2
After 12 hours at ordinary temperature and 500 mm.	4	860.6	7.8
After being heated for 3 hours to 40° C.	4	863.1	9.4
" " 2 " 100° C.	4	863.1	9.3

On reducing these tensions to volumes in cubic centimetres at 0° C. and 760 mm. pressure, the following numbers are obtained:—

1st mixture—		
Volume of nitrogen	14.94 c.c.	
Volume of sulphurous acid	5.39 c.c.	
Total	20.33 c.c.	
2nd mixture—		
Volume of oxygen	12.20 c.c.	
Volume of steam	17 c.c.	
Total	12.37 c.c.	
Sum of 1st and 2nd mixtures		32.70 c.c.
Volume found on mixing 1st and 2nd mixtures		32.70 c.c.
After standing 2 hours under 500 mm.		32.70 c.c.
" " 14 " " "		32.69 c.c.
After being heated for 3 hours to 40° C.		32.70 c.c.
" " 2 " 100° C.		32.71 c.c.

This experiment proves that no combination takes place between sulphurous acid, oxygen, and steam, when the latter is present in relatively small proportion, and is far removed from its condensation point.

A similar experiment was next made with a larger proportion of steam and a smaller proportion of sulphurous acid. The gases were measured separately, and mixed in the same way as before. The volume of the whole was again found to equal the sum of the mixtures measured separately. At line 4 in the eudiometer, at the temperature of the room, the gases were about half saturated with aqueous vapour, which exerted a tension of 4 mm. After standing in this state for twelve hours, under 500 mm., the gases were measured and their volume was found unaltered. They were then heated to 100° C. for two hours. On cooling, their volume was re-measured, and no diminution was found. The temperature of the water-jacket having been raised to 50° C., the gases were then squeezed into about one-third their original volume by a pressure of two atmospheres. The tension of the steam was thus increased to 12 or 14 mm. The gases were kept compressed at 50° for an hour. The pressure was then lowered, and the gases cooled and re-measured. No contraction was observed. The eudiometer was then warmed to 20° C., and the gases were again compressed by a pressure of two atmospheres. At this temperature the gases were more than two-thirds saturated with steam.

* When a measured volume of sulphurous acid had to be transferred from the eudiometer to the laboratory tube and back, it was found necessary to dilute it largely with nitrogen to prevent a small loss, probably owing to the action of the cement in the cap on the acid.

After standing for two hours under these conditions, the gases were again cooled and measured, the pressure having been first lowered. No diminution in volume had occurred.

In order to observe what amount of hydrogen sulphate would be formed in this mixture if some of the steam present were liquefied, the gases were once more compressed into one-third their original volume while the eudiometer was cooled to 5° C. At this temperature some of the steam was condensed and formed minute drops of water on the glass. After standing at this temperature, and under a pressure of two atmospheres, for two hours, the mercury was lowered, and the gases were re-measured. A small but distinct contraction was observed. The gases were again compressed and kept just below 0° for another hour. On re-measuring, a further small contraction was found to have taken place. After the gases had stood 24 hours longer, under 500 mm., at the temperature of the room, no further alteration was observed, showing that the hydrogen sulphate formed had had no appreciable action on the mercury. The following were the readings made:—

	Line in Eudiometer.	Reading of Barom.	Temp. Deg. C.
Dry vacuum	4	455.5	—
1st mixture—			
Dry nitrogen	4	724.7	7.1
On adding dry sulphurous acid	4	743.8	7.2
Dry vacuum	4	455.5	—
2nd mixture—			
Dry oxygen	4	646.3	8.7
Steam	4	650.3	8.6
On adding together 1st and 2nd mixtures .	4	940.0	8.6
After standing 12 hours at ordinary tem- perature under 500 mm.	4	941.9	9.8
After being heated for 2 hours to 100° under 500 mm.	4	941.2	9.4
After standing for 2 hours at 50° under two atmospheres	4	942.4	9.9
After standing for 2 hours at 20° under two atmospheres	4	941.0	9.1
After standing for 2 hours at 5° under two atmospheres	4	940.7	9.5
After standing for 2 hours at 0° under two atmospheres	4	939.2	9.1
After standing for 24 hours at ordinary temperature under 500 mm.	4	938.9	8.8
On reducing these tensions to volumes in cubic centimetres at 0° C. and 760 mm. pressure, the following numbers are obtained:—			
1st mixture—			
Volume of nitrogen		21.78 c.c.	
Volume of sulphurous acid		1.53 c.c.	
Total		23.31 c.c.	
2nd mixture—			
Volume of oxygen		15.35 c.c.	
Volume of steam . . . . .		.82 c.c.	
Total		15.67 c.c.	
Sum of 1st and 2nd mixtures		38.98 c.c.	

Volume formed on mixing 1st and 2nd mixtures	38.99 c.c.
Volume after standing 12 hours at ordinary temperature under 500 mm.	38.98 c.c.
Volume after being heated to 100° for 2 hours under 500 mm.	38.98 c.c.
Volume after being heated to 50° for 2 hours under two atmospheres	38.99 c.c.
Volume after being heated to 20° for 2 hours under two atmospheres	38.99 c.c.
Volume after standing at 5° for 2 hours under two atmospheres	38.91 c.c.
Volume after standing at 0° for 2 hours under two atmospheres	38.85 c.c.
Volume after standing at ordinary temperature for 24 hours under 500 mm.	38.86 c.c.

It appears, therefore, that sulphurous acid is unoxidized in a damp atmosphere so long as the temperature is maintained above the dew-point. The sulphuric acid found in a gas-lighted room is formed by the oxidation of hydrogen sulphite, which is first produced by the solution of sulphurous acid in water condensed on cold and hygroscopic surfaces, or sometimes, it may be, in water precipitated in the form of a cloud by cold draughts cooling the air locally below the dew-point.

The experiments of which an account has been given were made in the Lee Laboratory at Christ Church, Oxford. I have to thank Mr. Vernon Harcourt for placing his room at my disposal, and Mr. H. T. Lilley, of Balliol College, for his assistance in the earlier part of these experiments.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

(Continued from p. 617.)

As stated by our American correspondent, in his last letter (see ante, p. 618), there was only one paper read at the recent meeting of this Association—that by Mr. Nettleton, on Dieterich's Furnaces, a report of which we have already given. Subsequently the proceedings were of a conversational character, branching off into various subjects. From the "official report" published in the *American Gaslight Journal* of the 2nd inst., we abstract the following:—

THE PRESERVATION OF SERVICE-PIPES.

Mr. NEAL (the Secretary) said he would suggest, as a topic for consideration, the best method of preserving service-pipes. His experience in this regard differed from that of those who were away from the seaboard. At Charlestown there was a considerable quantity of salt in many of the streets, which permeated through the soil and affected the service-pipes, causing them to decay. In many cases they were found as thin as paper—so thin that the least touch would destroy them. He had no doubt that a great many of their service-pipes were very much decayed, but so long as they were not meddled with they continued to hold gas. For two or three years he had been exercised on this subject, and should be very glad to hear of a process to be adopted to make them more serviceable—whether by dipping them in some substance, such as tar or asphalt; or whether any kind of pipes could be used, other than were now employed, which would be more permanent. The cost of all their service-pipes had been written off, as they were considered more perishable than meters. The mains had been charged to construction account until lately, but the service-pipes were considered to be of a more perishable nature, and required to be renewed quite often. He was aware that in some places lead had been used for service-pipes instead of wrought iron, and it had been suggested that cast iron might be employed; but there were objections to the use of cast iron for services, especially for small ones.

Mr. Wood said he had some streets which had been filled in with mud,

and were very soft, and for these streets they had to dip the service-pipes in coal tar. To do this the services were heated not quite to a red heat; the whole length of the service being placed in a trough filled with thick tar. They were dipped right under, and allowed to remain long enough for the tar to fully cover them; then were taken out, and the heat of the pipes would set the tar so that it was like pitch upon them. In an hour or so it would harden so that the pipes could be handled. It was found that this helped to preserve them very much.

Mr. ALLYN asked Mr. Neal if he used galvanized iron?

Mr. NEAL: We use wrought iron, not galvanized.

Mr. ALLYN said the Cambridge Company formerly used plain pipes for services; but they found that they rusted out so badly that, of late years, they had used nothing but galvanized iron, and found that this prevented corrosion and rusting in a great measure, although some of the streets were so thoroughly saturated with salt that it would eat away almost anything in the way of wrought iron.

Mr. NEAL asked if any one present had used lead pipes for services,

Mr. CABOT said he had not used lead pipes, but for the last few years had used wrought-iron pipes covered with a coating of red lead, and had found benefit from it. They had not a great deal of soil likely to be saturated with salt water, and had not, therefore, had much trouble with pipes giving out; but for the last six or seven years they had adopted the process of covering their pipes with red lead.

Mr. NEAL said there was another kind of soil which was very injurious to pipes, and which was found away from the seaboard; he referred to filling, as with ashes, which was very injurious to wrought-iron pipes, causing them to oxidize rapidly.

The PRESIDENT said he had used galvanized iron pipes for three or four years, and believed, from his experience with them, that they were much more durable, at least in their soil, which also contained a great deal of salt. Their streets had been watered for a number of years with salt water, pumped up from the docks, and then sprinkled over the streets in the summer time. Of course, the water evaporated and left the salt behind, which was washed down into the ground by the rain, and in this way there was very salt ground. In certain portions of the city the soil was of clay, and impermeable to water. In the gutters where the kerbs had been laid and the gutters paved, the Street Department, in excavating the clay, filled in with gravel so as to prevent the heaving effect of the frost in winter. They found that the service-pipes rotted very rapidly indeed where they ran under this filling in the gutters. Where the pipe had been encased originally in the clay it would be absolutely free from incrustation, while the part which ran through the gutter would be completely destroyed. They answered for the gas so long as they were not disturbed; but when the water men came along and disturbed the ground they had to renew hundreds of service-pipes. He might say that five out of six were set leaking by the disturbance of the earth around them, and by the shovelling of the dirt upon them. While the water men did not go to the gutter, they disturbed the pipes sufficiently to start them leaking underneath the pavement. In putting in renewal pipes they always used galvanized iron; and his experience with them indicated that they would last very much longer.

Mr. NEAL asked what was the comparative cost.

The PRESIDENT said galvanized pipe was about 50 per cent. higher in price than ordinary iron pipe, with the same discounts.

Mr. SCOTT said for water supply he used wrought-iron pipe covered thoroughly with cement. The pipes were first lined with cement, and then covered with cement on the outside. This formed a good protection, and he should think would be cheaper than galvanized iron at 50 per cent. more than common wrought iron. It was very little work to put on the cement.

The PRESIDENT said there was one objection to this—that it very materially diminished the bore of the pipe to put cement on the inside.

Mr. NETTLETON said he had had charge of water-works where the same kind of pipe that Mr. Scott spoke of was laid in 1860, and it worked for a number of years—holding the water back with a pressure of 8 lbs. It was found, however, that the constant pressure of water on the inside caused it to ooze through the cement and rust the iron so that it would burst. Where these bursts occurred probably nine-tenths of each length of pipe taken out was found to be in a perfect state of preservation, showing that the cement covering both inside and out, although the water was running through it all the time, acted as a perfect preventive of the moisture getting to the iron. He was inclined to think that it would make an excellent coating for service-pipes wherever they ran through moist ground.

Mr. COGGSHALL said he had some service-pipes which had been in use for 16 years; and had never had more than one break in them. This break was occasioned by the pipe being jarred when laid down, so that the cement had fallen off, and thus the water had gained access to the iron, and it had rusted and given way. There was one locality in his Company's district where the soil was very moist and porous. There they could not keep a service-pipe more than six years before it would become so oxidized as to be used up. To preserve them he took a quarter of a pound of resin to a gallon of tar, or in that proportion—making sufficient to coat a pipe, somewhat as Mr. Wood did—by putting it in a trough while hot, then standing it up and letting it drip, and it very soon became hardened. Pipes thus treated had been in use for 12 years, and as he had had no trouble with them, he presumed that they were still sound.

The PRESIDENT: In coating, do you take care to exclude the tar from the inside?

Mr. COGGSHALL said he coated on the inside as well as the outside. Then he stood the pipe up and let it drip. It formed a very thin coating on the inside—so thin as not to obstruct the passage of the gas.

Mr. NEAL said he was sorry he had not obtained more information bearing upon this subject. He had hoped that some member would have had something to suggest as the result of his own experience. He must do something to prevent the destruction of his pipes by reason of the peculiar soil in which they were laid, while the great difficulty with lead pipe was the expense.

PURIFICATION OF GAS.

Mr. NEAL said he would now suggest as another topic—the purification of gas; and had hoped to be able to lay before the meeting the results of his experience with iron sponge. Although he had used the sponge for two or three weeks, he was not prepared to make any statement at present, except that he found he had not pursued the right course. As far as the handling of it was concerned, he liked it very much better than lime. In many places it was impossible, except at great expense, to procure a sufficient quantity of oyster-shells for the manufacture of lime. For a year or two past he had been paying 2 cents per bushel, and was now paying 2½ cents, while in some places, because of the distance from Boston, where the shells were shipped, the price was 5 cents per bushel. Even in his own case, where shells cost but 2½ cents per bushel, he thought it would be economical to use iron sponge, provided it would perform all that was claimed for it.

Mr. COOGSHALL said he had used iron sponge for about a year and a half, and the results had been very satisfactory. His purifier-boxes were 6 feet by 10 feet. The first run of the purifiers only gave about 1500 feet to the

bushel. The next was somewhere about 2000 feet or 2500 feet to the bushel. It went on increasing until the maximum was reached, which was 17,000 feet per bushel. In putting in the 70 bushels which the purifiers held, after about the third run it accumulated in bulk so much that he could only get 55 bushels in the same space of the original material—which was the quantity he was now using. At the present time he was running about 15,000 feet to the bushel. If he were starting anew he should have a place on purpose for revivification; as he had been troubled in very cold weather during the past winter, because it would cool off so rapidly that perfect revivification would not take place, and then it did not produce such good results. Last summer he could take it out of doors, and in two or three turnings it would become revived.

Major DRESSER: Do you use supplemental purification?

Mr. COGOSHALL said on the top layer they used a bushel of lime for each purifier. When he first commenced using it he tested very thoroughly for carbonic acid, and found traces—about 2 per cent.; and this was the largest amount found at any one time. So far as he could discover by the tests for illuminating power, he did not perceive that it made any practical difference. He was using Alleghany coal, and a very little oil as an enricher, and at the present time it took a bushel of lime to each purifier.

Major DRESSER: What is the size of the purifiers?

Mr. COGOSHALL said they were 6 feet by 10 feet.

Major DRESSER: Does a bushel of lime take out all the carbonic acid?

Mr. COGOSHALL said it removed all that it was necessary to take out. For the sponge he only used one layer about 22 inches. For the screen he had a 2-inch plank board with $\frac{1}{2}$ -inch holes in 1-inch spaces. It did not increase the back pressure at all.

Mr. SLATER said he had not had enough experience with the sponge to justify him in saying much about it. In some respects it had done better work than they were led to hope for, yet they had not reached the result they expected to get in the use of it. When they first commenced using it they were told not to expect to purify more than 1600 to 2000 feet of gas per bushel, and they commenced with between 3000 and 4000 feet. On an average they had from 1.5 to 2.25 per cent. of carbonic acid without the use of lime. During a portion of the time that they had used the iron sponge their purifiers were constructed with the inlets on the top, and the gas, in coming over, deposited some vapour on the top, and made a sort of thick, muddy paste of it, and they were obliged to throw away a portion of it. They then changed the inlet to the bottom of the purifier, and had not had so much trouble since.

Mr. NEAL: Do you use sawdust in the bottom of the purifiers to take up any of the tar?

Mr. SLATER said this had been suggested, and they had commenced to use it, but had not yet opened the first purifier charged with it.

Mr. ALLEN: Do you find that it heats up before you have time to remove it?

Mr. SLATER said they had not had any difficulty of this kind.

Mr. COGOSHALL said he calculated to turn the sponge over as soon as it began to warm, and the next morning turn it over again, and continue turning it over so long as there was any heat in it.

Mr. ALLEN said in larger works, where there were purifiers 20 feet square, it required nearly half a day to remove the material. In such cases he fancied that the latter part of it would be of a very high temperature before being removed. He understood that parties who had attended to the revivifying had pretty serious difficulty because of the fact that the material would become so hot that it would almost ignite.

Mr. SLATER said they had such an incident three or four months ago. By some means they drew in a small quantity of air which had a tendency to revivify the iron sponge as it was passing through; and the superintendent became frightened. They purified over 17,000 feet to the bushel, and still the gas was clean; but the purifier began to heat up, and the superintendent changed it off. The probable explanation was that the air revived the sponge in passing through with the gas.

Mr. STRINER said that having now very large purifiers for their make of gas they had not used the iron for several years; but he believed it was a very good thing to use in connection with lime. At the time he used it he was obliged to employ a great deal of lime to take out the carbonic acid; but had very favourable results from it. They had a layer of sawdust on the lower tray, and then the iron in a layer of 2 inches thick upon the boards. He believed iron sponge was good for use if works were the least crowded for purification; but sometimes when there was an extreme amount per square foot of purifying surface, as good results could be obtained from shell lime.

The conversation then ended.

THE USE OF GAS FOR COOKING AND HEATING.

(FROM OUR GLASGOW CORRESPONDENT.)

A great amount of interest has been excited throughout the West of Scotland in the use of gas for cooking and heating during the last year or two, in consequence, in a large measure, of the prominence given to the subject by the gas apparatus exhibitions that have been held within this time in Greenock, Paisley, and Glasgow; and as I have been favoured with a number of interesting and valuable notes dealing with the subject, generally and specially, from several gas managers and other experts, I put them into the form of a communication for the JOURNAL, in the hope that they may be of some use to such persons in other parts of the country, and more especially in Scotland.

The Greenock exhibition was really the first thing of the sort of any importance north of the Tweed, and therefore my historical data may appropriately begin with it. This show certainly created a great degree of enthusiasm in favour of gas-stoves; but owing to various causes it did not continue. Notwithstanding this fact, however, there has since been a steady and increasing demand in this town for gas-cooking stoves of various kinds, and for gas heaters; and from recent inquiries that have been instituted it is confidently stated that there is a considerable number of such appliances distributed all over the town, and the demand is continually widening. But there is no want of complaint, a number of the persons who have bought them not being satisfied with their acquisitions; and so far as can be ascertained, the dissatisfaction is due to one or more of the following causes.

First, many persons have bought cooking-stoves too large for their every-day wants, and consequently find that the consumption of gas is larger than was anticipated. The result is they only use them when they have large cooking operations to perform, and in this way they lose the advantages and conveniences due to every-day use.

Secondly, there are complaints as to the quantity of gas used, in consequence of the carelessness of servants, especially in the use of the "ring" burners, which always consume a larger quantity of gas in proportion to the work done, than the burners inside the baking and roasting chambers, which are usually on the Bunsen principle, while the others are not always so. The waste of gas arises from the ring burners not being turned off or turned down immediately they are done with, as should be the case, even though the cooking utensil is only removed for a temporary purpose; for, as the burner gives off the maximum amount of heat from

the moment the gas is lighted, there is no necessity for keeping it going up to its full power in order to maintain the heat, as in the case of an ordinary coal fire. Again, many servants have the habit of running to the gas-stove for every simple purpose while they have a coal fire at hand suitable for all they require at the time, and burning to waste.

Thirdly, persons often complain of the cost of gas as compared with that of coal, from the results, it may be, of only a few experimental tests. If, instead of doing so, they were to make a comparison of the yearly consumption of coal with the yearly increased cost for gas, the result would certainly be in favour of gaseous fuel. Many people do not keep any comparative account of what they pay for coal, while their gas accounts are always at hand to show the expense for gas; and, further, the time that ordinary fires are kept burning simply to be ready for the cooking operations is not noticed, while with gas this extra burning is quite unnecessary. But if the outlay for gas in a carefully-managed stove be a little in excess of that for coals, the cleanliness, comfort, and convenience of the gas-stove, with its regularity of heating, as compared with coal fires, should more than counterbalance any excess of cost for gas.

Fourthly, complaints frequently arise from want of pressure, in consequence of the stove being placed in a part of the house where the supply-pipes are small, and where, in many cases, they are already too small for the satisfactory supply for illuminating purposes only. Thus, when the stove is put on there is an inefficient supply—for it is not only the quantity of gas which the stove consumes that has to be taken into consideration, but also the necessity which exists for an efficient pressure of gas so as fully to develop the gas flames and at once put them up to their full power. If this is not done, there will not be sufficient heat for cooking the food properly. It is scarcely necessary to refer to the deficiency of gas supply from the ignorance and stupidity displayed by gas-fitters, in fitting up gas-stoves by connecting them with pipes altogether too small, even where there is an efficient supply. Where the gas supply of houses is controlled by a regulator placed on the meter, there is almost certain to be a deficient supply to the gas-stove. The only certain plan of avoiding complaint and ensuring an efficient gas supply is to have a separate service and meter for the gas-stove; and while dealing with this point, I may remark that Mr. Stewart, of Greenock, informs me that the Corporation Gas Committee of that town are quite willing, in such cases, to supply the extra meter, and put in free that portion of the service which extends from the street main to the tenement, providing the person wishing it will put in the other portion of the service. In this way a pipe of any required size would be obtained. The experience gained in Glasgow seems to show that in only very rare cases has such additional service-pipe been required for gas-stoves, but it is always strongly recommended by the Gas Corporation servants that the connection for the supply of gas-stoves be made upon the main-pipe leading from the meter. A pressure of 1 inch ought, as a rule, to be quite sufficient for any gas-stove, although in Mr. Stewart's experience there is one case where even this amount of pressure is not sufficient. I am informed that the maximum pressure allowed in England rarely exceeds 7.10ths of an inch—the minimum pressure allowed during the daytime in Greenock throughout the low parts of the town, round by the harbours, &c.; and as much of the town rises rapidly above the lower levels, there is always far more than sufficient pressure in the street mains; indeed, in many parts of the town the pressure is so much in excess as to be a cause of occasional complaint. Unfortunately, those gas consumers in Greenock who have cause of complaint from deficient supply to their gas-stoves do not lodge their complaints at the Gas Office, where there is a staff of skilled workmen kept for the purpose of giving assistance or advice, and which would be willingly rendered; instead, they simply give up using the stoves in disgust, and tell their friends how useless they are.

Fifthly, many persons complain of the smell arising from the use of gas stoves, more especially the ovens. This undoubtedly arises in many cases from an inefficient supply of air to the burners. When there is a want of air to the burners in the oven the smell is often perceived, but may easily be got rid of by drawing out a little tray under the oven, so as to let more air in. This will also prevent the gas flames in the oven from being extinguished when the door is quickly opened or somewhat violently closed. In Scotland generally the gas is so well purified—lime only, as a rule, being used—that no offensive smell should arise on account of the gas being impure. But there is another cause of smell when the stove is first lighted; I allude to that due to the accumulation of choke-damp and certain products of the imperfect combustion of the gas, and which collect in the small flue leading from the oven of the gas-stove, more especially where the stove is exposed to damp, or the flue has several more or less abrupt turns in it. This circumstance was very frequently noticed in the case of one of the gas-cooking stoves shown at the recent exhibition in Glasgow, the moist gases driven out of the flues after the stove was first lighted up being peculiarly pungent and disagreeable. Of course, all gas-stoves should have flues leading away to a chimney or otherwise to the external air, more especially those constructed to work on the principle of the Bunsen burner. Those stoves burning with a white flame do not seem to need a flue so much as the others.

The following are the chief points that should be noticed in choosing a gas-stove:—First, it should heat readily and retain the heat steadily from 250° to 400° Fahr. Those lined with reflector tiles often take a long time to heat, and are thus a cause of disappointment to persons who commence to use the stove as soon as the gas is lighted, as they see their friends do who have stoves not so constructed. Secondly, the stove should not radiate heat from its sides, so as to heat the apartment and incommode those using the stove. Thirdly, it should raise the required heat and retain it with a minimum expenditure of gas. Fourthly, all the parts of the stove should be readily got at, so that it may be kept clean throughout—inside and outside flues, shelves, &c. For this purpose, the top plate covering the ring burners should be removable, unless the part underneath this plate can be got at easily from the front of the stove, as in some cases where there is a tray passing below the ring burners. Fifthly, all stopcocks, their keys, pipes, &c., should be of a substantial character, and, if possible, "bright," thereby giving a neater and more cleanly appearance to the stove. Sixthly, the price should be noted as compared with similar-sized stoves.

Generally speaking, it may be stated that that stove is the best which, with a low first cost, consumes the least gas to do similar work in quantity and quality as compared with that done by other stoves; has most conveniences for general purposes; is well and substantially got up; does not throw out much heat from its sides, flue, or otherwise; is so devised as not to contaminate the food cooked, by providing that there shall be little or no chance or possibility of the gases resulting from the process of combustion reaching the food while being cooked; and, lastly, is easily fitted up into the position which it is to occupy when in use.

For a considerable time the difficulties attending the introduction of gas-stoves into Scotland were of a twofold character. They were not devised for the use of Scotch cannel gas, which is generally so rich in hydrocarbons as to have nearly twice the illuminating power of much of the gas supplied in English towns; and they were deficient in their fitness to compete economically with coal fires. Many of the stoves that people in Greenock and other towns first used were rejected from their unserviceable-

ness in actual work; but in most cases they were of English manufacture, and constructed for working with gas of low illuminating power. Even cooks and restaurateurs on a large scale, who were quite satisfied that immense advantages might result from the use of gas in cooking, had to "hold their hand" until the various difficulties they had to contend with were surmounted. Some of the English makers who put in an appearance at the recent exhibition of gas apparatus in Glasgow professed that they had succeeded in making cooking stoves suitable for burning Scotch gas, and in consequence many of their articles have now come into use. One local firm, however, who took up an agency for stoves, have been induced to give up, and have disposed of their stock "at a sacrifice." But the manufacture of cooking and heating stoves adapted to the quality of Scotch gas has now been taken up in Glasgow with great energy, and in a most enterprising manner; and the impetus given to it by the exhibition of last autumn is something extraordinary. The study and experience of many years have at last resulted in the production of stoves not only adapted to burn Scotch gas most perfectly, but displaying also a complete revolution in style, finish, and beauty of construction not formerly associated with gas-stoves. I learn from one person—himself a large restaurateur—that, although he was long ago convinced that there was nothing to compare with gas for cooking and heating purposes, he discontinued its use for a considerable time as an agent for heating ovens, until he discovered that the great secret of success lay in the proper kind of burner. The rest was an easy task. From time to time improvements suggested themselves in construction, substantiality, and form; and he has now acquired such an amount of experience that he is ready to undertake to build an oven anywhere, in the most complete confidence of success resulting to the builder, and comfort, cleanliness, and ease being experienced by the user.

Gas managers in Scotland—as also the directors of gas companies and gas corporation committees—are becoming alive to the benefits of the extended use of gas for cooking and heating. This is especially true of Mr. J. McGilchrist, the able and energetic Gas Manager at Dumbarton. Owing to his practical knowledge and skill, combined with the fact that there were in the market gas cookers and gas heaters in which he had every confidence, he has been enabled to do valuable service to the gas consumers in that town and in various parts of the county. He has, in the first place, been the means of greatly increasing the day consumption of gas; he has largely benefited many families; and has actively encouraged a very important branch of the iron manufacture. It is probable that in no part of Scotland has the use of gas for cooking and heating—relatively to the extent of the population—made more progress than in Dumbarton; and I understand that before long Mr. McGilchrist will lay before the gas world some specific data bearing upon the matter, which will be of an interesting character. Meanwhile, I may mention one or two facts placed at my service by a practical cook. One is a very important feature which is not likely to be known, he says, to gas managers generally, and is considered far less by the general public—namely, that besides the greater comfort in the kitchen (and those only who have experienced being broiled over large fires can appreciate this when much cooking is going on), there is the fact that in cooking joints by gas, not only is the gas paid for in its product or work done, but the saving in weight effected is so great that where there is a large quantity of cooking the oven itself is soon paid for. The shrinkage of the meat is, he remarks, much less, and the flavour is greatly improved through the juices being preserved with gas cooking. For my special benefit he made, a few days ago, a very careful comparative test of roasting in a coal-fired oven and a gas oven. Two joints of 16 lbs. each were taken, as nearly as possible alike, and the following is the result:—

	Coal Fire.	Gas Fire.
Weight put in.	16 lbs. . .	16 lbs. . .
Weight taken out	11 " . .	13 " . .
Loss	5 lbs. . .	3 lbs. . .

These are very striking figures, but they are only a confirmation of previous tests.

Stoves used for warming apartments are getting into extensive use as well as cooking stoves. When heated by white lights they do not prove more hurtful than ordinary gas burning simply to light a room. In many cases they are arranged to warm the air of the apartment without mixing with it, the resulting gases being carried off by a flue. In consequence they do not give off offensive gases, as is the case with many cookers.

That there is a greatly extending use of gas-stoves is abundantly proved by the fact that the day consumption is showing a marked increase both in Greenock and Glasgow, and this should be actively encouraged by all gas managers. Very shortly, I expect, there will be issued two very elaborate and valuable reports from the Glasgow Exhibition Jurors on the two classes of Gas Cooking and Gas Heating Appliances, in which gas managers, stove manufacturers, and other persons will find much food for thought; from which fact, and various others more or less enlarged on in the foregoing remarks, it may be confidently affirmed that the exhibition in question was held to some good purpose.

METHODS FOR JUDGING OF THE WHOLESOMENESS OF DRINKING WATER.

By Mr. REUBEN HAINES.

[Abstracts of Lectures delivered before the Franklin Institute, Philadelphia, U.S.A., in December, 1880.]

(Concluded from p. 665.)

Another point of importance in forming an opinion on the wholesomeness of a surface water is the natural character of its source. A river water which originates in peat bogs, or the tributary streams of which pass through a peaty district, will contain extract of peat in solution throughout its whole course. These waters certainly should not be compared, without qualification, with river waters which do not come in contact with peat, but nevertheless yield on analysis an equivalent amount of albuminoid ammonia derived from sewage contamination. Thus, for instance, the water of Lake Cochituate, one of the sources of supply for Boston, probably contains considerable extract of peat, or other "vegetable extractive matter," which is, so far as we know, perfectly harmless in drinking water. So also is this the case, I believe, with the water of Jamaica Pond, which also supplies a part of Boston. Now, the Schuylkill River water supplied to Germantown, and taken from the river at Flat Rock dam, pumped at the Roxborough Water-Works, of Philadelphia, gave, according to my own analysis, during the winter and summer of 1878, almost exactly the same results as Professor Nichols's analysis of the Cochituate and Jamaica Pond waters in 1873 and 1875 respectively, and with the same degree of variation at different times. But while the analytical results are the same in both cases, a comparison of the general characters and sources of these waters convinces me that we cannot call the Germantown supply nearly so pure from objectionable organic matter as the Boston water. I think we may safely say that the Schuylkill contains no extract of peat, and the albuminoid ammonia undoubtedly comes from material which is far more objectionable. At times also since 1878 this albuminoid

ammonia is as much as one-half greater than the largest amount from the Cochituate water in 1873, as supplied at the Massachusetts Institute of Technology, and nearly twice as great as the average amount of the latter. At such times the water has a perceptibly disagreeable taste and a slight odour, and this occurs usually when the water in the river is very low from drought.

In general, it may be said to be very necessary to know the exact source of any water submitted for analysis, the physiographical and geological characteristics of the locality from which it comes, and the location of any sources of pollution, such as cesspools, privies, drains, or sewers near the place of supply. Whatever method of water analysis is used, or in whatever way performed, the necessity of a knowledge of the previous history of the water is not diminished. Even with this knowledge, as is stated by Professor Nichols, cases may arise in which an experienced chemist will be unable to give a decided opinion.

When the river water is pumped up into distributing reservoirs, the water from near the surface, and at the bottom of these reservoirs should be submitted to analysis, so as to locate more accurately any trouble which may exist. Furthermore, attention should be especially called to the fact previously referred to in this paper, that it is probably not so much a question as to how much organic matter, *per se*, may be consumed without danger in our drinking water. This point does enter, it is true, into the consideration. But it is mainly a question as to whether there is any danger of the water being contaminated with faecal discharges from human beings suffering from infectious disease. It has been found that water containing so large a proportion of organic matter as to be called "loaded" with it may be drunk with impunity by some persons, or, at least, without any disastrous results being apparent for a long time, provided it does not also contain the "contagium" or unknown "something," whatever it may be, which will of itself develop specific disease. As soon as this "something" appears to be added by a previously diseased person, an epidemic of this disease breaks out among those who consumed the water, and who, until this time, remained apparently healthy. Inasmuch as we have no means whatever of discovering the presence of this "contagium," because we know nothing of its character, any contamination with sewage is dangerous in proportion to its amount, and to the nearness of the pollution in time and place. Some authorities in Holland were once asked how much organic matter was allowable in drinking water without danger; to which they replied that drinking water should be, like Cæsar's wife, above suspicion. It may be laid down as a positive rule that a suspicious water is always a dangerous water. The extent of dilution of the sewage in a river with a large body of moving water of good quality is undoubtedly an important factor, but this may be entirely counterbalanced by the fact of the water supply being taken very near a large sewer.

Upon these considerations lies the importance of the estimation of the nitrates and nitrites in a drinking water. These salts are among the results of the decomposition of organic nitrogenous matter, and are hence an evidence of what was either previously contained in the water, or which became oxidized by filtration through soil or by other means of decomposition before it reached the water. The greater the amount of nitrates above the natural limit, the larger the amount of organic material which has hitherto undergone oxidation, and hence the greater the danger, in the case of wells, of the soil becoming saturated and clogged with organic substance until a part of it will escape filtration, and pass unchanged into the water. Moreover, this part, which has escaped oxidation, may contain, for aught we know, the poison of a specific disease. Hence it is important, in order to form a correct opinion of the sanitary character of a well water, never to omit the proper tests for nitrates and nitrites; unless all the other quantitative tests concur in pronouncing the water pure. If any one of these gives a doubtful answer, the nitrates should always be tested for, and if more than traces are present, it will be best to make a quantitative estimation of them. It is true that nitrate may probably also result from reduction of the true ammonia; but this fact does not render the estimation any the less important, for this ammonia itself, under ordinary circumstances, results from the decomposition of the organic matter, and in shallow wells is usually regarded as evidence of pollution with urine.

We should remember, however, that deep wells may furnish a very pure water, containing very little organic matter, but large quantities of free ammonia, chlorides, and nitrates, all present in the same sample, which are derived from certain kinds of soil, such as the sand-beds beneath the London clay, and about 250 feet below the surface. Mr. Ekin considers it necessary to estimate the amount of nitrates and nitrites in every instance, and states that a small increase in their amount should materially influence the judgment to be given. He states that he has been forced to this conclusion by facts ascertained in the course of his somewhat wide experience in the analysis of about 2000 samples of water, many of which were directly connected with cases of typhoid fever. The estimation of nitrates, &c., in a river water, however, has manifestly not the same significance which it possesses in the case of well waters, on account of the superior influences effecting oxidation in the former, and the probable absorption of nitrates by aquatic plants. As regards nitrites, it is stated that delicate tests have not revealed their presence in the Thames river water.

In partial corroboration of the opinions of Mr. Ekin and Dr. Fox, as to the necessity of the estimation of nitrates, I will contribute a case in my own experience. I refer to the epidemic of typhoid fever in Spring Alley, or Royal Street, in the southernmost part of Germantown, which occurred last summer during the last week of July and the first of August. There were upwards of forty cases, including four which proved fatal; and all, except one, were grouped in the immediate neighbourhood of a well situated at the intersection of two narrow streets. This well, known as the Spring Alley well, has had a wide reputation as a remarkably strong pure spring for, it is said, nearly a century. It is also said typhoid fever never occurred in the locality before 1880. The well is only 10 feet deep, the ground slopes down towards it from three sides, and a brick sewer passes within about 10 feet of it, at about the same depth, and having two badly choked-up inlets directly opposite the well. An overflow drain connected the well directly with the sewer, entering the latter near the bottom at a short distance beyond the well. On the 6th of July a very heavy rain occurred, which deluged the vicinity of the well. As the sewer has, at this place, scarcely any fall, it must have become suddenly clogged up with filth, and backwater must have occurred, through the overflow drain, directly into the well, polluting it, no doubt, to a very great degree. It was subsequently found by Dr. A. F. Müller, of Germantown, that a case of typhoid fever, probably imported from elsewhere, had occurred in a neighbouring house about six weeks before the heavy rain, and that the drain from this house connected with the sewer above the well. There were also other circumstances probably contributing to the pollution of the well. Another well, frightfully foul, but in no way connected with the sewer, being on higher ground, and the sewer lying between the two wells, increased, no doubt, the malignity of the epidemic. All the cases of fever developed at nearly the same time. The exceptional one, before mentioned, which did not occur close to the well, but at a house two blocks distant, was a child in a family who had sent to the first-

mentioned well for water, shortly after the pollution took place. All the people of the locality, and especially all those who had the fever, had used the Spring Alley well. Some of them continued to do so after the fever broke out, some had also used the water of the other well, but none had used the city water from the Schnylkill until after the outbreak.

The chain of evidence thus seems unusually strong and clear. My analyses of this well water were made during the prevalence of the epidemic, and while new cases were developing. They are as follows:—

	No. 1.	No. 2.	No. 3.	No. 4.
Free ammonia	Parts per million. 0·034	0·010	0·010	0·058
Albuminoid ammonia	0·116	0·080	0·080	0·140
Chlorine	Grains per imp. gal. 2·300	2·600	2·300	2·400
Total solids	30·500	—	—	28·000
Nitrogen as nitrates } and nitrites	—	1·940	—	2·450
Nitrogen as nitrites only	—	0·096	—	0·032

The samples were collected in the order of the numbers respectively, Aug. 10, 12, 13, and 21; the last three early in the morning, and the first at noon. No. 2 was taken nine hours after a heavy rainfall lasting 1½ hours. No. 4 was collected half an hour after a short but heavy shower. The water, nevertheless, remained quite clear. All the samples were bright and colourless, with no odour, and having a refreshing taste. The water was quite hard.

In order to judge properly of these analyses, I give, for the sake of comparison, analyses of a hard and of a soft water which are typical of the purest well waters in Germantown, and perfectly free from contamination:—

	Free NH ₃ .	Albuminoid NH ₃ .	Chlorine.	Solids.
Hard water	0·010	0·050	2·2	34·0
Soft water	0·014	0·034	0·7	6·0

The hardness in Germantown waters is due chiefly to sulphates. It will be noticed that the chlorine in the Spring Alley well water was not greater than is usual in pure hard waters here. What is still more remarkable is, that the other well in Spring Alley contained not a particle more chlorine, notwithstanding that enormous amounts of free ammonia (from 2·7 to 5·2 parts per million) were present, with large excess of albuminoid ammonia, and large amounts of nitrates and considerable nitrite. In these two cases, therefore, freedom from excess of chlorine did not prove freedom from contamination by sewage, according to the rule usually stated. Three privies stood close to the second well, hence the chlorine test was of no value at all in this latter case. It may be added that the test was repeatedly made with the same result.

The following well waters of Germantown, which I analyzed in 1878, are examples of what we may find in wells in highly dangerous situations, which tend to confirm Mr. Ekin's statement, that dangerous wells may contain a small amount of organic matter along with considerable nitrate, and that in such cases the opinion to be rendered will depend very much on the presence of the latter:—

	No. 1.	No. 2.	No. 3.
Free ammonia	Parts per million. 0·040	0·022	0·016
Albuminoid ammonia	0·046	0·058	0·080
Chlorine	Grains per imp. gal. 3·200	3·200	2·700
Nitrates	Considerable.	Considerable.	Large amnt.
Nitrites	Traces.	—	—

Hardness in all these waters, about 12°, due to sulphates chiefly. The chlorine was very slightly in excess of the amount frequently found in pure hard waters of the district, and it would, therefore, by itself, scarcely be considered a suspicious circumstance.

I will conclude this paper with the analysis by Professor Nichols of a well water in Fairhaven, Massachusetts, published in the Massachusetts State Board of Health Report for 1879, which will be interesting in comparison with the foregoing analyses. It should also be stated that my analyses have shown that many other wells in Germantown are far more polluted than this one, particularly those in crowded localities:—

Free ammonia	0·01 parts per million.
Albuminoid ammonia	0·13 "
Chlorine	3·30 " 100,000.
Total solids	20·30 "
Nitrates	Not in large amount.

The privy vault was 100 feet distant from the well. The soil was composed of gravel and loam. On the 7th of September the husband was taken ill with typhoid fever, and his dejections passed freely into the privy vault. On Sept. 30, and during the next twelve days, his wife and six children were successively taken with typhoid fever, and another child took the same disease a few days later. Thus every member of this one family who had used the water of the well was ill with typhoid fever. The water was probably poisoned by the excreta of the husband, and the usual incubative period intervened before the disease appeared amongst the rest of the family. The chlorine in the water was found to be 1 part per 100,000—more than the natural amount for the locality. In order to compare it with that in the other analyses given above, multiply by 0·7 to reduce to grains per imperial gallon. The date of the analysis was Oct. 17, within a day or two of the development of the last case of fever.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.
Whatever the cause may be, there is this week a dearth of news relating to gas matters. The chief topic of interest at present is the dispute between the meter manufacturers and the Jurors appointed to report upon the meters entered for competition at the Glasgow show last autumn. I have heard the *pros* and *cons* of the question discussed both here and in the West, and the general feeling is that the Jurors, or those who acted for them, have done a somewhat rash act in printing the report in the form in which it appeared. No one can say, however, that ample time had not been allowed to the Jurors to draw up their report and to revise it carefully. Indeed, from the length of time they had had the matter at avizandum, as the lawyers here say, the expectation was that a carefully prepared, thoroughly matured, and exhaustive report would have been presented to the public. As yet none of the Jurors, either individually or collectively, have said a word publicly on the matter; but I have it on good authority that one of them has stated that his words have been twisted in such a way as to convey a wrong meaning. I do not know who is to blame for this, but the statement tends to show how much reliance may be placed on the conclusions drawn from the tests which were made, and which were only partially recorded in the document sent for publication.

The annual meeting of the West of Scotland Association of Gas Managers, which is always held during the last week of April, has been delayed for a week. For reasons which will probably be explained at the proper time, the meeting stands adjourned till the 5th of May; but I would give a word of warning to the Committee that such postponements, if indulged in, cannot but prove disastrous to the success of the Association, as they must materially interfere with the arrangements of every one connected with it.

I have on several occasions directed attention to what I considered the

illegal mode in which the affairs of the meter-stamping establishment in Edinburgh have been conducted, and as a straw indicates how the wind blows, so a move on the part of an official sufficiently points to the desire for reform. Until the recent visit of Mr. Chaney to Edinburgh, all test gasholders verified by the inspector were stamped with the official seal, and so were handed over to the purchaser, bearing the stamp of legal accuracy on their face. Although the Act of Parliament says that the inspector shall stamp all instruments for the measurement of gas if they fulfil the requirements of the Act, Mr. Chaney has been pleased to order that test holders shall not receive the official stamp, except where these holders are to be used by a local authority, and, in such a case, the stamping must be done in London. While the inspector is thus prohibited from using the seals of his office to certify the correctness of the instrument, he is quite willing to give a certificate to this effect. Well, one would think that this was quite as good as the stamp, and probably to the customer it is; but as it is not a process provided for by the Act, of course it cannot be regulated by the legal charges. I have heard of a Company who recently placed an order for a test holder in the hands of a well-known firm, and who, on being charged something like four times the amount provided for legal stamping, naturally desired to know on what authority the charge was made, and, if my informant is correct, the charge was wisely cancelled. Perhaps it was only an official joke!

A public meeting has been held in the village of Burghhead, and a Committee appointed, with the view of forming a Company to supply gas to the village. It is estimated that the Company will be able to give gas at 10s. per 1000 cubic feet.

The Food and Drugs Act is regarded very generally as a useless piece of legislation, because of the difficulty the sanitary officer experiences in enforcing its clauses. Recent prosecutions in Scotland, however, have brought to light the prevalence of a state of matters which loudly calls for more stringent legislation, in order that the lives of innocent people may be protected against the insidious compounds which are too frequently present in the most common articles of consumption. But even where the compounding matter is not of a dangerous character, protection is necessary. A trader has no right to sell a mixture as a pure article; and the fact that he believes the one to be as good as the other does not save him from the charge of dishonesty. A rather peculiar illustration of the unworkability of the Act occurred quite recently in Dundee. A man named Harris was charged before the Sheriff with having contravened the Act by selling milk "which was not of the nature, substance, and quality of the article demanded." The milk was admitted, in the course of the evidence, to be pure and genuine; but, as the result of bad feeding, it was deficient in fat to the extent of 15 per cent., while the total solids were 2 per cent. below the accepted standard, and the question arose—What is the meaning of the term "sweet milk?" and further, whether by the sale of this milk there had been an infringement of the 6th clause, there having been no admixture of a foreign substance? At the conclusion of the case his lordship came to be of opinion that the meaning of the term "sweet milk" is milk direct from the cow, and in this view there could be no conviction in the case before him. Now here it will be seen that if the quality of the milk had been reduced with water or by any other means, the party would have been convicted, but because the more ingenious (not to say anything of its inhumanity) course was followed of keeping the animals poorly fed, the milk dealer is without the pale of the law. The Act does not specify, as it ought to do, a standard for milk. Had there been such a standard the public prosecutor must have been successful, and the community would have been benefited to this extent.

For some time past a dangerous sort of disease has been prevalent in the west end of the city of Aberdeen—a disease which is quite new to the medical faculty. But as in many respects it is analogous to typhoid or enteric fever, steps were at once taken to test the purity of the water and the milk supply. Inquiry revealed this circumstance, that in all or nearly all the cases reported the supply of milk was obtained from Oldmill Reformatory, and the sanitary officer at once commenced to investigate the arrangements at this institution. He found that the water used in the establishment was absolutely pure up to the point of entering a large cistern from which water for all the purposes of the Reformatory was drawn. With that absolute inattention to hygiene which is still too common, the cistern was placed in the byre—a large shed accommodating 46 cows, and open from end to end—and of course the exhalations from the animals, their food, and bedding, found their way into this cistern. Now it is a well-known fact that wherever a large quantity of albuminoid matter is found in water, typhoid fever and diphtheria prevail. What may be called a fair quality of water does not contain more than 0·009 grain of this substance per gallon; but in the water taken from the Reformatory cistern albuminoid ammonia was as high as 0·212 part per million, while the chlorine was 10·143 per million parts. These proportions evidently render the water dangerous to use; but the question may not unnaturally be asked—How does the water reach the milk? Water which may prove fatal to man is innocuous to animals. Can the noxious compounds pass through the system of the cow and reappear in the milk? If so, this has not been determined? Again, is it possible that the mere washing of the milk-cans with such polluted water will contaminate milk? This is asserted by the medical officer. It was left, however, to a member of the Local Authority to hint that there might be a more direct mode of contamination, but that it would be difficult to prove this by chemical analysis. Whatever may be the course, there is no question that upwards of 200 persons have been affected, and that since the milk supply was stopped fresh cases have not made their appearance. A Government inquiry into the matter has been ordered. Meanwhile the milk is being converted into butter and cheese! If, as has been asserted, the milk is contaminated, there is no saying to how great a distance the germs of disease may thus be carried.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.
Considering the venerable age attained by Mr. William Clazy, the well-known and highly-esteemed Manager of the Kelso Gas-Works, it will not be surprising to his brother Managers to learn that at a recent meeting of the Directors of his Company he resigned his situation—a post which he has held for the long period of 45 years. It is stated that preliminary arrangements are in progress for the appointment of a successor. During his long service Mr. Clazy has been most zealous and faithful in the discharge of his duties, and in the furtherance of the interests of the Shareholders, who will doubtless learn with regret of the intended resignation. Mr. Clazy—who, besides being known as Manager of the gas-works over such a great length of time, for a long period discharged the duties of Master of Works under the Police Commissioners—has been almost a life-long public servant; and he carries with him into his retirement the respect and best wishes of all who know him, and especially those of his professional brethren.

Within the past few days there was held in Glasgow a meeting of the Committee of Management of the North British Association of Gas Managers, for the purpose of making preparations for the forthcoming annual meeting of that body. I understand a part of the business of the meeting

will be to make a present to Mr. Mackenzie, of Dunfermline, who so long and faithfully performed the duties of Secretary to the Association. There was a large representation of the Committee.

By way of supplement to the brief notice of the late Mr. Thomas Granger which I embodied in my "Notes" last week, I may mention that he was Manager of the Partick Gas-Works for the long period of 36 years. No man was better known in the suburban burgh of Partick.

After holding a number of special meetings on the subject, the Town Council of Port-Glasgow have at last selected a successor to Mr. Carlow in the gas managership. I mentioned last week that a list of six candidates for the appointment had been selected; they were—Mr. James McCubbin, Manager, Muirkirk Gas-Works; Mr. James Renfrew, Manager, Langbank Gas-Works; Mr. Arthur George Quigley, Assistant-Manager, Greenock Gas-Works; Mr. William Thomson, Manager, Kilmalcolm Gas-Works; Mr. Andrew Taylor, Assistant-Manager, Maryhill Gas-Works; and Mr. Danl. B. Mackenzie, Assistant-Manager, Dalmarnock Gas-Works, Glasgow. Then the number was reduced to two candidates—namely, Messrs. McCubbin and Quigley; and on Friday evening the final choice was made, which fell on the first-named gentleman. It is proper to mention, however, that the unsuccessful candidate in the last division was supported by the Provost and Bailie Hunter, the Convener of the Gas Committee.

There are serious grumblings about the high cost and poor quality of the gas now being supplied by the Bridge of Weir Gas Company; and it is said that half of the people within the area of supply are burning paraffin oil. Such a fact as this would seem to indicate that there was room for grumbling. The Directors have been strongly urged to let out on contract the whole work of making gas, collecting the rates, &c., to a competent person who would have the entire responsibility.

A writer in the editorial columns of one of the Greenock papers, while discussing in a recent article the subject of electric lighting, put the question—How does London gas at 3s. per 1000 cubic feet compare with Greenock gas at 4s. 2d. per 1000 feet? A correspondent replying to the question says that as the London gas only averages about 16 candles, while the average of Greenock gas is 28 candles, the comparison stands, light for light, as follows:—16 : 36d. :: 28 : 63d. That is, the Greenock 28-candle gas, if sold at 5s. 3d. per 1000 feet, would be equivalent in quality of light to London gas at 3s., while it is sold at only 4s. 2d. per 1000 feet. It is, therefore, he concludes, correspondingly cheaper in Greenock. Like many other editorial writers, this particular one has laid himself open, by not thoroughly priming himself on his subject before proceeding to discuss it, and found conclusions upon his assumptions.

I do not know who "Lucem" is, but under this *nom de plume* a correspondent writes to one of the Glasgow papers about Dr. Wallace's letter on the quality of Glasgow gas, to which I referred in last week's "Notes;" and in directing attention to the duties of the Magistrates in respect of the Gas Act and the Corporation Gas Commissioners generally, he says:—"It is very singular that while so much stir is being made by electric lighting companies to supplant gas, an important body of men with a valuable trust committed to them do not seem to maintain even a normal opposition to its rival by furnishing gas of first-rate quality liberally, and at a pressure sufficient to give good results at the point of combustion. Were this done—and it will pay gas producers to do it—we would hear nothing of electricity as an illuminating agent, either on the score of economy or of utility, in opposition to coal gas. You may perhaps give me the opportunity of giving, through your columns, on an early day, some data bearing upon the relative cost and efficiency of gas and electric lighting."

At the Justice of Peace Small Debt Court held at Hamilton last Monday—Major-General Lockhart and Mr. Michie presiding—the Motherwell Gas Company had 22 consumers summoned for being in arrears with their gas accounts. Three cases were postponed till next Court day, and decret was obtained in the other cases, with expenses.

The Glasgow pig iron market has been irregular this week. There was a desire to buy on Tuesday, and a marked spurt of about 1s. took place in the price; but it quietly settled down, and the close on Friday was 47s. 8d. cash, and 47s. 9d. one month.

Quietness has been the rule in the coal trade, in most of its departments, during the week. For steam and shipping sorts somewhat large orders are being booked. There is no quotable change in prices.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Generally only a dull demand is reported for all descriptions of round coal. Here and there some of the principal collieries are well supplied with orders for house-fire coals, but, as a rule, the demand is not sufficient to take away the present output, and stocks are accumulating, with prices tending downwards. For best Wigan Arley at the pit's mouth 9s. to 9s. 6d. per ton is quoted; but good qualities are to be bought at 1s. per ton under these figures, and common sorts at about 6s. 6d. to 7s., whilst Pemberton four-feet coals now average about 6s. 9d. to 7s. 3d. per ton. Common classes of round coal for iron-making and manufacturing purposes are generally bad to move, and colliery proprietors in many cases are not able to keep their common mines going more than four days a week, whilst prices have receded to a point in many instances quite as low as prior to the late strike, common coal being offered at almost any figure from 5s. 3d. per ton upwards at the pit's mouth. Consumers of gas coal are now coming into the market with inquiries for contracts, but both buyers and sellers are at present acting very cautiously. Colliery proprietors, although they seem disposed to sell over the next twelve months at comparatively low figures, are quite averse to entering into more extended engagements, whilst buyers, on the other hand, do not display any anxiety to place out their orders at present. In the existing state of the market it is difficult to give any very reliable quotations, as prices have scarcely yet been actually tested; but from what I can hear, common Wigan gas coal could be bought at about 6s. 6d. to 6s. 9d. per ton, whilst for the best gas coal 8s. to 8s. 6d. per ton is quoted. Engine classes of fuel are steady in price. The prospect of a scarcity of slack during the summer months, to which I have pointed in previous reports, is causing this class of fuel to be stiff in price, with the result that burgy, although at present plentiful in the market, is also being held for full rates. Burgy averages about 4s. 6d. to 5s. at the pit's mouth, and good slack 4s. 3d. to 4s. 9d., with common sorts about 3s. to 3s. 6d. per ton.

The iron trade has been very dull. Comparatively speaking, no one seems to want iron at present, and where holders press sales, very low figures have to be taken. Concessions in price, however, have little or no effect in bringing forward business, the only offers being for deliveries deferred over long periods, which makers do not care to entertain. For delivery into the Manchester district, Lancashire forge and foundry pig iron could be bought at about 44s. to 45s. per ton, less 2½; and common bars at from £5 10s. to £5 15s. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

Under unfavourable conditions of wind and weather, the total of the coal clearances at Cardiff for the past week has been equal to the recent

average. Most collieries are in good work, and shippers are fairly well supplied both with orders and tonnage to arrive. But, as usual, some are more favoured in this respect than others, and in some cases prices are noticeably easier. The most peculiar feature of the past week has been the very large carrying capacity of the tonnage that has entered the port, notwithstanding the strong easterly winds that have continuously prevailed. The total is much more than sufficient to replace the tonnage cleared during the week, and includes a considerable proportion of large steamers and sailing vessels. Exports for the week:—Coal, 95,139 tons; patent fuel, 2450 tons; iron, 2926 tons; coke, 50 tons. As far as the shipments of coal are concerned, business at Swansea during the past week has continued very restricted, and the totals are less than might have been expected, even when due allowance is made for the holidays. The total exports are—coals, 6497 tons; patent fuel, 4725 tons.

The trade of Newport during the past week has, on the whole, continued to show a fair amount of activity. This is the more noticeable as, during the time the strong easterly winds have continued, vessels have not been able to arrive. The shipments of coal, notwithstanding the Easter holidays, will show a good total, and shippers are in most instances well supplied with tonnage. Prices are firm, and sellers seem to have no fear for the next few months; in fact, it seems to be thought that trade will continue in its present satisfactory state at least to the end of the present year. Some of the smaller collieries, however, give way slightly in price under very special circumstances. A good deal of chartering has been done, the chief difficulty being in arranging days for loading. The rates obtained have, on the whole, been fairly remunerative, and the inquiry for tonnage in most directions is firm.

The iron trade is satisfactory, and the different works in the district seem to be fully occupied. Notwithstanding this the demand for iron ore is fairly met by the supply, and there is no visible alteration either in the price of iron ore or in the rates of freights given.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

But little improvement can be reported in the state of either the local iron or coal trades. The reduction made in the rates of coal and iron at the quarterly meetings has not had the effect of materially increasing business. Owing to the Easter holidays, most of the mills and forges have been but little employed during the past week. The transactions at the usual weekly meetings of ironmasters at Wolverhampton and Birmingham were but few, and the orders given out were for small parcels only. The demand for coal was of a limited character. Manufacturing fuel received but little attention, though for best household qualities a slightly better call was observable. Gas coals not much inquired for. The demand for finished iron for the foreign market is reported a little better, though the prices accepted are in the majority of cases exceedingly low. Marked bars have been in slightly better request since the alteration of rates. Second-class bars are, however, quoted so low that brands of good quality have the call in buyers. Sheets and plates are only required in small lots. Hoop and strip iron received the greatest call, but with this exception prices are weak, and the call is of a limited character. The pig trade is in a very unsettled state, prices being irregular and for the most part of an unprofitable nature. Hot-air pig is quoted at £3 2s. 6d., but offers a little lower are accepted. Cinder pigs are realizing £1 17s. 6d. Agents of neighbouring makers are quoting at rates considerably lower. Heavy ironfounders are doing rather more time than was reported a week or two back. Tube makers and manufacturers of hydraulic machinery are better engaged in contracts for the foreign markets.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The state of the iron trade throughout Yorkshire does not appear to have varied a great deal since my last notice. Prices have not undergone any material change. There is, however, scarcely so large an output of pig iron as was the case a couple of months ago, whilst the mills and forges are not over well employed. The foundries, taken as a whole, are quiet, and where anything like an active business is being done, the firms so privileged deal with specialities, such as gas and water fittings and coal washing and crushing machinery, in connection with which a good deal of interest is just now taken, owing to improvements which are being introduced for perfecting the make of first-class coke.

The house coal trade throughout the country is very quiet, and must remain so until either the consumption increases or the output is diminished. Although the weather is exceptionally cold, the demand for household qualities of coal is very limited. The London trade, as shown by the official returns, has been very quiet in South Yorkshire, whilst the quantity carried by rail, as a whole, has increased. Some of the pits in West Yorkshire appear to have fared very well of late, but the Silkstone and a number of the thick-seam pits are accredited with a very small tonnage. The position of the trade with other markets, including the Eastern Counties, is also depressed, while prices are very low indeed.

The contracts for locomotive coal remain unaltered, but these are not sufficient to take anything like all the hard coal produced. The improvement in the steam coal export trade is being anxiously looked for, but as yet the Baltic ports will admit of but little traffic. Although some 15 or more of the South Yorkshire thick-seam pits have special agents in Hull who look after their interests, the quantity sent to that port is only moderate. There is also a very small tonnage sent by both rail and water to Grimsby. The West Riding coalowners are no better off with regard to the Goole trade. As is usual at this period of the year, there are inquiries for steam coal; but the prices offered—in some instances not reaching 6s. per ton—are being refused. There can, however, be no question that when all the pits are allowed to work, the output in South Yorkshire cannot fail to exceed the demand, unless trade wonderfully improves, of which at present there is not much indication.

Other kinds of fuel, including manufacturing coal and slack, are in but moderate request; but, on the whole, the demand for coke holds well up. Owing to the fact that most of the furnaces in North Lincolnshire are still in blast, prices, even for the best qualities, do not seem to increase, nor do makers seem anxious to put down forward orders at a less figure than now prevails.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coals, notwithstanding the Easter holidays were kept two days at the pits, have been a pretty good average. As is usual in April, the coasting demand continues to fall off; but the Baltic being now fully opened, the contracts which were made in February for the supply of gas coals to all the leading ports in that sea are being brought into operation, and shipments thither become more active every week. The other oversea exports are also better; as gas companies are anxious to replenish stocks after the long winter. I have reported that there was not much probability of any alteration in prices during the first six months of the year, and gave the reason—viz., that most of the first-class gas collieries in the county of Durham are fully contracted for the year. Under

these circumstances, first-class gas coals do not come into the open market in any quantities. Second-class gas coals are not much sought after for shipment, as there is no difference in freight for best and second-class gas coals. Steam coals have been more inquired after during the past two weeks, and there has been a good market for best, which in some instances show an advance in price of from 3d. to 6d. per ton. The coke trade in Durham seems to be over-produced. The shipments are dull, and an advance in prices is difficult, if not impossible, to establish.

Coasting freights do not alter. There is a better supply of small sailing vessels for carrying fire-bricks, cement, and other sorts of material used in gas-works. The shipments of all kinds of the best fire clay goods coast-wise and overseas are large, and an active business is done. The cement manufacturers on the Tyne are transacting a moderate business. The chemical trade does not get better; in fact, the market has been weaker over the fortnight. Prices have been drooping, and they have sunk within 2 or 3 per cent., in some instances, of the very lowest quotations of the most depressed period in the history of the trade. Lead, copper, and other metals produced on the Tyne also show a very dull market. As the summer begins to approach, there is a better demand for gas and water pipes; but prices do not advance. The large foundries on the Tyne are busily employed in the manufacture of heavy metal castings for the ship-building trade at home and abroad.

MR. THOMAS CANNING, of the Gas-Works, Newport (Mon.), was last Thursday elected a Member of the Institute of Engineers of South Wales.

A NEW work, entitled "Municipal Gas and Water Supply," by Mr. Arthur Silverthorne, C.E., is announced as shortly to be published. We understand that part of the book will be devoted to statistics of the progress of gas and water undertakings throughout the United Kingdom.

M. DUMAS, the distinguished *savant*, gave a lecture last week in Paris, in the course of which he described the experiments of MM. Camille Faure and Reynier in their attempts to store electricity. It is claimed that they have solved the problem of storing up electricity in a reservoir, so as to transport and employ it for illuminating or other purposes; and M. Dumas spoke very highly of their investigations.

BRADFORD CORPORATION GAS SUPPLY.—At the meeting of the Bradford Town Council on Tuesday last, the Chairman of the Gas Committee (Alderman Priestman) announced that the profits of the gas-works for the past year, applicable to the reduction of rates, amounted to £31,431 12s. 3d., against £26,131 2s. 9d. in the preceding year. He also stated that by advice of the Town Clerk, the Committee had not done anything towards carrying out a recent resolution relative to a reduction in the price of gas; but the matter would receive attention in due course. The Town Clerk added that, in the interest of the public, there were reasons why the matter should not be dealt with at the present moment.

BRIGHOUSE LOCAL BOARD GAS SUPPLY.—At last week's meeting of the above-named Board, the newly-elected Chairman (Mr. J. C. Bottomley), referring to the present position of the town with reference to its finances, said he thought there was cause for congratulation in every way. In the gas department the consumption had nearly doubled in the last ten years, and if this increase went on, the Board would soon have to enlarge their works, and purchase fresh land. The profits from the gas supply during the past year had been such as would warrant them in making a further reduction in price—or perhaps it would be better to let the reduction take the form of a discount of 10 per cent. upon all accounts paid promptly.

DEATH OF MR. W. HUMBER.—The death is announced, on the 14th inst., in his 61st year, of Mr. William Humber, Assoc. M. Inst. C.E., M. Inst. M.E., &c., who has for years past been closely identified with many of the water-works undertakings of England. He was also an author of some mark, in connection with subjects allied to that branch of professional work to which he specially directed his attention. His principal book was "A Comprehensive Treatise on the Water Supplies of Cities and Towns," published in 1876; while his other productions include: "A Complete Treatise on Cast and Wrought Iron Bridge-Construction;" "A Record of the Progress of Modern Engineering;" "A Handy-Book for the Calculation of Strains on Girders;" &c., &c.

THE PRICE OF GAS AT ILFRACOMBE.—Last Tuesday week a meeting of consumers of gas at Ilfracombe was held to hear the reply of the Directors of the Gas Company to a memorial recently presented praying for a reduction of price. That the reply was not favourably received may be judged by the following resolution, which was unanimously agreed to:—"That in view of the reply of the Gas Company, declining to grant any reduction in the price of gas, this meeting pledges itself to reduce the consumption to the greatest possible extent, and, where practicable, to discontinue its use, and the consumers be invited to sign a declaration to that effect." A second resolution was also carried respectfully inviting the Directors of the Company to meet the consumers with a view of discussing the question on a basis laid down by them. It was also resolved that a memorial be sent to the Local Board, urging them to bring pressure to bear upon the Company to reduce the charge for the public lamps.

SALES OF GAS SHARES.—On Thursday, the 14th inst., some shares in the Windsor Royal Gas Company were sold by auction by Messrs. Cartland and Sons. The auctioneer having pointed out the advantageous

position of the Company and the value of the shares as an investment, referred in feeling terms to the loss the Company had sustained in the recent death of the Chairman, the late Mr. C. S. Cantrell, whose well-known business habits and strict integrity had given such great confidence to the Shareholders of the Company, that, except from death or other unavoidable causes, very few shares were placed in the market. The auctioneer, however, felt sure the knowledge that so able a man as Mr. G. H. Long had been elected by the Directors as their future Chairman would be a guarantee that the interests of the Company would be in safe hands. Thirty-six original shares of £20, bearing 10 per cent. interest, were then offered in lots of two, three, and five each, and realized sums varying from £37 10s. to £38 each. Twenty-six preference shares of £8 each were then put up in lots of five, and fetched from £9 to £9 5s. each. After this eighty-three new shares (£4 paid) were offered in lots of five and ten, and were sold for £6 each.—Last Thursday, Mr. J. P. Chapman sold by auction, at Lewes, twelve £5 shares in the Uckfield Gas Company. They were put up in four lots, and the first sold for £93 5s., the other three for £94 5s. each.

TAMPERING WITH A GAS-METER.—At the Blackburn Police Court, on the 13th inst., William Haworth, was summoned by the Corporation Gas Manager (Mr. S. R. Ogden) for sojourning a gas-meter as to prevent its registering the quantity of gas supplied. It appeared that the meter inspector of the Corporation went to defendant's house on the 14th of February, when he found that the meter had only registered 500 feet of gas since the 31st of December, whereas it should have registered more than double this quantity. The inspector thought something was wrong, and on the 4th of April he went to defendant's house again, and then found the meter index was in the same position. Upon examination, it was found that the drum had been pierced, and in consequence the gas passing through was not registered. The defendant, in reply, said that in December last he was in a beerhouse, when he remarked that his gas-meter was frozen up. A man named Ainsworth, who was in the room, said he was employed by the Gas Manager, and would make it right if defendant would allow him to see the meter. He did so, and paid Ainsworth 5s. The man examined several other meters in the neighbourhood. Defendant was perfectly ignorant of what was done to the meter, and was innocent as far as committing any fraud was concerned. The Bench thought the case a serious one, and inflicted the full penalty—£5 and costs.—On the following day Ainsworth was charged with having obtained 5s. from William Haworth by false pretences. The Bench adjourned the case for a week, but admitted defendant to bail. He was brought up on remand on Thursday last, when, after a hearing of two hours, the case was dismissed, the Bench being of opinion that there was not sufficient evidence to justify them in sending Ainsworth to trial.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 1684.—WESTON, J. H., Shepherd's Bush, London, "Improved means of carburetting and regulating gas." April 16, 1881.
1714.—STEVENS, C. R., Lewisham, Kent, "Improvements in apparatus for heating and cooking by gaseous, liquid, or solid fuel, which improvements are partly applicable for other purposes." April 20, 1881.
1723.—WATSON, W., Leeds, Yorks, "An improved method of exploding gases used in gas-engines." April 20, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 4242.—LAKE, W. R., Southampton Buildings, London, "An improved apparatus for regulating or controlling the flow of gas or other fluids." A communication. Oct. 13, 1880.
4260.—ROBINSON, H., Manchester, "Improvements in gas motor engines." Oct. 19, 1880.
4270.—BEECHER, C. G., Hilgay, Norfolk, "Improvements in gas motor engines." Oct. 20, 1880.
4293.—LAKE, W. R., Southampton Buildings, London, "An improved apparatus for the combustion of gas, with or without other fuel, for cooking and heating purposes." A communication. Oct. 21, 1880.
4323.—FORD, A., Stockton-on-Tees, Durham, "Improvements in apparatus used in the purification of gas." Oct. 23, 1880.
4338.—WATES, P. J., Balham, and CHANDLER, S. and J., Newington Causeway, London, "A new or improved gas valve and appliances connected therewith." Oct. 25, 1880.
4361.—JOHNSON, J. C., Wednesbury, Stafford, "New or improved machinery for welding gas, steam, and water pipe fittings." Oct. 26, 1880.
4398.—RHODES, J. C., Blackpool, GOODBRAND, W., and HOLLAND, T. E., Manchester, "Improvements in gas motor engines." Oct. 28, 1880.
180.—FOULIS, W., Glasgow, "Improvements in gas-engines." Jan. 14, 1881.
368.—HOLMAN, S., Queen Victoria Street, London, "Improvements in apparatus employed in the manufacture of gas." Jan. 27, 1881.
457.—MILLS, B. J., Southampton Buildings, London, "Improvements in steam-boiler and other furnaces for burning gas." A communication. Feb. 3, 1881.
532.—FIELDING, J., Gloucester, "Improvements in gas motor engines." Feb. 8, 1881.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending April 20, 1881.

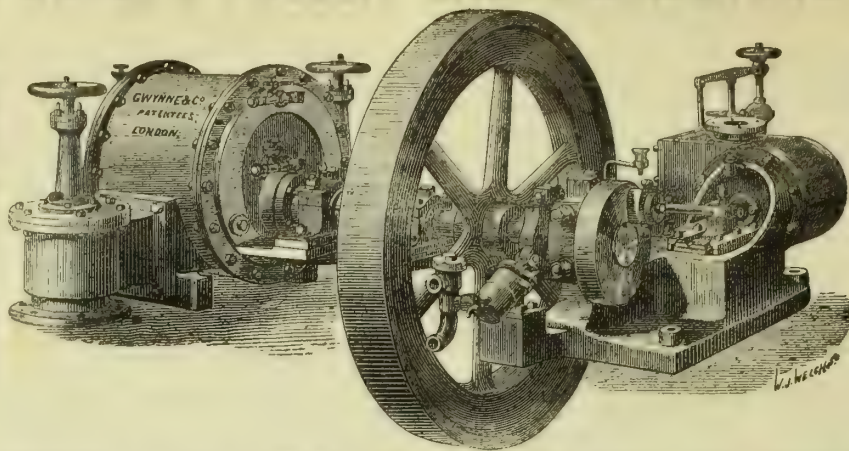
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.6	16.8	17.2	11.6	7.3	9.8	0.1	0.0	0.0	None.	In excess.
	Camden Town	17.1	16.7	16.9	14.0	11.6	12.7	0.1	0.0	0.0	"	"
	Dalston	17.4	16.9	17.2	11.5	10.2	10.8	0.0	0.0	0.0	"	"
	Bow	17.1	16.4	16.7	10.9	9.8	10.3	0.8	0.4	0.6	"	"
	Chelsea	17.0	16.7	16.9	15.6	13.7	14.5	0.4	0.2	0.2	"	"
	Kingsland Road	17.0	16.4	16.8	13.4	10.9	12.1	0.2	0.0	0.1	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas) . .	21.4	21.1	21.2	9.1	7.7	8.3	0.0	0.0	0.0	"	"
	Peckham	Apparatus under repair			11.5	10.4	10.8	0.4	0.0	0.2	"	"
Commercial Gas Company	Old Ford	17.2	16.9	17.1	11.6	7.9	10.3	0.4	0.4	0.4	"	"
	St. George-in-the-East . . .	17.6	16.9	17.2	7.2	6.2	6.7	0.3	0.0	0.1	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

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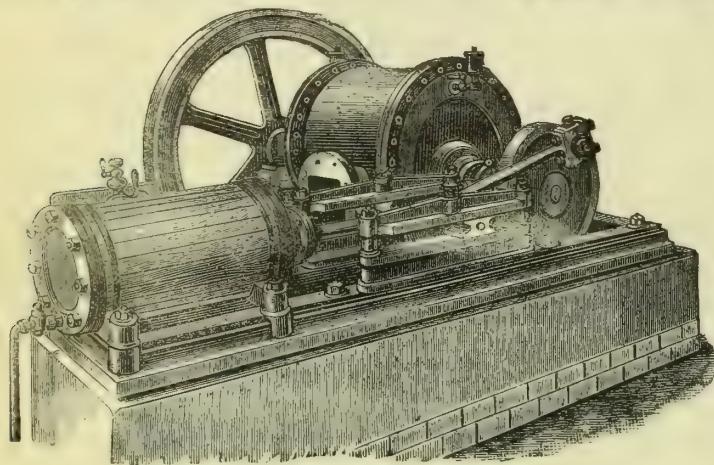
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Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

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INVENTED SPECIALLY TO REDUCE
OSCILLATION, FRICTION, AND POWER.
TO WORK BY BELT OR WITH

ENGINE COMBINED.



G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[SEE ALSO ADVERTISEMENT PAGE 726.]

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OHRER, Assoc.M.I.C.E., Gas-Works, SYDENHAM.**

WANTED, Engagement as Secretary, ASSISTANT SECRETARY, or CASHIER. Ten years' experience in Gas undertaking. Good references and security. Aged 38. Address **M. R., 202, Monument Road, BIRMINGHAM.**

TO GAS COMPANIES AND CORPORATIONS.

WANTED, an Engagement as Engineer and MANAGER. The advertiser has had 20 years' practical experience in the above capacity, is a good draughtsman and designer of gas plant, correct accountant and good carbonizer; is well acquainted with the modern chemical and mechanical improvements introduced in the manufacture, purification, and distribution of gas, and its residual products; is energetic in promoting the gas interests confided to his charge, and would accept salary on the results of his management. No objection to go abroad. Speaks Spanish and Portuguese, with a slight knowledge of French and Italian. Satisfactory references and testimonials. Address **L. S., care of J. C. Gough, 98, Maldon Road, Haverstock Hill, LONDON, N.W.**

TO SMALL GAS-WORK MANAGERS.

WANTED, in the West of England, a thoroughly Practical WORKING MANAGER, who has had the charge of Gas-Works where the whole of the duties have been performed by himself for the greater part of the year. The wages will be 23s. per week, with house, coal, fire, and garden free. State age, experience, number in family, and when at liberty; and send copies only of testimonials, addressed to **No. 742, care of Mr. King, 11, Bolt Court, FLEET ST., E.C.**

WANTED.—The Advertiser, a young man, aged 31 years, will shortly return from a foreign engagement. Has a thorough Practical Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 13 years. A Situation in a like capacity preferred, either at home or abroad, and security to any reasonable amount given for the due performance of all duties in connection with the Office. Unexceptional testimonials as to character and ability. Understands the Spanish language well. Satisfactory reasons for change. Apply, by letter only, to **No. 741, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

RE-ENGAGEMENT wanted as Manager or SECRETARY and MANAGER of Gas-Works, or ASSISTANT in large Works, by one who has for the last 12 years been Manager of Gas-Works in a large provincial city. Aged 34; married; abstainer. Can leave present situation at brief notice. Highest recommendations. Address **No. 727, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.**

WANTED, Managers and Proprietors of Gas-Works to apply for TENDERS to **S. BUTTERFIELD AND SON, Retort-Setters, 25, Crossley Terrace, Halifax;** established over 30 years. Drawings, specifications, and tenders forwarded for every description of Retort Settings (with the tongued and grooved segmentary bricks, sectional lengths, whole clay, or other kinds of retorts) and Apparatus required for the Manufacture of Coal Gas. Retort Benches erected complete, with or without ironwork.

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gasholder. Must be thoroughly sound. Price and particulars to be addressed to **Mr. EDWARD BAKER, Engineer, Reading Gas-Works.**

HIGHLY IMPORTANT SALE AT THE OLD GAS-WORKS, COMMERCIAL ROAD, HEREFORD.

MR. SUNDERLAND, Sen., is instructed by the Gas Management Committee of the Hereford Town Council to SELL by AUCTION, upon the premises, as above, on Friday, the 29th of April, 1881, at 2 p.m., the following Valuable Lots, viz.:

A GASHOLDER, 80 ft. diameter, by 20 ft. deep, with eight Columns 40 ft. high, and cast-iron open Girders.
A GASHOLDER, 75 ft. diameter, 16 ft. deep, with eight Columns, 16 ft. high, and cast-iron open Girders.
Four PURIFIERS, 10 ft. square, with 10-in. Pipe Connections; wrought-iron Covers and Lifting Gear, and Hydraulic Centre-Valve.
A STATION-METER, capacity 10,000 cubic feet per hour, with Hydraulic Valves and Bye-pass.
A STATION GOVERNOR, with 10-in. Connections.
A CYLINDRICAL EGG-END BOILER, 15 ft. by 3 ft.
A DITTO DITTO, 14 ft. by 2 ft. 6 in.
Two No. 9 PULSOMETERS, to lift 35,000 gallons per hour.
A MORTAR MILL, with 7-ft. Pan, by Smedley Bros. On view prior to Sale, and any further particulars can be obtained from the AUCTIONEER, 107, East St., HEREFORD. April 14, 1881.

FOR SALE—A 12,000 feet per hour STATION-METER, Cylindrical Case. In excellent condition, with Tell-Tale, Index, &c.
ALEX. WRIGHT AND Co., 55, Millbank St., LONDON, S.W.

THE Gravesend and Milton Gas Com-pany have for SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of West-minster.
For further particulars apply to the undersigned.
S. Sowood, Manager

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

A. G. H.—Your letter was only received yesterday, too late for insertion this week. It shall be published in next number.

AN OLD GAS MAN.—The statement we published, founded as it was on the figures given at the same time, does not admit of discussion.

NO BOMBAST.—The remark referred to does not occur in the report to be published next week. Your letter, therefore, is inadmissible.

T. G.—There is no restriction, as to illuminating power, contained in any General Act of Parliament; though the minimum usually prescribed in private Acts is 14 candles.

MANAGER.—The test acid is prepared by mixing 1 lb. of strong sulphuric acid (sp. gr. 1.845) with distilled water till the solution measures exactly 1 gallon at 60° Fahr. (See "King's Treatise on Coal Gas," Vol. I., p. 384.)

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 3, 1881.

MR. STANHOPE'S PROPOSED STANDING ORDER.

A SMALL but important deputation from Gas Companies, representing directly some of the largest undertakings in the kingdom, had, as will be seen from a report in another column, an interview with Dr. Lyon Playfair, Chairman of Committees of the House of Commons, on Thursday last, with reference to Mr. Stanhope's proposal to introduce a new Standing Order to control the practice of the House in respect of Gas and Water Companies' opposed Money Bills. As most of our readers are doubtless aware, it has grown to be a rule of the Court of Referees of the House of Commons to refuse *locus standi* to Local Authorities to oppose Bills promoted by Gas and Water Companies, when such Bills are intended solely to extend the capital powers of the undertakers, without making any other change in the conditions of the supply. This restriction upon the combative powers of Local Boards and Corporations is much resented in certain quarters, and

Mr. Stanhope was therefore sure of considerable support for his intended motion to enable Local Authorities to oppose Gas and Water Companies seeking additional capital, the effect of which would be to override the Court of Referees, the opposition becoming at once entitled, on their own allegation, to appear before a Committee. It was necessary that some representations should be made by the other parties potentially interested in this matter, in order that Mr. Stanhope and his supporters might not be entirely carried away by the belief that they were about to remove an unwarrantable disability, imposed by a rule arrived at in consequence of unfounded assumptions. This duty has been most effectively performed by the deputation of last Thursday, through their spokesman, Mr. W. H. Michael, Q.C., who carried out his difficult and delicate mission with consummate address. We say advisedly that Mr. Michael's task was both difficult and delicate, for he had to condense a many-sided and profound question into a short and clear narrative, and to take the part opposed to the popular view without appearing to be actuated by motives of self-interest to such a degree as to impair the value of his arguments. Without pretending to repeat the words of the advocate, we may convey some sense of their character and force by stating that he so far succeeded in proving his case that, as the immediate result, and in deference to the expressed desire of the Chairman of Committees, Mr. Stanhope has postponed his motion, which stood on the paper for Friday last, for a week, to give an opportunity for the same arguments which so impressed Dr. Lyon Playfair being laid before the President of the Board of Trade, who is understood to be prepared to support the proposed Order. The ultimate result of the proceedings cannot, of course, be predicted; but it may be expected that some modification of the Order will be made, if its main purpose should be persevered in.

We will now look at the question in its more prominent aspects, in order to set forth some of the results of the present practice, and also those which might be expected to follow from the introduction of the new Order in its original as well as in a modified form. The most obvious effect of the existing rule is to discourage costly parliamentary opposition, and this is of itself such a good influence that much might be pardoned for its sake. The principle involved is very plain, and consists in limiting the critical action of Local Authorities in regard to Gas Companies—we will here say nothing of Water Companies—to such matters as may directly concern them. It is doubtless difficult to draw the line, in the matter of gas supply, between what does and does not concern the Local Authority as representing the ratepayers and gas consumers. It may, however, be fairly contended that when all the other conditions of supply have been settled, the necessity for fresh capital to carry on an expanding concern is the least of all possible causes for the hostility of those in whose interests the expenditure is required. As contended by Mr. Michael, Gas Companies under recent legislation, and who are thereby compelled among other things to raise all new capital by auction, have no other inducement to increase their capital than is offered, or rather enforced, by the necessity in most cases of continually extending works to meet the requirements of a business which is as continuously increasing, whether the proprietors like it or not, because the Act of 1871 renders the supply compulsory. Hence, as the natural increase of population ever brings new consumers, who must be supplied, more capital must be continually expended for the purpose; and it is hard that a simple request for leave to do that which is not of their own seeking, should be allowed to simultaneously involve the applicants in a bitter and costly struggle for bare existence.

On the other hand, Local Authorities will urge that capital is the life of a gas undertaking, and, in the interest of those who eventually have to render the desired capital remunerative, it is essential that they should hold the right of making use of the opportunity afforded by a Gas Company desiring a new lease of existence, to have a word on the general subject of the past and probable future of the concern. Unfortunately, however, Local Authorities are not, in respect of Gas Companies' affairs, quite the impartial and disinterested critics they endeavour to appear. They do not always come into court with clean hands, or altogether free from ulterior views of their own. In fact, setting the public interest for the moment aside as practically equal in the estimation of both parties, Local Authorities are as eager to damage Gas Companies as the latter are to preserve their property; but, unluckily for the Companies, the public sanitary regulations of the past few years, with public and private gas legislation, old and new, have constituted the local rulers at

once inspectors of, and competitors with the Companies and therefore able to work in either or both ways as may suit their purpose. Again, there are few Gas Bills promoted solely for capital purposes; there are generally other requirements included in such measures, which give opponents the right of being heard. So the extent of the hardship of the present practice is exceedingly limited, even if it is admitted to have that character.

To return to Mr. Michael's argument. The contention that the issue of new capital is of no advantage to Companies, of course only applies to those who have incorporated the auction clauses in a recent Act, and the plea against raking up questions of initial price over and over again also refers exclusively to those cases wherein this crucial point has been lately settled in a satisfactory manner. There are, however, many Companies who may only need occasionally refreshing with capital to go on for an unlimited period without moot-ing other points, and the just control of the Local Authorities may be held to be baulked in such cases, unless they are enabled to bring the Company to book at stated times in regard to matters only constructively implicated in a proposed Bill. Such cases may, perhaps, be met by granting to opposing petitioners a right of hearing on the subject-matter of a Bill, with discretionary power in the Referees to strike out irrelevant claims. Some feasible method of solving the difficulty is needed whereby the repressive effect of the present practice may be preserved, while at the same time meeting the desire of Mr. Stanhope and those who support his action in this matter, who, being powerful and presumably in earnest, will probably not be content to abandon their principles, however willing they may be to embody them in a form calculated to remove the worst of the objections of their opponents.

THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY AND THE ELECTRIC LIGHT.

THE spectacle of a Gas Company undertaking to light by electricity the principal thoroughfares in their district would be decidedly novel, and might be considered as a visible advance towards the period when the lion and lamb are to lie down together in mutual confidence; but there is every reason to suppose that this new development of the "happy family" idea will be observable before long, and in a division of the United Kingdom wherein the millennium is hardly expected to originate. The Directors of the Alliance and Dublin Consumers' Gas Company have offered to light the classic precincts of Sackville Street and College Green, at their own expense, with electric lamps of the most approved type, the entire control of the arrangements for this purpose being left with the Corporation, who are only asked to provide a site for the engine and generators, and to take the trouble of nominating the working staff. The Company have power to supply any and every kind of light within their district; and therefore, imagining that the population of Dublin would like to see the new method of street lighting in their midst, and to compare its effect side by side with the gas, they have made the above offer, which was brought before the Town Council on Monday, the 25th ult., and by them referred to a Committee of the Whole House. The Municipal Authorities seem to have been considerably surprised by the action of the Company, and were consequently divided in opinion as to what the proposal meant. One party—the majority, as it was eventually proved—were for gratefully entertaining the idea, at least so far as to refer it to one of their Committees; while the other division could only see in the project some diabolical scheme of the Company's. It is remarkable, considering that the ratepayers were not asked to pay anything for the show, how many prudent reasons were found by the suspicious party in favour of waiting to see the result of the electric lighting experiments in London. Such a respectable minority—the motion to refer the letter in which the Company's offer was contained being only carried by two votes—has hardly been found in any English town where it has been successfully proposed to saddle the rates with the expense of a useless repetition of what might have been better seen elsewhere. We sympathize with the minority in many respects, if not in their motives. Any more replications of the already old styles of electric street lighting are unnecessary, in default of fresh instruction to be gained therefrom. The Dublin Company deserve great credit for their "pluck," but it would be wasted in this connection. If, being apparently quite indifferent as to the kind of light they supply, they would undertake the illumination of a suitable group of shops, residences, or public buildings with the latest approved-pattern incandescent lamps of Swan, Maxim, and others,

and would give the world the benefit of their experience after a year's working, they would materially help to clear up a particularly dark subject, round which mystery will otherwise continue to cling for an indefinite time.

THE GAS AFFAIRS OF ORMSKIRK.

THERE have been two recent attempts upon the Ormskirk Gas Company by discontented consumers and others, having for their direct object the appointment by the Court of Quarter Sessions of a Public Accountant to investigate the Company's affairs. The first of these applications was dismissed on the ground of informality, and the second, having avoided the same disaster, has been argued out before the full Bench, the Earl of Derby being Chairman, with the result that the Court has declared in favour of the Company, being unanimously of opinion that the petitioners had failed to show sufficient grounds for the inquiry. This result was only to be expected under the circumstances. The Ormskirk Gas Company is one of those who are seriously affected by the late notable decision of the Queen's Bench Division in respect of the Gas-Works Clauses Act of 1871; and as soon as this case in point had been settled, the Company accepted the inevitable with the best possible grace, and instantly began to set their affairs in order. Consequently, before the last application to the local Justices could be heard, they had prepared their accounts in due form, certified, moreover, by the firm of Accountants whom it was intended to appoint to inspect their books. There was consequently little to complain of in the matter of accounts, and the alleged doubtful dealings with capital on the part of the Company shrank into insignificant proportions when explained in Court. The discontented petitioners are therefore left to settle their own little bill of costs among themselves, and to think over their next move.

THE LIGHT-GIVING POWER OF PARAFFIN OIL.

THE communication from Mr. F. W. Hartley, A.I.C.E., on the "Value of Paraffin Oil as an Illuminant, compared with "Coal Gas," which will be found in another column, is of great interest. Mr. Hartley's known care and conscientious thoroughness as an experimentalist are sufficient guarantees that the tests catalogued in the article in question may be absolutely relied upon. The results stated are therefore of especial value as being the only well-authenticated facts yet published on a subject of equal importance to gas consumers and the users of oil lamps. It should be particularly noted that Mr. Hartley has undervalued the gas employed in the comparison, in order to bring it nearer to the usual conditions of ordinary domestic use, and he has also been careful to test common oil, such as is sold over the counter in oil-shops, in ordinary lamps, but with the uncommon observance of great care in ensuring the best results, by maintaining the wicks, chimneys, &c., in the highest possible state of efficiency. The final result of Mr. Hartley's observations under these conditions is that, reckoning the cost of oil at 1s. 6d. per gallon—which is less than is paid by the majority of purchasers of small quantities—and gas at 3s. 6d. per thousand cubic feet, the difference in favour of gas is more than sixteen per cent. in the case of small to medium-sized lamps, and more than twelve per cent. with larger lamps. If to this difference is added the cost of attending lamps and renewing them when, as frequently happens, they break, it will appear that the cheapest lamps are out of comparison dearer than gas. Ten minutes every day devoted to trimming and lighting lamps amounts in a year to a serious proportion of a busy housewife's time. It is not too much to say that the competition of mineral oil lamps with gas is far more important than that of electric lighting, and every contribution to the work of establishing gas as pre-eminently the best and cheapest light of the dwellings of all inhabitants of towns, deserves the warmest recognition and the widest publicity. Mr. Kidd's method of carburetting gas—for this is really the action of the compound gas and oil flame spoken of so highly by Mr. Hartley at the end of his communication—is also worth notice, and may be very suitable for shops, corridors, &c., being specially adapted for use with a wall reflector.

Water and Sanitary Affairs.

"WHEN the Bill relating to land in Ireland is passed," the Home Secretary will be "in a better position" to say whether there is "a likelihood of a measure dealing with the Metropolitan Water Supply being introduced." Such is the degree of enlightenment which Mr. Ritchie gained for himself and the public when interrogating Sir W. Harcourt, on

this subject, in the House of Commons last week. Sir William is resolved not to throw away his strength. The Irish Land Bill may fail to pass, and experience shows how dangerous it is to appeal to the country with an unpopular Water Bill besetting the Government. There is also another question in which the present Home Secretary is deeply interested, and which may possibly claim his consideration prior to any attempt at castigating the Metropolitan Water Companies.

Mr. Crookes, Dr. Odling, and Dr. Tidy, in their report on the water supplied to the Metropolis during the month ending on the 20th ult., state that the improvement mentioned in their previous monthly report has been still further noticeable in the past month. The Metropolitan waters, it is stated, "taken as a whole, leave nothing to be desired in respect of colour, wholesomeness, complete aëration, or absence of suspended matter." We wish Mr. Crookes and his colleagues would readjust their month, so as to make it coincide with the period for which Dr. Frankland professes to report. A month ending on the 20th day is so purely arbitrary that it ought to be abandoned in favour of the simple calendar month. This is also needful in order that the exact year may be covered. In search of a coincidence between Dr. Frankland and the three analysts who thus compete with him, we have to go back to the report given by the latter for the month ending on March 19. Dr. Frankland took a sample of East London water on March 10, and pronounced it "no better than average Thames water." Mr. Crookes and his friends took one of their East London samples on March 11, and, in addition, one on the 3rd and another on the 19th; but nothing was found which, in the opinion of these analysts, called for an expression of regret or complaint. It is curious also that even Dr. Frankland declared the East London water to be "efficiently filtered before delivery." How, under such circumstances, it could be "no better than average Thames water" it is difficult to understand.

As there is known to be a close association between the Metropolitan and the Metropolitan Board of Works, we view with some interest an editorial note in the columns of that journal with reference to the supply of water at fires. The Vestry of St. George, Hanover Square, are said to have come to the conclusion that it is desirable to obtain a constant water supply, "so that in case of fire the water may be turned on at once." Dr. Brewer has suggested that in the absence of the constant supply, the firemen should have the power to turn on the water when they arrive at the scene of the conflagration. Our contemporary thereupon observes that this idea, although a good one, is not new. It is added that the real difficulty consists in knowing "which are the proper plugs to turn"—a species of knowledge which is only possessed by "an experienced turncock." Has the Metropolitan forgotten that the Water Companies proposed long ago for the turncocks to reside at the Fire Brigade stations, the Companies paying the expense? This is an old story, but it will bear repeating, and its repetition seems necessary. But there is another answer, given every month by Lieut.-Col. Bolton, who is never tired of reckoning up how many miles of constantly charged street mains are available for hydrants. This would not include all London, but fire hydrants along 700 miles of streets would go a long way towards protecting the Metropolis more efficiently against the peril of conflagration. The Vestry of St. George, Hanover Square, may thus learn that even where the constant supply exists, the Metropolis fails to benefit by the boon to the extent which it might. If, instead of grumbling at the Water Companies, the Local Authorities would confer with them, the public good might be greatly advanced; but a conference between a Vestry and a Water Company would be so perfectly phenomenal as to presage something little short of the millennium.

The contractor for the Dublin sewer works happens to be a Scotchman and a "foreigner." His doings have, therefore, been closely watched, and serious charges have been made as to the manner in which the works have been executed. At the instance of the Public Health Committee of the Dublin Corporation, the subject has been referred to Mr. Bell, an eminent Engineer and Surveyor of the northern division of the county, and his report has just been produced. Mr. Bell states that he has examined a great portion of the work, and as a result he finds that "some of the complaints are well founded, but are not of a very extensive nature, while some of the complaints are incorrect and cannot be substantiated." It appears from Mr. Bell's report that the superintendence provided for the works was insufficient for its purpose; but while there are certain defects of construction, the materials

employed seem to have been good, and even "of a much better class than what is required by the specification." The Corporation feel that no investigation which they may conduct will be accepted as conclusive, and consequently they have decided on calling in the aid of the Local Government Board, to hold a sworn inquiry into the facts of the case. The primary responsibility in the matter rests with the City Engineer, and unfortunately this gentleman was ill during the progress of the works, so that he was unable personally to inspect the sewers, but relied upon the reports of his assistants. During the discussion which took place on this subject at the sitting of the Corporation last week, one of the speakers stated that Mr. Bell had only examined four defective sewers, whereas there were fourteen others in the same condition. It seems to be a common complaint that portions of the sewers are laid with a fall the wrong way. In one instance Mr. Bell found that there was a fall in the wrong direction for a distance of 300 feet, there being "a mistake in the levels of three inches." In deciding to call in the aid of the Local Government Board, under section 209 of the Public Health Act, the Corporation were greatly influenced by the fact that this course was recommended by Mr. Gray, M.P., the Chairman of the Public Health Committee. On the whole their decision appears to have been a wise one, seeing that the question raised is one which affects not only the "foreign" contractor, but also their own engineering staff.

The economy of borrowing money on mortgage of freehold lands and properties, instead of raising it upon the security of the rates and entering into the usual engagement for the repayment of the principal within a given period, has been recognized by the Birmingham, Tame, and Rea District Drainage Board, who have resolved to adopt this mode of obtaining the money required for the purchase of land in carrying out their new sewage scheme. According to the statement recently made before Mr. J. Thornhill Harrison, one of the Inspectors of the Local Government Board, the United Drainage Board require to raise a sum of £180,000, of which £92,640 will be for land. As there has been a large previous expenditure, the Board are apparently in a position to raise as much as £150,000 on land, and seeing that this kind of property will not—as Alderman Avery expresses it—"wear out," there will be no need to engage for a repayment of principal. It is reckoned that the saving thus effected will amount to rather more than £1500 per annum. Perhaps it ought to be remembered that the reduced annual charge will be permanent, while the other would be terminable. However, the Public Health Act provides that Local Authorities may deal in this manner with a debt created for the purchase of land. Another matter connected with the Birmingham sewage scheme is the continued intervention of Lord Norton, who, as Sir Charles Adderley, obtained in 1875 a perpetual injunction to restrain the Council of the Borough of Birmingham from polluting the River Tame where it ran through his estate. Under the Public Health Act of 1875 the Birmingham, Tame, and Rea District Board purchased the outfall works from the Council of the Borough, and Lord Norton has instituted an action to make the decree of 1875 available against the new authority. The Drainage Board demurred, but on the case coming before the High Court of Justice last Tuesday, the demurrer was, as will be seen from a report in another column, disallowed. At the meeting of the Board held on the same day, the result was announced, and it was resolved to appeal against the decision. From the discussion which took place at the Local Government Board inquiry a short time back, it would appear that the real difficulty in this matter consists in excluding storm water from the river. To do this is a virtual impossibility, and the Drainage Board plead that they ought not to be held responsible for that which no efforts on their part can prevent.

THE number of the "City Lantern, and Free Lance," published in Manchester on the 22nd ult., contains an admirably executed lithographic portrait of Mr. Samuel Hunter, A. Inst. C.E., Engineer and Manager of the Salford Corporation Gas-Works. It forms one of a "gallery of local portraits," and is accompanied with an interesting sketch of Mr. Hunter's life from the commencement of his connection with the gas profession.

THE controversy recently raised in respect to what we published in the JOURNAL of the 29th of March, as the report of the Jurors in Section III. (Meters, Governors, &c.) of the recent Exhibition of Gas Apparatus, held under the auspices of the Philosophical Society of Glasgow, has resulted in a letter from the Secretary of the Society (Mr. J. Mann) being received by us last Saturday. After stating that the report "is now issued," the letter proceeds: "I am to ask if you will be willing to publish it in full, along with the tables, other-

wise the Jurors object to its being printed at all, as the figures on which they found their conclusions are necessary to a proper understanding." Having telegraphed our acceptance of this offer, the report arrived yesterday morning. It contains two very extensive tables, besides other matter which it is desirable should be carefully examined, so as to prevent the possibility of an error occurring. We therefore defer the publication of the whole till next week.

We have much pleasure in acknowledging the receipt of a copy of a lithographed portrait of Mr. Magnus Ohren, Assoc. M. Inst. C.E., Secretary of the Crystal Palace District Gas Company, by Mr. Geo. Pickworth, of 6, Queen Anne's Gate, Westminster. The portrait has been executed for a number of subscribers. It is printed on India paper, size 24 in. by 18 in., is well executed, and conveys a very fair likeness of the sitter, who has for many years past been a conspicuous figure in the English gas profession, and an active member of the British Association of Gas Managers.

MR. JAMES PATERSON, of the Warrington Corporation Gas-Works, writes as follows:—"Permit me, in the interests of the profession, to give notice that an impostor, representing himself as my son, has recently imposed upon several gentlemen in the Midland Counties. He is represented as tall, rather dark, well spoken, and evidently has some knowledge of Gas Engineers. It is to be hoped his career will be cut short when his antecedents are known, and if possible handed over to the police." A Manager of Gas-Works in the Birmingham district writes in confirmation of Mr. Paterson's statements.

THE Eighth Half-Yearly Meeting of the North of England Gas Managers' Association was held at Newcastle-on-Tyne on Saturday last. There was a large attendance of members and friends. Mr. J. H. Cox, of Sunderland, the President of the Association, occupied the chair. Papers were read by Mr. T. N. Ritson, of Carlisle, on "Concrete Tanks;" and by Mr. J. Whyte, of Seaham Harbour, on "Fire-Stone v. Fire-Bricks for Furnaces." The next meeting of the Association was appointed to be held at West Hartlepool, under the presidency of Mr. T. Trewhitt. We shall give full details of Saturday's meeting next week.

A STUDY ON GASHOLDER CONSTRUCTION.

(Continued from p. 695.)

PROCEEDING now to the consideration of the guide-rollers, we have two systems to compare with each other.

The Radial or Normal System.—Let fig. 4 represent the jointed

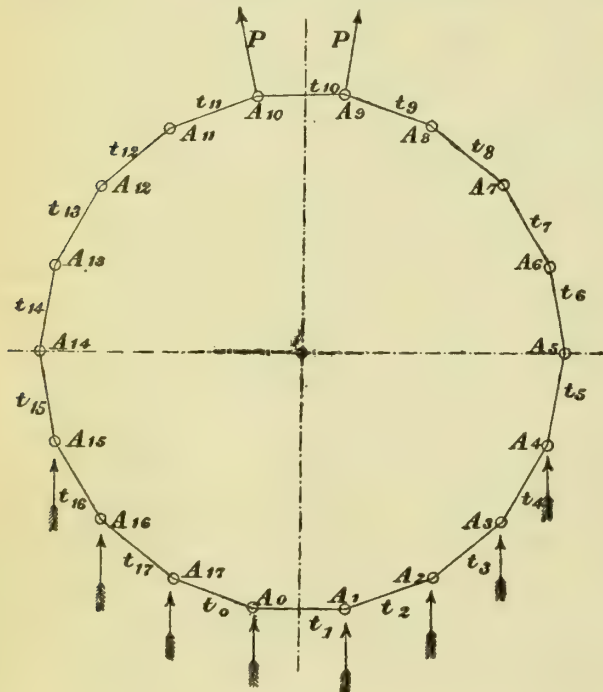


FIG. 4.

polygon formed by the girders connecting the columns. When the holder, driven by the wind, is forced against the columns, it generally bears at least against three lines of guide-rails. But as the resultant of the action of the wind may be directed exactly in the line bisecting the angle formed by the abutting of the planes of two consecutive rollers, the stability of the holder may depend solely on the reactions of these two rollers; and this case must be studied, as presenting the most unfavourable conditions for the maintenance of the equilibrium of the structure. The forces applied to the columns are—(1) The pressures exerted by the holder upon the two guides A₀ and A₁₀; these pressures are equal, and we will designate each of them by P. (2) The pressure, p, exerted by the wind upon all the columns situated in front of the diameter A₁₄A₅, which is perpendicular to the direction of the wind. This being assumed, we may apply the equation (A) already given,* to every one of the apices of the polygon, with the reservation that because of the symmetry of the object, it will be sufficient to take only those which are included between A₀ and A₁₀. We will first repeat the general equation—

* See ante, p. 695.

$$t_{i-1} - 2at_i + t_{i+1} = \frac{q_i + q'_{i-1}}{m} - (q'_i + q_{i-1})$$

and begin by calculating the values of q and q' for every one of the apices in question.

Utilizing the fundamental relation between the sides of a triangle and the sines of the opposite angles, and the polygon having 16 sides, we have—

$$\begin{aligned} q_0 &= p \frac{\sin. 90^\circ}{\sin. 20^\circ} & q'_0 &= p \frac{\sin. 70^\circ}{\sin. 20^\circ} \\ q_1 &= p \frac{\sin. 70^\circ}{\sin. 20^\circ} & q'_1 &= p \frac{\sin. 90^\circ}{\sin. 20^\circ} \\ q_2 &= p \frac{\sin. 50^\circ}{\sin. 20^\circ} & q'_2 &= p \frac{\sin. 110^\circ}{\sin. 20^\circ} \\ q_3 &= p \frac{\sin. 30^\circ}{\sin. 20^\circ} & q'_3 &= p \frac{\sin. 130^\circ}{\sin. 20^\circ} \\ q_4 &= p \frac{\sin. 10^\circ}{\sin. 20^\circ} & q'_4 &= p \frac{\sin. 150^\circ}{\sin. 20^\circ} \\ q_5 &= p \frac{\sin. (-10^\circ)}{\sin. 20^\circ} & q'_5 &= p \frac{\sin. 170^\circ}{\sin. 20^\circ} \\ q_6 &= 0 & q'_6 &= 0 \\ q_7 &= 0 & q'_7 &= 0 \\ q_8 &= 0 & q'_8 &= 0 \\ q_9 &= -\frac{P}{2 \sin. 10^\circ} & q'_9 &= -\frac{P}{2 \sin. 10^\circ} \\ q_{10} &= -\frac{P}{2 \sin. 10^\circ} & q'_{10} &= -\frac{P}{2 \sin. 10^\circ} \end{aligned}$$

By means of these values it is easy to calculate those taken by the second member of the general equation, where the index, i, varies from 0 to 10. Lastly, calling in the known trigonometrical relations—

$$\begin{aligned} \sin. \alpha + \sin. \beta &= 2 \sin. \frac{1}{2}(\alpha + \beta) \cos. \frac{1}{2}(\alpha - \beta) \\ \tan. \frac{1}{2} \alpha &= \frac{1 - \cos. \alpha}{\sin. \alpha} = \frac{\sin. \alpha}{1 + \cos. \alpha}; \quad 2 \sin.^2 \frac{1}{2} \alpha = 1 - \cos. \alpha \end{aligned}$$

and remarking that m = cos. 20°, and that in consequence of symmetry t₀ = t₂, &c.; we have, after making all reductions, the following system of equations:—

$$\begin{aligned} -at_1 + t_2 &= 0 \\ t_1 - 2at_2 + t_3 &= 0 \\ t_2 - 2at_3 + t_4 &= 0 \\ t_3 - 2at_4 + t_5 &= 0 \\ t_4 - 2at_5 + t_6 &= 0 \\ t_5 - 2at_6 + t_7 &= \frac{p \cos. 10^\circ}{\cos. 20^\circ} = 1.0480 p \\ t_6 - 2at_7 + t_8 &= 0 \\ t_7 - 2at_8 + t_9 &= 0 \\ t_8 - 2at_9 + t_{10} &= -\frac{P \sin. 10^\circ}{\cos. 20^\circ} = -0.1848 P \\ t_9 - at_{10} &= -\frac{P \sin. 10^\circ}{\cos. 20^\circ} = -0.1848 P \end{aligned}$$

If it is admitted that the girders are not susceptible of extension, A = $\frac{1}{\cos. 20^\circ}$, whence we deduce the following quantities for the tensional strain of the ten girders numbered—

$$\begin{aligned} t_1 &= 0.0849 P - 0.5133 p; \quad t_2 = 0.0904 P - 0.5462 p; \\ t_3 &= 0.1074 P - 0.6492 p; \quad t_4 = 0.1383 P - 0.8356 p; \\ t_5 &= 0.1870 P - 1.1294 p; \quad t_6 = 0.2595 P - 1.5682 p; \\ t_7 &= 0.3653 P - 1.1603 p; \quad t_8 = 0.5181 P - 0.9014 p; \\ t_9 &= 0.7374 P - 0.7583 p; \quad t_{10} = 0.8667 P - 0.7126 p. \end{aligned}$$

We have only to concern ourselves with the two last mentioned, which are each connected to one of the most heavily strained columns. It should be stated here that in the preceding discussion it is supposed that the resultant of the action of the wind takes effect precisely in the horizontal plane of the girders. This is not actually so in practice, but there is no inconvenience in assuming it for the sake of simplicity, because by so doing the strains in question are slightly exaggerated, so that the dimensions found sufficient to meet the theoretical case thus stated, will be found more than enough to satisfy all practical requirements.

The pressure exerted by the wind upon one column is equal to 7.2 m. × 0.950 m. × 86.3 kilos. = 590.3 kilos. for the lower portion, and to 9.2 m. × 0.85 m. × 86.3 kilos. = 564.9 kilos. for the upper portion, which is divided thus: Through the middle girders 633 kilos. = p, and through the top girders 337 kilos. = p'. As to the pressure transmitted by the holder, its amount has been already ascertained for the most heavily strained columns, and is thus divided: Through the middle girders 12,922 kilos. = P, and through the top girders 6352 kilos. = P'. Introducing these values of P, p, P', and p' into the foregoing expressions, we have—

$$\begin{aligned} \{ t_9 &= 9049 \text{ kilos.}; \quad \{ t_9 = 4428 \text{ kilos.} \\ \{ t_{10} &= 10748 \text{ kilos.}; \quad \{ t_{10} = 5265 \text{ kilos.} \end{aligned}$$

Comparison of the Two Systems.—If the strains to which the chief pieces of the guide framing are submitted are contrasted, the second system will appear to have an incontestable advantage over the plan of radial guide-rollers. And as the calculations above set forth also go to show that the dimensions of the framing for radial rollers must greatly exceed those required with the alternative system, it may be asked if, on the score of economy, it would not be better to adopt tangential rollers alone, and so economize in the weight of guide framing. But it must not be forgotten that in the preceding study we have always assumed that the direction of the wind was exactly perpendicular to a plane of the meridian passing through two opposite columns. It will therefore be interesting to inquire as to the effect which may be expected when this condition is not rigorously fulfilled. It will be seen that in the case of radial guiding rollers, the holder will always take, under the pressure of the wind, such a position that at least at three points the rollers will bear against the guides in such a way that the resultant of these normal reactions passing by three points is equal and opposed to the action of the wind. This condition can always be fulfilled whatever may be the direction of the wind, since the three reactions are not necessarily equal. Thus, in this case, three columns at least will be brought into play, and the strains which they will be required to withstand will be less than those with which we have been dealing, upon the supposition that the wind blows in line with the bisection of the angle between the two columns.

With tangential rollers there is a difference. In fact, in so far as the direction of the wind is no longer perpendicular to one of the planes of the meridian passing through two opposite columns, the reaction of the rollers upon the guides becomes oblique in relation to the surfaces of the paths, against which they have a sideways bearing; and in the possible case wherein the diameter-plane normal to the direction of the wind follows the bisection of the angle of two consecutive diameters (in the case of a polygon of 18 sides), and therefore makes with one of these diameters an angle of 10° —as the co-efficient of friction of cast upon wrought iron is $0.18 = \tan. 10^\circ 30'$, the tangential rollers will then lose their efficacy, and the holder will begin to drag against the sides of the vertical guides. This phenomenon of dragging is easily remarked in observing the working of a holder guided tangentially only. It is produced more frequently when there are few columns than with a great number. For a holder with over 18 columns it should never be produced, if the various parts of the guiding arrangements are rigorously fixed in the positions assigned for them in the drawings. This condition is, of course, exceedingly difficult to realize and maintain, despite every care in the execution of the work. It is therefore prudent in any case to adopt such fittings for tangential rollers as may diminish the action of sliding or dragging here described. This necessity has, therefore, been anticipated in the present instance by the adoption of radial rollers fixed in the top carriages of the holder.

The investigation into the principles involved in the work being now completed, we shall next proceed to describe the holder and tank as executed.

(To be continued.)

Communicated Article.

THE VALUE OF PARAFFIN OIL AS AN ILLUMINANT, COMPARED WITH COAL GAS.

By Mr. F. W. HARTLEY, A.Inst.C.E.

Several statements of experimental results have been published upon this subject, in which it has been made to appear that paraffin oil, as it is usually burned for lighting purposes, is less costly than common coal gas. In the course of some experimental investigations upon which I was engaged about 18 months ago, I was led to doubt the correctness of the conclusions arrived at, in consequence of the results that I obtained with several good and well-trimmed paraffin burners, which I used in order to ascertain the lighting value of paraffin oil per gallon, indicating an economic inferiority to coal gas. Repugnant as was the odour of paraffin oil to me at that time, I resolved to overcome my antipathy to it, and to carry out, at intervals, as time would permit, a series of trials with a selection of burners which were fairly representative of the best types. I soon became somewhat indifferent to the odour of the oil, although I cannot say I have grown to enjoy it. I am still painfully affected when I enter a room in which a badly trimmed lamp, slightly smoking, has been burning for some time, as two effects are produced—namely, an oppressive constriction across the forehead, and an irritation of the organs of respiration to a degree little less than that caused by an atmosphere tainted by the products from a Bunsen gas-burner which has “lighted back.” Hence, with all the paraffin burners which were used, great care was taken to so trim their wicks that the flames were well formed and the oil was burned perfectly, although in two or three cases it was found needful, in order to obtain the highest results with well-shaped flames, to approach so nearly to the smoking point that the least current of air across the lamps caused smoke to be evolved.

Judging from my experience among friends and acquaintances, the public do not take nearly enough trouble and care in the trimming of these lamps, and, as a consequence, fail to realize anything like the most economic effects. Hence, in instituting comparisons as to the economic value of the two materials in question, it is manifestly unfair to use a paraffin burner under the most refined conditions, and set the result so obtained in opposition to a depreciated estimation of the power of coal gas; and yet this is precisely what has been done. In all the large towns, in most of

the smaller ones, and even in some villages, gas of fully 15 to 16 candles illuminating power is supplied; but the standard adopted by the reporters on petroleum lamps is 12 candles only, and notwithstanding that I think the 12-candle power too low as an average for 5 feet per hour consumption, still, as there are small places—some, strange to say, near the coal-fields—where inferior gas is supplied, I am quite content to adopt the 12-candle value for gas, and, as will be seen, something lower in certain comparisons, while according to the paraffin burners all the advantages due to careful treatment. I also frankly admit that when due care is taken with a good paraffin lamp, the light emitted is clear, brilliant, in some cases almost white, and is altogether very beautiful; while if oil of a fine quality be employed, the steadiness of the flame and its uniformity in lighting power during several hours command honest and unprejudiced admiration.

Some of the burners operated with were, with their wicks, bought at shops; others, with wicks, were obtained direct from the makers, who were informed that the burners were to be tested. The wicks were not subject to any special treatment beyond being stored in a warm dry room, and therefore were in such condition as they would be used by the general public; but, as already said, extreme care was taken in trimming, and the lamps were re-charged with oil on every occasion of being re-used, while the flames were adjusted to such sizes as in every case seemed to be most advantageous for the particular burner, except when some flames were deliberately reduced in size in order to see to what extent a reduction in the rate of burning affected the economic value of the fuel. Such examples are given in Table I., under 1A, 4A, and 8A, which show how greatly the cost per candle power is increased by reducing the total amount of light. The examples 6 and 6A, on the contrary, just indicate the ill effect which results from an attempt to force a burner beyond its powers, the greater light costing more money per candle power.

The paraffin oil employed was of tolerably fine quality, was procured in pints from dealers of the highest respectability, and retailed by them at $2\frac{3}{4}$ d. per pint, or at the rate of 1s. 8d. per gallon, which, of course, is what the public have to pay, and not 1s. per gallon, which is the price that those who have instituted comparisons between the cost of lighting by this oil and by coal gas have, for some reason, chosen to elect. It is quite true that the oil may be bought in quantities for 1s. per gallon, and that some retail vendor are willing to supply it by the single gallon for from 1s. 6d. to 1s. 4d.; but the cost of a thing to the consumer is what he can purchase it for in such quantities as he wants, and not what it is sold for in the wholesale market, by gallons, hundredweights, or tons. This is such an elementary rule in political economy that it seems almost absurd to state it; but I have felt obliged to put the matter of cost in its true position, and notwithstanding that gas forms a general exception to the rule stated; for, in the majority of cases, he who buys 100 cubic feet of gas gets it at as low a price per cubic foot as he who buys a million. The specific gravity of the various samples of oil used, ranged from .7888 to .7928; the mean may therefore be taken as .7908, and one gallon would weigh 53,356 grains. As, however, some samples of paraffin oil weigh very closely upon 8 lbs. to the gallon, it has been assumed, in order to do full justice to the value of the oil, that a gallon weighs 8 lbs., or 56,000 grains, or about 600 grains in excess of the weight of many samples.

It need hardly be stated, perhaps, that the light of comparison was a Methven's Illuminating Power Standard, which rendered a constant light to the photometer disc in all the trials. I am happy to be confirmed in my estimation of the value of this standard by the willing testimony of Charles Heisch, Esq., F.C.S., &c., Gas Examiner to the Corporation of the City of London, who, after some months of practical experience with it, says, “The ease and rapidity with which observations can be taken, and the freedom from the irregularities to which even the best candles are liable, render it, in my opinion, a most valuable instrument.”

The photometer employed was of refined construction, and was provided with every accessory which could facilitate operations and render the indications accurate. The terminal point of the bar was defined by two plumb-lines about 23 inches apart. The lamps were placed in such positions that the plumb-lines (1) cut the edges of single-wick flames, when their sides were presented to the disc; (2) cut the centre line between the two flames when, with duplex burners, the side flames were presented to the disc; (3) cut the middle of the flames when their edges were presented to the disc; and (4) cut the Argand flame centrally.

The flat flames were presented alternately side and edge to the disc, the respective powers recorded, and the ratio afterwards deduced from averages. The power of the edge light is a little difficult to determine with accuracy, but as the conclusions are based upon averages, they fairly represent the truth. An important fact is brought out by them—namely, that the percentage of light yielded by the edges of such flames is much higher than has been heretofore believed. Two experimenters stated some time since that the edge light of a flat-flame paraffin burner was equal only to about 50 per cent. of the full or side flame; but only in one instance in my experiments was the result so low as this. Here I may observe that there seems to be no absolute proportion between the percentage of edge light and the width of the wick; for although the smaller flames do give a higher percentage, yet burner No. 7 (Table I.), $1\frac{1}{8}$ -inch wick, gives more than No. 8, with $1\frac{1}{2}$ -inch wick. Neither is there any absolute relation between the width and thickness of a wick and the rate at which the oil burns; very much depending, doubtless, on the quality of the cotton and the manner in which it is plaited, upon the burner, and upon the shape and size of the chimney or glass adopted.

TABLE I.—Flat-Wick Paraffin Lamps.

Reference Number of Burner.	Width of Wick.	ILLUMINATING POWER.					Grains of Oil burned in One Hour.	Grains of Oil per Hour per Candle Power.	
		Side of Flame.	Edge of Flame.	Mean Power.	Ratio Edge to Side = 100.	Ratio Mean to Side = 100.		Side of Flame.	Mean Power of Flame.
1	$\frac{3}{8}$ in.	7.08	5.60	6.34	79.10	89.55	390	55.08	61.50
1A	$\frac{3}{8}$ "	4.40	3.60	4.00	81.80	90.90	292	66.36	73.00
2	$\frac{3}{8}$ "	5.90	4.00	4.95	67.80	84.00	359	60.84	72.52
3	$\frac{3}{8}$ "	7.85	5.78	6.82	73.70	86.90	508	64.71	74.40
4	$\frac{3}{8}$ "	8.08	6.32	7.17	78.80	89.30	507	63.13	70.70
4A	$\frac{3}{8}$ "	4.20	3.50	3.85	83.33	91.66	344	81.90	89.38
5	$\frac{7}{8}$ "	9.70	7.55	8.63	77.83	88.97	524	54.00	60.72
6	$1\frac{1}{16}$ "	11.70	7.52	9.61	64.27	82.14	610	52.13	62.03
6A	$1\frac{1}{16}$ "	10.00	6.44	8.22	64.40	82.00	537	53.70	65.32
7	$1\frac{3}{8}$ "	19.50	9.80	14.65	50.25	75.12	1183	60.66	80.75
7A	$1\frac{3}{8}$ "	15.86	9.34	12.60	58.90	79.45	938	59.14	74.44
8	$1\frac{1}{2}$ "	12.03	8.60	10.32	71.50	85.79	714	59.35	69.18
8A	$1\frac{1}{2}$ "	9.76	7.56	8.66	77.46	88.73	658	67.42	75.98

TABLE II.—Duplex Paraffin Lamps.

Reference Number of Burner.	Width of Wick.	ILLUMINATING POWER.					Grains of Oil burned in One Hour.	Grains of Oil per Hour per Candle Power.	
		Side of Flame.	Edge of Flame.	Mean Power.	Ratio Edge to Side = 100.	Ratio Mean to Side = 100.		Side of Flame.	Mean Power of Flame.
9	$1\frac{1}{4}$ in.	24.10	14.77	19.44	61.28	80.66	1349	56.00	69.39
9A	$1\frac{1}{4}$ "	21.10	14.30	17.70	67.77	84.00	1268	60.01	71.65
10	$1\frac{1}{16}$ "	21.70	14.00	17.85	64.51	82.26	1118	51.52	62.63
10A	$1\frac{1}{16}$ "	19.69	14.00	16.85	71.10	85.57	1006	51.09	59.70
11	$1\frac{3}{8}$ "	19.50	13.90	16.70	71.28	85.64	1059	54.30	63.40
11A	$1\frac{3}{8}$ "	16.60	12.00	14.30	72.28	86.14	996	60.00	69.65
12	$1\frac{1}{8}$ "	19.02	12.04	15.53	68.30	81.65	1226	64.46	78.93

TABLE III.—Argand Paraffin Lamps.

Reference Number of Burner.	Diameter of Wick Externally.	Light in Sperm Candles.	Grains of Oil Burned in One Hour.	Grains of Oil Burned per Hour per Candle Power.
13	$\frac{3}{8}$ in.	8.16	459	56.25
14	$\frac{1}{2}$ in.	10.85	700	64.52
15	$\frac{1}{2}$ in.	14.53	755	51.96

While, however, the powers of edge flames are shown to be high by my tests, the actual value of paraffin oil is proved to be much lower than has been heretofore assumed, and I am fully satisfied that my results show the maximum value of the material to the public.

In instituting comparisons between the cost per candle light with lamps of high power and the cost of gas for the same amount of light, it always seems to have been forgotten or ignored by the experimenters that the lighting power of gas per cubic foot increases with an increased rate of consumption, when burned under proper conditions from suitable burners. Now it is almost as common for consumers to use burners of 6 or even 7 cubic feet per hour consumption, as it is for them to use burners of 5 or 4 cubic feet rate. Hence against the depreciated power of the gas with small burners we may fairly set its enhanced power with larger ones. In spite of this fact, it is usual to assume that the useful effect to the public is, for 16-candle gas, only about 12 candles. But, for the purposes of some comparisons in the table that follows, I have been content not only to adopt 12-candle power for 5 cubic feet, or 2.4 candles per cubic foot, but in certain other comparisons to go lower, and adopt 2.28 candles per cubic foot, or 11.4 candles for 5 cubic feet. The reason for this is that flat gas flames give, as do the lamp flames, less light from their edges than from their sides; the edge light, however, of batswing burners used with ordinary coal gas is only, by my tests, 4 to 8 per cent. inferior to the side light, so that the lower standard I have adopted for gas meets extreme cases.

Reverting to the cost of oil, it is true that it can be bought in large quantities (wholesale) at 1s. per gallon or somewhat less, and on inquiring of respectable dealers I have been informed that they are willing to supply a single gallon for 1s. 6d., or two or three gallons at a time at the rate of 1s. 4d. per gallon. Add to the latter price the loss by waste in charging the lamps, &c., the cost for wicks, for new glasses—for they do break—and the absolute cost for lighting with good paraffin oil may be fairly taken to be at the rate of 1s. 6d. per gallon, even to considerable buyers. If labour were also taken into account, 6d. or even 1s. more might well be added.

The following table (IV.) shows the illuminating value in standard sperm candles for one hour of one gallon of paraffin oil with each burner tried; also the quantity of coal gas required to produce an equivalent amount of light and the cost thereof at 3s. 4d. per 1000 cubic feet. As against the side or full flames of the lamps the gas is estimated to yield 2.4 candles light per cubic foot, or 12 candles light for 5 cubic feet (columns 4, 5), and as against the mean powers of the lamps the power of the gas is estimated at 2.28 candles

per cubic foot, or only 11.4 candles for 5 cubic feet (columns 6, 7). Paraffin oil of the quality used is retailed at the rate of 1s. 8d. per gallon by the pint or quart, but by the gallon can be bought of dealers at 1s. 6d. or even 1s. 4d. per gallon.

TABLE IV.

1. Reference Number of Burners.	2. Value of One Gallon of Oil in Sperm Candles for One Hour.	3. Value of One Gallon of Oil in Sperm Candles for One Hour.	4. Cubic Feet of Gas to yield Light equal to Side Flame of Lamp.	5. Cost of Gas.		6. Cubic Feet of Gas to yield Light equal to Mean Power of Lamp.	7. Cost of Gas.	
				s.	d.		s.	d.
1	1016	911	423	1	4.92	400	1	4.00
1A	844	767	352	1	2.08	336	1	1.44
2	920	772	383	1	3.32	339	1	1.56
3	865	753	361	1	2.44	330	1	1.20
4	888	792	371	1	2.84	348	1	1.92
4A	684	628	285	0	11.40	275	0	11.00
5	1036	923	431	1	5.24	405	1	4.20
6	1074	903	448	1	5.92	396	1	3.84
6A	1043	857	435	1	5.40	376	1	3.04
7	923	693	385	1	3.40	304	1	0.16
7A	946	752	394	1	3.76	330	1	1.20
8	943	809	393	1	3.72	355	1	2.20
8A	831	737	346	1	1.84	323	1	0.92
9	1000	807	417	1	4.68	354	1	2.16
9A	932	782	389	1	3.56	343	1	1.72
10	1087	894	453	1	6.12	392	1	3.68
10A	1096	938	457	1	6.28	411	1	4.44
11	1031	883	430	1	5.20	387	1	3.48
11A	933	804	389	1	3.56	352	1	2.08
12	869	709	362	1	2.48	311	1	0.44

Argand Lamps.

	Value of One Gallon of Oil in Sperm Candles for One Hour.	Cubic Feet of Gas to yield Light equal to the Lamp. 5 ft. = 15 Candles.	Cost of Gas.
13	995	332	1 1.28
14	868	289	0 11.56
15	1078	359	1 2.36

The preceding table (IV.) shows clearly that gas, at 3s. 4d. per 1000 cubic feet, and estimated at a low illuminating value, is in every instance less costly than paraffin oil, with the lamps that were tested. It is true that Nos. 10 and 10A indicate, as against gas, a slight superiority with the side light, though only to the extent of the sums of 0.12d. and 0.28d. per gallon; but the apparent advantage vanishes when the mean lighting powers are compared, for then the cost of gas sinks to less than 1s. 4½d., as against the 1s. 6d. for oil—a difference of over 9 per cent. in favour of gas, even when

lamps are as carefully treated as those were which are in question. If it be urged that gas cannot be so economical when burned to produce small flames, it can be replied that the same truth holds good with lamps, as witness 1A and 4A in Table I., and the relative cost of gas in Table IV. Further, it can also be said that if the larger burner flames be reduced very much, a greater loss of light power ensues than with the smaller burners, and moreover that under such conditions the large burners tend to produce small.

Taking the mean values per gallon of oil from the third column of Table IV., for burners which did well up to 12-candle power—viz., Nos. 1, 2, 3, 4, 5, 6, 6A, and 8—the average candle value per gallon will be found to be in round numbers 840; this divided by the low estimated power of 2.28 candles per cubic foot of gas gives 368.5 feet, costing, at 3s. 4d. per 1000 feet, 1s. 2.74d., and at 3s. 6d. per 1000 feet 1s. 3.48d., as against the low estimate for oil of 1s. 6d. In the same way the figures for burners Nos. 7, 7A, 9, 9A, 10, 10A, 11, and 11A (excluding the bad one, 12), of more than 12-candle power, give an average value equal to 820 candles. Gas required would be 360 cubic feet, costing, at 3s. 4d. per 1000 feet, 1s. 2.4d., and at 3s. 6d. per 1000 feet, 1s. 3.12d.

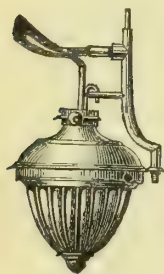
Gas at 3s. 6d. per 1000 feet is more than 16 per cent. cheaper than the oil; but it must be remembered that when powerful lights are wanted more than 3-candle power per cubic foot of gas is realized. Dividing 840 by 3, the quotient gives 280 cubic feet only as the quantity of gas needed to afford the same amount of light as one gallon of oil burned from large burners; the gas costing, at 3s. 4d. per 1000 feet, but 11.2d., and at 3s. 6d. per 1000 feet, 11.76d.; so that the oil light would be dearer than gas by more than 50 per cent. under the conditions stated. As regards Argand burners, the economy is unmistakeably on the side of gas, as there certainly can be no reason for assuming that these need be used disadvantageously.

In conclusion, it may add to the interest of this article to state some results obtained with paraffin oil used in conjunction with gas. First, the effect produced upon gas by passing it, without bubbling, through a vessel containing some of the oil; paraffin oil not only being totally unfitted for the enrichment of coal gas in this way, but an actual destroyer of its illuminating power. In this respect it acts like the heavy naphthas from coal tar:—

	Light Yielded. Sperm Candles.	Per Cent.
Batswing burner, gas delivered in its normal condition	16.2	100.00
Same burner and rate of gas delivery, but the gas passed through a vessel containing paraffin oil	9.0	55.55
Loss		44.45
Argand burner, gas delivered in normal condition	16.4	100.00
Same burner, but gas passed at the same rate through vessel containing paraffin oil	11.7	71.34
Loss		28.66

The loss is greatest with flat flames, and with any flame the percentage loss increases as the flames become smaller. Thus with the same Argand as referred to above, burning gas at a low rate, and giving a light equal to 8½ candles with normal gas, the reduction in light was 48 per cent.

Vastly different is the effect when a gas flame is combined with a paraffin lamp flame in the manner shown in the annexed illustration—viz., with the gas-burner horizontal and the lamp-burner vertical. The gas flame striking across and being a little above the wick of the oil-burner, the issuing gas carries with it the vaporized oil, the result being the production of a powerful and very economical light. This arrangement is the invention of, and is patented by Mr. James Kidd, of St. Bride Street, London. In the careful trials I made with it, the power of the horizontal (so calling it) gas flame was first ascertained in three positions—viz., flame wholly *within* the terminal line of the photometer and wholly *beyond*, and with the centre of the flame coinciding. In the same way the power of the compound flame was



tested. Deducting the light due to gas alone, the remainder gave the increase due to the paraffin (this being the only way to arrive at a conclusion), and it was found that the light due to a gallon of paraffin oil was over 2300 candles, as compared with 900 candles realized from the side light of a good paraffin burner of about the same width of wick as that used with the gas; so that the lighting power of the oil was 2½ times greater when burned in this way in conjunction with coal gas than when burned by itself.

MR. I. A. CROOKENDEN, late Secretary of the Phoenix Gaslight and Coke Company, has been appointed to the Secretaryship of the Employers' Liability Assurance Corporation, Limited.

We hear from Messrs. J. E. and S. Spencer that during the past few weeks an order has been placed for 17 miles of 14-in. wrought-iron tubes in 14-ft. lengths, which is said to have been the largest order ever placed for large wrought-iron tubes, and as the weight is about 1200 tons, this would seem to be very probable. Owing to the short time in which delivery was required, the order was divided, and they state that they secured half of it—viz., 8½ miles—for their principals. It was at first contemplated coating them by Barff's rustless process; but the short time of delivery made it impossible, as so large a quantity would have necessitated special arrangements.

Parliamentary Intelligence.

HOUSE OF COMMONS.

WEDNESDAY, APRIL 27.

The South Metropolitan Gas Bill and the London Sea Water Supply Bill were referred to a Select Committee, consisting of Mr. Knight (Chairman), Mr. Jacob Bright, Mr. Fremantle, Mr. Hamar Bass, and Sir John Duckworth (Referee); to meet on Tuesday, May 3.

The Westbury-upon-Trym Gas Bills (Nos. 1 and 2) were referred to a Select Committee, consisting of Mr. A. Vivian (Chairman), Mr. Boord, Mr. A. Moore, Mr. A. Pease, and Mr. Bonham-Carter (Referee); to meet on Thursday, May 5.

MUNICIPAL BODIES AND THEIR *LOCUS STANDI* AGAINST GAS AND WATER BILLS.

THE PROPOSED ALTERATION OF THE STANDING ORDERS OF THE HOUSE OF COMMONS.

On Thursday last, Dr. LYON PLAYFAIR, Chairman of Committees of the House of Commons—with whom were Mr. PEMBERTON, M.P., and Mr. RICKARDS—received a deputation from Gas Companies and others interested in the proposed revision of the practice of the House in the matter of Gas and Water Bills dealing with capital. Mr. Stanhope, M.P. for Mid-Lincoln, had given notice of his intention last Friday to move the following new Standing Order:—"Any municipal, sanitary, or other authority whose district, or any part of whose district, is alleged to be injuriously affected by the provisions of any Bill relating to, or affecting the sale or supply of gas or water, or the raising of capital for any such purpose, shall be entitled to be heard upon their petition against such Bill;" and it was against this proposal that the deputation wished to be heard. The deputation was introduced by Col. W. T. MAKINS, M.P.; and among those present were Mr. W. Woodall, M.P., Mr. J. Orwell Phillips, Mr. W. King, of Liverpool, Mr. H. E. Brown, Mr. E. H. Thorman, and Mr. W. Livesey, Secretary of the Gas and Water Companies' Association.

Mr. W. H. MICHAEL, Q.C., in a luminous speech, stated the present practice of the Referees, and set forth the objections entertained by those responsible for the administration of Gas and Water Companies to the proposed Order. Commencing with the Public Health Act of 1875, and confining himself chiefly to gas matters, Mr. Michael showed how local authorities became interested, as a matter of public sanitation, in the affairs of the gas companies in their districts. He described how the permission to establish gas-works where no authorized company exists, came as a pendant to the critical attitude reserved for the local authorities, in the interests of the general body of ratepayers and gas consumers, with respect to existing gas companies. He then traced the progress of the practice of local governing boards acquiring gas undertakings, generally with a view to the relief of the rates out of the profits; and showed how easily any money required for extending such works is raised by the corporate body owning them. Returning to the immediate question, Mr. Michael indicated the method in which, by the operation of the sliding scale, all temptation to gas companies to inflate their capital is removed, while the periodical expenditure of fresh capital is rendered necessary for every incorporated company, for the reason that the Gas-Works Clauses Act of 1871—lately rendered identical in its range with the Act of 1847—compels gas companies to supply gas to all who may ask for it; and this, of course, involves the periodical extension of works. Mr. Michael proceeded to describe this continual extension, with the attendant raising and expenditure of capital, as a positive burden on gas companies, imposed in the public interest, instead of a simply selfish benefit to the old proprietors, who are thus compelled to share their hard-earned profits with all comers. He indicated some of the reasons why local authorities are led to oppose all Gas Bills whenever the opportunity is offered, particularizing the obvious motive of seeking to depreciate the property for the time, with the object of being able to acquire it on good terms for themselves. Mr. Michael also descanted on the hardship that would be inflicted on Parliamentary Committees by requiring them to decide over and over again the whole polity of a gas supply for any particular district, whenever the company might desire to raise the fresh auction capital rendered necessary by the compulsory supply of a populous and rising place. But, in the main, Mr. Michael's point lay in the unnecessary waste of money by both sides, to be ultimately drawn from the public, which would be caused by the frequent and heavy parliamentary contests that would in all probability be the result of allowing local authorities unlimited powers for opposing Gas Bills.

Dr. PLAYFAIR asked whether some modification of the terms of the motion might not be devised to meet the most urgent demands of the deputation.

Mr. MICHAEL expressed the opinion that nothing could be suggested whereby the objectionable word "capital" could be affected in the sense desired. To alter this part of the motion would be to strike out its sole principle.

Dr. PLAYFAIR observed that the proposed Order would receive the support of the Board of Trade, and therefore would be likely to pass, but it might be subject to modification.

Mr. PEMBERTON (Chairman of the Court of Referees) said that, having other private Bills—such as those relating to railways—in view, he would like to see the Order modified in some way, by permitting local authorities to be heard, but only in reference to the subject-matter of any particular Bill.

Dr. PLAYFAIR said he appreciated the cogency of Mr. Michael's argument, and thought public bodies should not have unlimited power to rake up general matters on a petition against a Bill for a certain limited and definite purpose, and agreed to the suggestion of Colonel Makins that Mr. Stanhope should be asked to postpone his motion from Friday last for a week, to enable the deputation to lay their views before the President of the Board of Trade.

The deputation, having thanked Dr. Playfair for his attention, then withdrew.

[Mr. Stanhope's motion now stands on the paper for Friday next.]

The present Manager of the Cowes Gas Company (Mr. T. Giles) is about to take charge of the Bridport Gas-Works; and Mr. T. Anderson, jun., of Bath, will succeed him at West Cowes. There were exactly 100 applications for the situation, which was advertised in these columns.

DETERMINING THE COLOUR OF WATER.—In regard to the description given in the JOURNAL of the 5th ult., of the method adopted by Drs. Odling and Meymott Tidy and Mr. Crookes to determine the colour of the waters upon which they report monthly to the Local Government Board, it may be stated that, in their report for the past month, they say: "The composition of the blue solution should be 5 grammes of pure crystallized sulphate of copper in 1 litre of distilled water, instead of 10 grammes as given last month."

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION, 1881.

PROGRESS MADE TO SATURDAY, APRIL 30.

Title of Bill.	Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Commons Bill	March 29	April 7		..
Alnwick " Gas Bill "	Commons	Jan. 27	Jan. 28	Feb. 2	March 8	March 28
Barrow-in-Furness Corporation Bill.	Lords	Jan. 27	Jan. 28	Feb. 7	April 5	April 28
Beverley " Water Bill "	Commons	Jan. 27	Jan. 28	Feb. 2	April 8	..
Bingley " Water and Improvement	Lords	Commons Bill	March 25	April 4	March 22	April 7
Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 11	March 24
Birkenhead Corporation (Gas and	Lords	Commons Bill	April 8	Feb. 7	March 24	April 7
Water) Bill	Commons	Jan. 31	Feb. 2	..	..	..
Bradford Water and Improvement	Lords	Commons Bill	April 8	Feb. 4	March 18	April 8
Bill	Commons	Jan. 27	Jan. 28	Feb. 25	..	..
Bray Township Bill	Lords	Feb. 18	Feb. 18	..	..	..
Brighton " and Hove Gas Bill . . .	Commons	Commons Bill	March 15	..	..	..
Cambridge University and Town	Lords	Jan. 27	Jan. 28	Feb. 14	March 8	March 14
Gas Bill	Commons	Commons Bill	March 11	March 21	March 22	March 25
Cheltenham Corporation Water Bill.	Lords	Jan. 27	Jan. 28	Feb. 7	March 1	March 10
Cleator Moor Local Board Bill " .	Commons	Jan. 27	Jan. 28	Feb. 2	April 5	..
Colne and Marsden Local Board Bill.	Lords	Commons Bill	Jan. 27	Feb. 7	March 15	April 25
Dudley " Gas Bill . "	Lords	Commons Bill	Jan. 28	Feb. 9	March 15	March 21
Dundalk Water Bill	Commons	Lords Bill.	March 28	..	..	..
Eastbourne Water Bill	Lords	Commons Bill	April 1	April 8	..	..
East London Water " Bill.	Commons	Feb. 2	Feb. 3	Feb. 15	March 22	March 31
Egremont Local Board Bill.	Lords	Jan. 28	Jan. 31	Put off for	six months	..
Fylde " Water Bill "	Commons	Commons Bill	April 5	Feb. 15	March 18	April 4
Goole " District Gas and Water	Lords	Commons Bill	Jan. 27	Feb. 8	March 7	March 11
Bill	Commons	Commons Bill	Jan. 28	March 14	..	..
Hexham Gas Bill	Lords	Commons Bill	Jan. 27	April 5	..	..
Holland " (Parts of) and Sutton	Commons	Commons Bill	Jan. 28	Feb. 2	March 11	April 4
Bridge Water Bill	Lords	Commons Bill	Jan. 27	Jan. 28	March 18	March 29
Hyde Gas Bill	Commons	Commons Bill	Jan. 28	Feb. 8	March 18	April 25
Irvine Burgh Bill	Lords	Commons Bill	Jan. 31	April 8	March 18	March 29
Kirkcaldy " and Dysart Water Bill	Commons	Commons Bill	Jan. 28	March 2	March 18	March 29
London " Sea Water Supply Bill . .	Lords	Commons Bill	Jan. 28	Feb. 7	March 22	March 31
Lower Thames Valley Main Sewer-	Lords	Commons Bill	Jan. 28	Feb. 14	March 25	April 5
age Board Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Matlock Water Bill	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Oban Burgh Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Paisley " Water Bill	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Reading " Corporation Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Richmond " Gas Bill "	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Ryton Local Board (Water) Bill . .	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Sevenoaks " Gas Bill "	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Sheffield " Water Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
South Metropolitan Gas Bill	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Stalybridge Extension and Improve-	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
ment Bill	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Stirling Water Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Westbury-upon-Trym Gas (No. 1)	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Westbury-upon-Trym Gas (No. 2)	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Bill	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
Westgate and Birchington Gas Bill.	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
Woking " Water and Gas Bill " . .	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..
" " " " " " " " " " " " " " " "	Lords	Commons Bill	Jan. 28	Feb. 7	April 1	..
" " " " " " " " " " " " " " " "	Commons	Commons Bill	Jan. 28	Feb. 7	April 1	..

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

TUESDAY, APRIL 26.

(Before Vice-Chancellor BACON.)

ATTORNEY-GENERAL V. BIRMINGHAM, TAME, AND REA DISTRICT DRAINAGE BOARD.

On the 16th of April, 1875, a perpetual injunction was granted to restrain the Council of the Borough of Birmingham from polluting the River Tame where it ran through the estate of Baron Norton, then Charles Bowyer Adderley, by sewage. The present defendants had, under the Public Health Act, 1875, purchased the outfall works from the Council of the borough, and were carrying on the works; and the plaintiff instituted the present action to make the decree of 1875 available against them. The defendants demurred on the ground that there was no subject of complaint against them, and that their drainage works were not alleged to cause any damage to the plaintiff's property.

Mr. HORTON SMITH, Q.C., and Mr. COZENS-HARDY argued for the demurrer. Mr. DAVEY, Q.C., and Mr. CARSON, who appeared for the plaintiff, were not heard.

The VICE-CHANCELLOR said the demurrer could not be sustained. The

Town Council had transferred their rights to the present plaintiff, and the statement of claim in this action averred that since such transfer the sewage of the borough of Birmingham had been drained into the River Tame, and the demurrer would, therefore, be disallowed. The defendants would be allowed a month to put in their defence.

BANKRUPTCY COURT.—WEDNESDAY, APRIL 27.

(Before Mr. MURRAY, Registrar.)

In re OUTHWAITE.

This debtor, John Henry Outthwaite, was described as a Contractor and Gas Engineer, of No. 17, Parliament Street, Westminster, and of Aldershot and Sandhurst. He has filed a petition for liquidation, estimating his liabilities, secured and unsecured, at £15,000, with assets £1000, irrespective of profits derivable from contracts.

Mr. W. R. PHILP, on behalf of the debtor, and with the concurrence of creditors for about £6000, applied for the appointment of Mr. John Hardcastle, of Victoria Square, Leeds, as receiver and manager of the business; and for an injunction to restrain actions. He explained that the debtor held Government contracts for the supply of gas to the camps at Aldershot and Sandhurst, and, unless the Court appointed some one to carry on the business, the troops might possibly be left in darkness.

The REGISTRAR granted the application.

WEST DERBY QUARTER SESSIONS.—THURSDAY, APRIL 21.
(Before the EARL OF DERBY, *Chairman*, and a *Bench of Magistrates*.)
THE ACCOUNTS OF THE ORMSKIRK GAS COMPANY.

Last week we reported an unsuccessful application to the Court of Quarter Sessions for the appointment of an Official Auditor of the Ormskirk Gas Company's accounts; the ground of the refusal being that one of the two applicants was not a gas ratepayer within the meaning of the Act. The question again came before the Court to-day.

Mr. SEGAR, as before, appeared for the petitioners (who in this case were Mr. J. Martlew, Mr. W. Newsham, and Mr. W. Riding); Mr. KENNEDY and Mr. G. W. DUNCAN for the Company.

Mr. SEGAR having opened the case, and stated the grounds of the application, called the following witnesses:—

Mr. Joseph Bradley, Solicitor to the petitioners, said he was a Shareholder in the Ormskirk Gaslight Company. He produced the old accounts of the Company for the past ten years, and also some amended accounts which had recently been made out. He had looked over the first batch of accounts, and there was not any separate statement of capital stock or any statement how the money had been spent with regard to the purchase of buildings or land. He had compared the old accounts with the form given in the schedule to the Gas-Works Clauses Act, 1871, and the accounts did not comply with it, and as a result of this non-compliance it was a fact that he could not ascertain what money had been spent in the purchase of a public-house or cottages. He went to see the Manager of the Company a few days after the general meeting in March last. He saw Mr. Martin and the books at the office.

Mr. SEGAR: Was there any purchase made by the Company, in 1874, of a public-house?

Witness: There was.

What was the price apparently paid for it?—£873 9s. 7d.

In 1878 was there a purchase of any land or premises and cottages?—Some houses and land for £619 9s.

In 1880 was there any purchase made?—The sum put down for it is £1075.

Do you know whether any of these cottages or any of the land have been in any way utilized for the manufacture of gas?—They have not; they are still there, and are let to tenants.

What have the Company spent recently on new works, which you got from the books of the Manager?—In 1875 they spent £539 14s. 9d. on capital account; in 1876, £344 8s. 5d.; in 1877, £95 4s. 2d.; in 1878, £1000 or thereabouts on a new gasholder; in 1879, 1880, and part of 1881, they spent £1334 on a new purifying-house and fittings.

The CHAIRMAN: All these sums are on capital?

Witness: On capital account. Besides, there is £227 in 1879, making £614 5s. 11d., which should have been spent out of capital only.

Mr. SEGAR: Are any of these items of expenditure specifically shown?

Witness: Not one.

In the Company's new accounts can you find the £6000 anywhere?—I cannot.

No additional capital has been called up for ten years, except £330 to get this? None, as disclosed by these accounts.

Will you turn to the balance-sheet in the old accounts for 1871, and tell me what is the gross amount appearing to be expended on capital account?—£11,405 1s. 10½d. up to that time.

In the same account what is the gross amount of capital called up?—£9948 12s. on share account.

Therefore the accounts show that the sum of £1456 9s. 10½d. had been paid on capital account from revenue up to that period?—From some source.

In the statement of accounts for the year ending December, 1880, what was the gross amount expended on capital account up to that time?—£14,700 0s. 2d.

What was the gross amount of capital called up at that time?—£10,278 12s. on share account, but there is a sum of £500 called debenture account. The Company have power to borrow £2000.

They have therefore spent £4421 8s. 2d. more than they have raised on capital account?—That is so.

The nominal capital of the Company is £20,000?—It is.

They are allowed to put by as a reserve fund 10 per cent. on this, which is £2000?—Yes.

Therefore it would appear that £2421 8s. 2d. has been spent, over and above the reserve fund, out of revenue?—Yes; in the old accounts there are two accounts (one called the depreciation fund account), and these amount to £3305 8s. 9d.; so that according to the Act of Parliament they are £1000 in excess there.

Has the quality of the gas been inferior in the district?—Yes; but it is better than it was.

Did you, on the 28th of March in this year, give notice to the Company, on behalf of some petitioners, that you intended to apply to Quarter Sessions for the appointment of an Accountant?—I did.

What is the present price of gas?—In my last account I was charged 4s. 9d. per 1000 feet, in January of this year.

Do you know whether the Company have reduced it or not?—They have.

What to?—I think it is 4s. 6d. per 1000 feet now.

Has there been in the Ormskirk district an Association called the Ormskirk Gas Consumers Defence Association?—It has been formed recently.

Do you know of your own knowledge that there are a large number of gas consumers desirous of having a Public Accountant appointed?

Mr. KENNEDY objected to this question, whereupon

Mr. SEGAR said he should be wasting the time of the Court were he to bring forward the whole of the persons who were dissatisfied.

The CHAIRMAN remarked that they knew there was a memorial. What Mr. Segar had to prove was that the Company had been putting money from revenue to capital, which would be illegal, even if there were no complaints.

Mr. KENNEDY (to witness): Before there is to be anything done in the way of reducing the gas-rate, 10 per cent. dividend is to be made up to the Shareholders from the commencement, is it not?

Witness: I have great doubts as to how far that will go back.

But you will say it is lawful that the amount of interest can be made up to 10 per cent. from the commencement of the undertaking?—I believe it is so.

You are aware that this 10 per cent. has never been made up in this case?—I know the Law Clerk has told me so, but of my own knowledge I do not know.

You know, I dare say, as you are so interested in this matter, that there has been a dividend declared of £1027 15s. 6d., and also a sum of £180, which makes up the 10 per cent. for the years 1866 and 1867?—All I know is that a dividend of 10 per cent. has been paid, and 2 per cent. added.

Do you know that the balance of £2596 4s. 7d. is exactly the sum which will make up the 10 per cent. dividend for the years at present in deficiency?—That I do not know.

I believe the whole of these accounts have been at your service, with all explanations, for at least a month?—The accounts were delivered to

the Shareholders on Saturday last. They passed the seal of the Company on Saturday last.

The accounts are not an alteration of figures, but an alteration of form?—I have not compared them.

You are aware, are you not, that section 31 of the 1871 Act prescribes a reserve fund?—One of the sections does.

You said there were certain sums spent in the purchase of buildings in 1875 and 1876, which do not appear in the accounts?—Yes.

You say you do know the old accounts?—Yes.

Will you kindly take the old accounts, and look at the sum of £1485 under heading of property purchased?—That is not under the heading of capital account.

I thought you said the accounts did not show it.

The CHAIRMAN: He said on the capital account.

Witness: There is a heading which says "property purchased," but that is not in accordance with the Act.

Mr. KENNEDY: The capital has been half called up. The result of calling up more capital would have been, would it not, that a larger amount of profit would have been required to pay the same rate of interest?

Witness: There would have been more persons entitled to a dividend.

You have spoken of the purchase of a public-house?—I say that the public-house is not necessary for the purpose of the works.

You are not aware that actually a portion of it has been used?—I do not know; a small portion may have been.

Have you made any inquiry from any of the officers of the Company as to the purposes for which these purchases were made?—I have not. I am a Shareholder, and know the situation of the premises very well.

Were you aware that so necessary was it to have this property that the Company had for years been renting a portion of it?—I am not aware.

Did you ever ask?—I did not.

All the purchases, so far as the land is concerned, appear in the accounts, except those for this year?—I cannot say it is not so, but I cannot say it is so.

You do not object, do you, to their buying a gasholder?—If it be bought out of revenue, I do. It is not my personal objection. I am not speaking on my own behalf, but on behalf of my clients.

The other works were strictly in connection with the gas making?—I suppose they were, but there are some of the items I cannot answer for; for instance, the purifying-house and fittings. The Manager told me there had been a certain amount spent upon new works, but I should like to verify this by an investigation.

Assuming they were spent out of revenue, what then?—Capital should have been called up for the purpose. It is governed by the Act of Parliament, and the Act says that all matters relating to capital shall be paid out of capital account.

What section do you refer to?—It is my impression that the Act of Parliament requires it, but I cannot just now remember the section.

Cannot you tell me what statute you refer to?

Mr. SEGAR said this was a question of law, and unfortunately Mr. Bradley had not the opportunity to cross-examine Mr. Kennedy.

Witness, in further cross-examination, said he was of opinion that the supply of gas had not considerably increased. He considered the question whether the Company had been economical was a matter for investigation. He was saying that he believed the new accounts were prepared by Messrs. Harmood Banner and Son, but

Mr. KENNEDY corrected him, and said that Mr. Martin had been working at them night and day to have them in accordance with the Act of Parliament, and it was right to state, in justice to Mr. Martin, that it did him great credit to have remodelled ten years' balance-sheets in the short period of three weeks. Messrs. Banner and Son were merely called in to test them.

Mr. W. Newsham, one of the petitioners, said he considered it desirable that an inquiry should take place to see if the price of gas could not be lowered.

Mr. Nicholson, of the firm of Messrs. Banner and Son, said there was no doubt that money derived from revenue had been spent on capital account, and (in reply to Mr. Kennedy) that the sum over and above the dividend for last year would just make up the dividend to 10 per cent. for those years in which this amount was not paid.

Mr. KENNEDY then reviewed the evidence, and argued that what the Company had done was for the benefit of the consumers, as, if they had called up more capital, they would have been compelled to raise the price of gas, so as to pay the dividend of 10 per cent upon it.

In reply to the Chairman,

Mr. SEGAR said the powers of the Accountant would be to have access to the books, and make a report to the Court at some future time; and the Court would then say whether the price of gas was too high, and, if so, make an order for its reduction.

The Bench retired, and on their return into Court,

The CHAIRMAN said they had considered the question, and were unanimously of opinion that no sufficient ground had been made out for the inquiry, and so they dismissed the petition.

Mr. DUNCAN applied for costs.

The CHAIRMAN said it would be better that both sides should pay their own costs.

Miscellaneous News.

JOINT-STOCK GAS AND WATER COMPANIES, 1878-80.

There has recently been printed a return to an Order of the House of Commons—moved for by Mr. Evelyn Ashley, on Aug. 20 last year—giving a list of all the Joint-Stock Companies formed and registered under the Companies Act, 1862, during the period from June 1, 1878, to May 31, 1880. This return is in continuation of a similar one moved for in the session of 1878.

In the later return, with which only we propose to deal, there were in the twelve months ending May, 1879, 886 companies registered with a total nominal capital of £83,349,187, and 36 companies registered without nominal capital. The corresponding figures for the next year, 1879-80, are—1133 companies, with a capital of £123,831,032; and 38 companies without nominal capital. Since the commencement of the Act in question (Oct. 3, 1862), the total nominal capital of the 15,897 companies that have been registered is stated at £1,855,777,667.

In regard to the companies with which our readers are interested (omitting entirely the numerous electric light companies), we append a list of those relating to gas and water undertakings, premising with the statement that the particulars in the return are tabulated under the following heads:—Name of company; objects; place of business; date of registration; number of persons who signed the Memorandum of Association; total number of shares taken by subscribers to Memorandum of Association; nominal capital; number of shares into which it is divided; number of shares taken; amount of calls made on each share; total

amount of calls received; number of shareholders in company at date of last return; whether still in operation or being wound up.

ALBO-CARRON LIGHT COMPANY.—Registered July 25, 1878, for carrying on the business of gas engineers, and fitting and maintaining any appliances necessary for supplying illumination. The capital was fixed at £24,000, in £50 shares, of which the subscribers took one each. No returns have been furnished as to the position of the Company, which is marked as "supposed to be still in operation."

ALEXANDRIA WATER COMPANY.—Registered Feb. 28, 1879, with the object of supplying the City of Alexandria, in Egypt, with water. The subscribers took 560 of the 17,500 £20 shares constituting the capital. There are now 180 shareholders, who have contributed £200,000 in all.

ARMAGH GASLIGHT COMPANY.—Formed by Deed of Settlement, the registration being dated Feb. 18, 1879, for supplying the town of Armagh, and the suburbs and liberties thereof, with gas. There are 54 shareholders, who have taken up 10,200 of the 15,400 £1 shares.

BANCHORY GASLIGHT COMPANY.—Registered Dec. 13, 1879, with the object of manufacturing gas and furnishing electric light in Banchory, Kincardineshire. There were eight subscribers to the Memorandum of Association, and they took 247 of the £1 shares, of which there are to be 2400. The amount at present called up on the 1765 subscribed shares is 17s. 6d. each, or £1644 7s. 6d. in all.

BARMOUTH DISTRICT GASLIGHT AND COKE COMPANY.—Registered Nov. 18, 1879, for the making and selling of gas, coke, meters, pipes, fittings, and other apparatus connected with the use of gas. The capital is divided into 1400 shares of £5 each, of which the originators took one apiece. No further returns are made.

BELGRANO (BUENOS AYRES) GAS COMPANY.—Registered Sept. 4, 1878, with the object of supplying with gas the town of Belgrano, in the province of Buenos Ayres, Argentine Confederation. The capital of £100,000 has been more than half subscribed by 15 shareholders; the paid-up capital being £65,490.

BOVEY TRACEY GAS COMPANY.—Registered Aug. 28, 1879. Capital £2000, in £5 shares, 72 of which are taken by 32 subscribers.

BUCKHAVEN GASLIGHT COMPANY.—Registered Jan. 30, 1880. Capital £2500, in £1 shares, of which the subscribers to the Memorandum of Association took 55. No further returns.

CARLETON WATER-WORKS COMPANY.—Formed March 22, 1880, for supplying the village of Carleton, near Skipton, Yorks, with water. The originators subscribed for 75 of the £2 shares in the capital of £2000; but there is no return of further proceedings.

CORSTORPHINE GAS COMPANY.—Registered Aug. 29, 1879, with a capital of £1700 in as many shares, all issued, and on which 10s. apiece has been called up. There are now 38 shareholders, the original 11 taking 995 of the shares.

DORCHESTER GASLIGHT AND COKE COMPANY.—Formed before the passing of the Companies Act, 1862, and subsequently registered (Dec. 13, 1878), as a limited company, with a nominal capital of £19,500, and a paid-up capital of £17,000, held by 93 shareholders.

DOWSON ECONOMIC GAS COMPANY.—Registered April 21, 1880, with the object of acquiring and working patents for improvements in apparatus for the manufacture of gas. The original subscribers took one each (7 in all) of the £50 shares into which the capital of £8000 was divided. There are no further returns; but the Company is "supposed to be still in operation."

DUNGANNON GAS AND LIGHT COMPANY.—Registered July 17, 1879. Capital £6000, in 600 shares. These are held by 20 shareholders, who have paid up £4200.

FALKIRK LIGHTING COMPANY.—Formed, "to carry on gas-works," on Jan. 6, 1879, with a nominal capital of £12,000, three-quarters of which has been subscribed, and two-thirds paid up by the original 7 subscribers, who are still the only shareholders.

FRANZINI PATENT GLOBE REFLECTOR AND LIGHTING COMPANY.—Registered March 28, 1879 (and at date of return, "winding up"), with the object of acquiring and working certain patents for an improved apparatus for lighting purposes. The capital was to be £50,000, in £5 shares, and the only particulars given are that, of these, the originators subscribed for 106.

GARSTANG GAS COMPANY.—For supplying gas to Garstang and other places in Lancashire, was registered Nov. 7, 1879, with a nominal capital of £2000, divided into 400 shares; the subscribers to the Memorandum of Association taking 110.

GOUROCK GASLIGHT COMPANY.—A registration (March 18, 1879) of an old-established Company for the manufacture of coal gas in Gourcock, Renfrewshire. The 52 shareholders are returned as possessing 900 of the 3000 £2 shares constituting the capital.

HALSTEAD GAS COMPANY.—Registered Jan. 2, 1880, with a nominal capital of £10,000, for the purpose of manufacturing and supplying gas to the town of Halstead, in Essex, and disposing of the residual products. The signatories to the Memorandum of Association are subscribers for the whole of the capital.

HARRISON'S PATENT GASLIGHT IMPROVER COMPANY.—Formed on May 10, 1880, with the object of acquiring and working certain inventions for improved attachments to fish-tail and other gas-burners. The original 7 were the only shareholders at the date of the return; and they had subscribed, on their 31 shares, £515 out of a total nominal capital of £2000 in £20 shares.

HAVANT GAS COMPANY.—A registration on Feb. 26, 1879, of a Company already supplying Havant, in Hampshire, with gas. The capital of £3000 is all subscribed, and is held by 30 shareholders.

HEXHAM GASLIGHT COMPANY.—With the object of acquiring the property and undertaking of the Hexham Gaslight Company, and manufacturing and selling gas, electricity, or other means for providing light or heat, this Company was registered Dec. 2, 1878, with a capital of £15,000, in £10 shares; 810 of which have been taken, and the nominal amount fully paid up. The shares are held by 43 persons.

HUELVA GAS COMPANY.—As gas manufacturers at Huelva, Spain, this Company was registered Sept. 13, 1878. The nominal capital of £15,000 is more than half subscribed, 963 of the 1500 shares being taken, though only £5315 has been paid up by the 26 shareholders.

IMPERIAL CONTINENTAL WATER CORPORATION.—Registered Aug. 6, 1879, for the purpose of supplying water and executing water-works, docks, canals, harbour works, &c., in the United Kingdom, or on the Continent of Europe. The capital of £1,000,000, in £20 shares, was, at the date of the return, in a very backward state as to being paid up. The total receipts from calls, at the rate of £2 10s. per share, had realized only £485; there being only 19 shareholders with 194 shares in all.

INSCH NEW GASLIGHT COMPANY.—Registered July 17, 1879, to supply the village of Insch, Aberdeenshire, with gas. Nominal capital £501, in 394 shares, 65 of which were taken by the nine subscribers to the Memorandum of Association.

KIRKHAM, HULETT, AND CHANDLER.—The Company working under this title was registered Oct. 7, 1879, with the object of acquiring and carrying on the business of Kirkham, Hulett, and Chandler, of 21, Abingdon Street, Westminster, patentees of apparatus, machines, and instruments

used in the manufacture or purification of gas and other vapours. The capital of £80,000, in £20 shares, was all held by the 12 shareholders at the date of the return.

LONDON SULPHUR COMPANY.—Registered Dec. 29, 1879, for the purpose of acquiring the business and property of the St. George's Sulphur Company, Limited, and making, preparing, extracting, refining, and dealing in sulphur and sulphur compounds. There are 27 shareholders, with 2257 shares. Of this number, however, 1800 are vendors' shares, and are consequently considered as fully paid up; £3 per share being paid on the remainder.

MICKLEOVER AND ETWALL GASLIGHT AND COKE COMPANY.—Formed Oct. 1, 1879, to supply the villages of Mickleover and Etwall, in Derbyshire, with gas, coke, and other kindred materials. All of the 600 £10 shares constituting the nominal capital of the Company have been subscribed by the existing 43 shareholders; and £3 per share has been paid up.

MONTE VIDEO WATER-WORKS COMPANY.—Registered May 6, 1879, with the object of acquiring the property known as the Monte Videan Water-Works, and the privilege of supplying the City of Monte Video with water, &c. The capital consists of 20,000 shares of £20 each; 17,510 of which have been fully paid up, by the 13 subscribers at the date of the return.

MOSCOW METROPOLITAN GAS COMPANY.—With the object of supplying the City of Moscow with gas, this Company was registered Nov. 10, 1879, with a nominal capital of £550,000, divided into 27,500 shares, all of which have been fully paid up by 18 shareholders.

NEWHAVEN GAS AND COKE COMPANY.—A registration, dated Nov. 13, 1878, of a previously-formed concern. Of the 1000 £10 shares comprised in the nominal capital, 350 have been taken by 10 persons and these have been fully paid up.

NEW IVYBRIDGE GAS CONSUMERS' COMPANY.—Registered, with a nominal capital of £5000, on Sept. 10, 1878. The eight subscribers to the Memorandum of Association took 220 shares (£5 each); but there are no further particulars in regard to the Company.

NEWTOWN AND LLANLWCHAIARN GAS AND COKE COMPANY.—This Company, for supplying gas in Newtown and elsewhere in Montgomery, was registered Aug. 20, 1879. The capital of £15,000 was divided into £10 shares, of which the original subscribers took 864.

OGMORE GAS AND WATER COMPANY.—Registered Sept. 26, 1878, for supplying the villages of Nantymoel and Tynewydd, and the parishes of Llandyfodwg and Llangenor, with gas and water. The signatories to the Memorandum of Association took 46 of the 200 shares (£10 each) into which the capital was divided.

ONGAR GASLIGHT, COAL, AND COKE COMPANY.—Formed (Jan. 17, 1880) for acquiring gas-works and apparatus, and supplying Ongar, in Essex, and precincts, with gas, coals, and coke. Only 97 of the 600 £5 shares were taken by the originators; and no information is given as to the further progress of the undertaking.

PATENT MAGNETIC WATER-METER COMPANY.—Registered on Feb. 16, 1880, for acquiring certain patents, and manufacturing apparatus for measuring water and other liquids. The seven originators, who are stated to have subscribed for 303 shares, have added only one shareholder to the list; the total number of shares now taken being 353 (out of a total of 2000 at £5 each), and half of the nominal amount being said to have been called up on these shares. The "total amount of calls received" is, however, only put down at £25!

PRIORS MARSTON WATER COMPANY.—Registered May 12, 1879, to supply water to Priors Marston, in Warwickshire. The capital is fixed at £500, in £2 shares, 54 of which have been taken. A call of 5s. per share (or £13 10s.) was the amount of receipts at the date of the return.

PURTON GAS COMPANY.—Registered March 6, 1880, with the object of supplying the town of Purton, in Wiltshire, with gas, and dealing in coal, coke, lime, and the residual products arising from the manufacture of gas. The subscribers to the Memorandum of Association are said to have taken 138 of the 400 shares (£5 each) fixed as the nominal capital of the Company; but no further particulars are given.

QUAKER'S YARD GAS AND WATER COMPANY.—Formed Sept. 20, 1878, to acquire land and premises, &c., for carrying on the businesses of a Gas and Water Company in Glamorganshire. All the information in the return is that the 10 originators took 122 shares of £10 each, the capital being fixed at £15,000.

ST. IVES (HUNTS) GAS COMPANY.—The registered office of this Company on Aug. 29, 1878, was in Leicester; and there were at the date of the return 60 proprietors, holding £7560 worth of shares out of the £10,000 of nominal capital.

ST. JOHN'S GAS COMPANY.—Registered July 18, 1879, with the object of manufacturing and supplying gas at St. John's, in the island of Porto Rico, and dealing in coal, coke, tar, and other products arising from the manufacture of gas. The capital is fixed at £35,000, in £10 shares, of which only 7 have been taken by the originators. The whole amount of these shares has been called up, and represents the capital of the Company at the date of the return (£70).

SHELF WATER-WORKS COMPANY.—Formed (Sept. 11, 1878) to supply Shelf, Yorkshire, with water. The whole of the 3000 £1 shares have been taken, and half the nominal amount paid up, by 135 persons.

STAVELEY GASLIGHT AND COKE COMPANY.—A registration (on Jan. 1, 1880) of a Company formed by Deed of Settlement, for the making and vending of gas, coke, and other residual products at Staveley, in Derbyshire. The total nominal capital is £6000—viz., 100 shares of £20, and 400 of £10. Of the latter class 300 have been taken up by 33 shareholders, who have paid £2400 in all—£10 each on half the subscribed shares, and £6 on the remainder.

THIRSK DISTRICT WATER COMPANY.—Registered Dec. 20, 1878, with the object of supplying the townships of Bolthby, Files Kirk, Thirsk, Sowerby, and Carlton Miniott with water. There are 80 shareholders, who have paid £4574—£3 each on 1674 shares out of a total of 3200, which being of the nominal value of £5 each, makes the total capital of the Company £16,000.

THURSO NEW GAS COMPANY.—The date of registration of this Company was Nov. 19, 1879, with a nominal capital of £15,000 in £10 shares. The 16 registered shareholders had subscribed £1910 (if the 150 vendors' shares, that are considered as fully paid up, are counted), £2 apiece having been paid on the 243 ordinary shares, which alone are taken of the 1350 offered.

TISBURY GAS COMPANY.—Registered Jan. 21, 1880, with the object of supplying gas to Tisbury, in Wiltshire, and of selling coal, coke, lime, peat, oil, &c. Only £85 (including £45 paid in advance) has been received from calls on 98 shares taken by 12 persons. There were 400 shares of the nominal value of £5 each to make up a capital of £2000.

TRAWDEN GAS AND WATER COMPANY.—Formed Oct. 2, 1878, to supply the township of Trawden, Lancs, with gas. Capital £2000, in £1 shares, of which 16s. per share has been called up, realizing, on the 686 shares taken by 36 persons, £513 5s.

VIENNA (WEST) WATER-WORKS COMPANY.—Established Aug. 13, 1879, to provide water-works for the supply of the western side of the City of Vienna. There were only 8 shareholders at the date of the return, who

had subscribed £20,000 out of the nominal capital of £400,000 in £20 shares.

WATH-UPON-DEARNE GAS AND LIGHTING COMPANY.—Registered Sept. 13, 1879, with the object of taking over the gas-works, land, &c., of the Wath-upon-Dearne Gas and Coke Company, and manufacturing and selling gas or other illuminating agent, coke, coal tar, pitch, asphaltum, and other residual products. The only particulars given are that the capital is £20,000, in £20 shares, of which the subscribers to the Memorandum of Association took 74.

THE MELBOURNE INTERNATIONAL EXHIBITION.
JURORS' AWARDS.

The *Melbourne Argus* for the 14th of March contains a list of the Jurors' awards in, among others, the sections of "Mining and Metallurgy," and "Heating and Lighting." Of the British exhibits in which our readers would be specially interested, there is only one mentioned in the former section, viz.—

RUSTLESS IRON.—*First Order of Merit.*—Rustless and General Iron Company (James E. and Samuel Spencer), London.

In the section of "Heating and Lighting" there are the following mentions:—

CARBURETTED GAS.—*Second Order of Merit.*—H. L. Müller, Birmingham.

GAS-METER TESTING APPARATUS AND DRY METERS.—*First Order of Merit.*—George Glover and Co., London.

WET AND DRY GAS-METERS.—*First Order of Merit.*—W. and B. Cowan, Edinburgh.

PHOTOMETERS.—*First Order of Merit.*—W. Sugg, Westminster.

IMPROVED GAS-BURNERS AND LAMPS FOR STREET LIGHTING.—*First Order of Merit.*—W. Sugg, Westminster.

GAS, CENTRE, AND OTHER VALVES, AND PLANED JOINTS FOR PURIFIERS.—*First Order of Merit.*—C. and W. Walker, London.

FIRE-CLAY GOODS.—*First Order of Merit.*—J. Dunnachie, Glasgow; Harper, Moores, and Co., Stourbridge; J. Cowen and Co., Blaydon-on-Tyne. *Second Order of Merit.*—G. K. Harrison. *Third Order of Merit.*—J. Hall and Co., Stourbridge.

THE PUBLIC LIGHTING OF DUBLIN.

A NOVEL PROPOSAL BY THE GAS COMPANY.

A Special Meeting of the Dublin Corporation was held on Monday last week—the Right Hon. the LORD MAYOR presiding—at which the following letter from Mr. W. F. Cotton, the Secretary and Manager of the Alliance and Dublin Consumers' Gas Company, was read:—

My Lord,—In view of the experiment being carried out in London and other places with the improved systems of public lighting by gas and electricity, I have been directed by my Board to state that they are prepared to give the citizens an opportunity of judging of the relative merits and costs of both systems, and to carry out that object they will undertake to light Sackville Street, the Bridge, Westmoreland Street, College Green, and some other places; the costs of such experiments to be borne by the Company, the Corporation undertaking to provide a site for the engine and apparatus required for electric lighting; the Company undertaking to place under the control of the Corporation the whole of the electric apparatus during the experiments; the Corporation to employ whatever staff may be required to carry out the experiments with electric light, and the Company bearing the whole expenditure incidental thereto.

My Board have been informed that, both as regards cost and effect, the new system of lighting by gas is superior to that of electricity; but in order that the citizens of Dublin may have an opportunity of judging for themselves, they have determined to carry out these experiments, and will feel much obliged if you will bring this letter under the consideration of the Council at their next meeting.

(Signed) W. F. COTTON, Secretary.

Sir JOHN BARRINGTON said the offer of the Gas Company was a very spirited one; and he moved that it be referred to No. 1 Committee.

The motion having been seconded,

Mr. MAYNE said they should not be too hasty to express their gratitude to the Company for their offer in this matter. He was a member of a Committee of the Corporation who, whenever they made any request of the Company which would cost very much less, were always met with a flat refusal. They asked them to deal with the Committee that had to do with gas in a spirit which they believed would be more reasonable to the citizens. This was in consequence of the monopoly the Company enjoyed. It should not be forgotten that important experiments were made in England, and that they were being made by Companies interested in the success of electric lighting. Now, making these experiments and offering so liberally to defray expenses, he did not mean to say it was the object of the Gas Company to saddle Dublin with a feeling or idea against this mode of lighting, or that it was an attempt to prove that electric light was not a success. If the Corporation waited a little longer they would be able to see and judge of the experiments that were being properly carried out in London. The Corporation of London were initiating comparisons that would furnish data for the three kingdoms. One sentence in the letter was very suggestive—the Company said they were anxious to give the citizens an opportunity of judging of this, but they themselves thought gas the better. This looked particularly as if they were anxious to make the experiments in order that gas might be glorified. He believed that the difficulty of domestic lighting had been solved, and the Council should be very cautious what step they took in this matter.

Mr. McEvoy thought the letter should be referred to No. 1 Committee.

Mr. LYONS moved an amendment, that the letter be marked "read." He thought the veil was too thin to hide from the members the fact that these experiments were being proposed simply to show the inferiority of the electric light as compared with gas; and the parties getting up the experiments were clearly interested in proving that this was so. He did not think the time had come for the experiments, and in any case it was clearly the duty of the Corporation to see that the experiments should be placed in the hands of disinterested parties.

Mr. JOHNSTONE seconded the amendment.

Mr. KENNEDY considered it was rather ungenerous to characterize the letter as Mr. Mayne had done. He thought it only fair to say this, although he was not a Shareholder in the Gas Company.

Alderman TARPEY said the offer had been honestly made to the Corporation, and it was for them to say how they would receive it.

Mr. HODGSON said they were much indebted to Mr. Mayne for the assistance he had rendered in connection with the Committee who had had charge of the gas question. It was very much to be regretted that the Corporation did not take the supply into their own hands, for opposition was very desirable. He did not see why they should not try these electric lighting experiments themselves.

Mr. DAWSON said he would be for gladly accepting the proposition of the Gas Company, but with certain conditions. They should, however, see that the Corporation had unfettered control in the matter—they should have the selection of the apparatus. There were trials being made in England not as between gas and electricity, but between different systems of electricity. They should therefore accept the offer with this modification: They would not, of course, object to the expenses being paid, but they should, after mature consideration, select the very best apparatus

and appliances, and then the Corporation could fairly judge of the advantages of electric lighting.

The LORD MAYOR said the subject was really one on which, as it came up in the form of a letter, there should not be any discussion. It could only be referred to a Committee. He himself was of opinion that it should be sent to a Committee of the Whole House.

The amendment was then put, and on a division there voted for it—12; against—14. The amendment was therefore declared lost, and the original resolution was carried.

Alderman COCHRANE said there would be little use referring it to No. 1 Committee, for the members were nearly all Shareholders in the Gas Company. He thought it should be referred to a Committee of the Whole House.

The suggestion was agreed to, and the Corporation proceeded with other business.

SALES OF GAS AND WATER SHARES.

On Thursday, the 21st ult., Messrs. Kidwell and Son sold by auction, at Chatham, the following gas and water shares:—One fully-paid £50 share in the Rochester Gas Company, entitled to a dividend of 10 per cent., at £100; one ditto, at £101; twelve £12 10s. shares, bearing 7 per cent. dividend, at £16 17s. 6d. per share; eleven £3 6s. 8d. shares, at £4 15s. per share; seven £8 10s. (10 per cent.) shares, at £17 5s., and five ditto, at £17 per share; two shares in the Chatham Water Company, at £10 10s. per share.

Last Tuesday, Messrs. Smith and Goldsmith sold by auction, at Gosport, 71 fully paid £25 shares in the Gosport Gas Company. The dividend paid by the Company last year was at the rate of 9 per cent. per annum, and, with the prospect of an increase to 10 per cent. for the current year, there was a very good sale. The shares were put up in 23 lots, and were all sold at £35 per share.

On Wednesday last, Mr. H. Morris (Messrs. Southerden, Morris, and Burtenshaw) sold by auction, at Lewes, a number of shares in the Lewes Gas and Water Companies. The Gas Company's stock was put up in four lots, each representing £40 worth of stock, and realized £54, £54 10s., £55, and £55 10s. Two original £25 shares in the Lewes Water Company sold for £100, and two others for £105; while single shares fetched £51, £51 10s., and £52 each. Seven lots of new £25 shares (£20 paid) were taken in couples at £65, £65 10s., and £66 per lot. Some preference stock (£70 worth) was, on the same occasion, sold for £89.

NICHEROY (BRAZIL) GAS COMPANY, LIMITED.

The Thirteenth Annual General Meeting of this Company was held at the Offices, Great Winchester Street, E.C., on Friday last—Mr. H. L. MICCOLLS in the chair.

The SECRETARY (Mr. W. W. Wright) having read the notice convening the meeting, the following report and accounts were presented:—

The Directors submit to the Shareholders their thirteenth annual report with balance-sheet and statement of accounts.

The property of the Company at Nictheroy is in good condition, and in a satisfactory state of efficiency, and the works have been carefully and economically administered. An order has been given by the Provincial Government for 51 new public lamps, which when completed will make the total number 1120, and a still further increase is expected.

It will be remembered that in the accounts for 1879 a large amount was brought forward from 1878, the average dividend of those two years being only 4 per cent. per annum. The present results, after writing off £1000, as advised by your Auditors, to reserve, and £250 to the sinking fund for debentures, will admit of the payment of a dividend of 4½ per cent. for the year. The revenue shows a balance of £3636 19s. 9d., out of which an interim dividend of 2½ per cent. was paid in October last, and the Directors recommend a further dividend of 2 per cent., free of income-tax, leaving £293 2s. 10d. to be carried forward.

Mr. Martineau is the retiring Director, and, being eligible, offers himself for re-election. The Auditors (Messrs. Price, Waterhouse, and Co.) retire, and offer themselves for re-election.

Dr. Revenue Account, for the Year ending Dec. 31, 1880.		Cr.	
Manufacture of gas—		Gas supplied—	
Coals carbonized	£3,683 11 5	Public lamps	\$10,708 4 7
Purifying materials	101 13 0	Less fines	3 11 7
Salaries and wages	1,886 2 5		\$10,704 13 0
Materials for repair and maintenance of works and plant	597 1 0	Public buildings	337 8 1
Distribution of gas—		Private consumers	3,525 0 9
Salaries and wages	564 10 3		\$14,567 1 10
Materials for repair, maintenance, and renewal of mains and service-pipes	35 11 6	Residual products	977 16 7
Lighting and repairing public lamps	1,252 17 11	Fittings, &c.	61 6 4
Management—		Meter-rent	5 16 9
Directors' remuneration	500 0 0	Transfer fees, &c.	2 14 0
Agency in Brazil	431 9 8		
Collection	237 19 8		
Office expenses (England and Brazil)	385 13 3		
General expenses (England and Brazil)	51 1 9		
Auditors	21 0 0		
Honorarium to Concessionaire, pursuant to arbitration award	250 0 0		
Taxes (England and Brazil)	203 12 2		
Fire insurance fund	100 0 0		
Bad debts and allowances	98 18 8		
Sinking fund to pay off debentures	250 0 0		
Interest on debentures	273 0 0		
Interest	28 0 7		
Amount carried to reserve for depreciation and cost of concession	1,000 0 0		
Loss on exchange	25 12 6		
Balance, being profit for the year	3,636 19 9		
	£15,614 15 6		\$15,614 15 6
Interim dividend, 1880	£2 123 3 5	Balance brought down	\$3,636 19 9
Balance of revenue, Dec. 31, 1880	1,901 13 7	Surplus of revenue, 1879	387 17 3
	£4,024 17 0		\$4,024 17 0

The CHAIRMAN, in moving the adoption of the report, said that on the whole he thought in the past year the Company's business had been very fair. Though it was not quite equal to what had been anticipated, there were some points in favour of it which he thought the Shareholders would approve. The bad debts had been reduced to almost nothing, and the fines, which in previous years were very heavy, were now reduced to a minimum. This was very satisfactory as regarded the management on the other side. The consumption of gas was a little reduced as compared with the previous year, but this had been caused by their having to cut off the supply of gas from certain private consumers who did not pay, and whom it was consequently better to be without. However, the Directors looked forward to an increase in the private lighting, as their Manager informed them that he was doing all in his power to get the houses which had been cut off put in communication again under good security. The Shareholders would notice by the

accounts that a very fair amount had been placed to the reserve fund. This had been strongly urged on the Directors by the Company's Auditors, as making them secure against any loss which might arise at the conclusion of the concession. Had it not been for this, they had hoped to pay a larger dividend. They, however, fully concurred in the views of the Auditors, and consequently had placed £1000 to the reserve fund, besides the amount set aside for the redemption of the debentures. Owing to this provision, they were enabled to pay this year a dividend of only 4½ per cent.; but when the Shareholders looked at what was done last year, the business really showed more favourably than at that time. Last year's dividend, although 6 per cent., was made out of two years' working; and when it was considered that the amount then set aside was £1500, whereas on the present occasion it was £1250, and they could pay 4½ per cent., he thought the Shareholders must agree with the Directors that the business had rather improved than otherwise—that was to say, the business of the year 1879 was but a 4 per cent. business, while last year it was one of 4½ per cent. In the year at present under consideration, too, the Company had had some serious difficulties to contend with. Trade in the Brazils had not been good, and the exchange had been against them. In 1879 they made by the exchange a gain of £341, while last year they lost £25, making a difference against that year of about £360. However, this was a question which must always stand with them, and it was scarcely right to look upon it as a profit; but at any rate, as a question of comparison, it did speak well for the management of the past year. He hoped the Directors would have a better business to report upon hereafter. The Manager wrote them that he had applications to supply gas to several new buildings, and he hoped to increase them considerably during the current year. That their Manager was a good man was proved, for on taking an average of their production of gas it would be observed that he had made 11,740 cubic feet per ton of coal for the year. He (the Chairman) did not know of any foreign-managed gas company that could or did exceed this. He would be most happy to explain any of the figures in the accounts, and he trusted that when the Directors met the Shareholders in a future year their report would exhibit an improvement, and that they would be able to propose a better dividend than it was in their power to offer on this occasion. At any rate he could say that the business was safely managed, and that the guarantee which their reserve fund now offered must be very satisfactory to the Shareholders, showing that their business was carried on upon right principles.

Mr. E. GORTO seconded the motion. The Chairman had, he remarked, touched on every point to which it was necessary to draw the attention of the Shareholders, and he endorsed everything the Chairman had said.

Mr. DODGSON thought it would have been better for the Directors to have made the interim dividend 2 per cent., and the final dividend 2½ per cent. He said he did not think the interim dividend should exceed that paid in the second half of the year; but perhaps the Directors had been disappointed as to the latter half of the year.

The CHAIRMAN stated that at the time the interim dividend was paid the accounts looked very favourable. The exchange was in the Company's favour, being nearly 23, whereas it had now fallen to 21. The Directors quite expected to be able to make the dividend for the year 5 per cent. or more. Replying to other questions by Mr. Dodgson, he stated that the concession would terminate in August, 1889. The population of Nitcheroy was slightly increasing. It was quite true that at the outset of the Company they were unfortunate in their local management, there being no one there to teach people how to use gas. They had really now a very good man, and he was most anxious to do everything in his power to extend the Company's business. He understood the Brazilians thoroughly, and was extremely popular.

Mr. DODGSON remarked that at Hong Kong the proportion of private lighting was five-sevenths against two-sevenths of the public lighting. In the case of this Company the proportion of private to public lighting was only one-third.

Mr. C. NEATE replied that the reason why the private lighting had not succeeded as the Directors had hoped was on account of the class of residents in Nitcheroy not altering to the extent that had been anticipated. There was almost a certainty of the place assuming greater proportions as the extension of railways went on.

The CHAIRMAN also pointed out that the Directors had had to cut off a number of houses which used to make the bad debts heavy, whereas last year they were almost nil.

Mr. DODGSON thought this was very satisfactory, and as regarded their finances, their position in proportion to the capital of the Company was equally so.

The CHAIRMAN added that the electric light scare was not affecting the Company at present.

The motion was then put, and carried unanimously.

The CHAIRMAN next moved the payment of a dividend of 2 per cent. for the past half year.

Mr. BEESLEY seconded the motion, and it was carried unanimously.

The retiring Director and Auditors having been re-elected, a vote of thanks was proposed to the Chairman, Directors, the Manager, and the Secretary in England.

The CHAIRMAN, in reply, expressed the acknowledgments of his colleagues and himself, and eulogized the services of the Manager and the Secretary.

The SECRETARY also replied on his own behalf, and the meeting then separated.

ODESSA WATER-WORKS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held on Thursday last at the Terminus Hotel, Cannon Street—Sir FRANCIS S. HEAD, Bart., in the chair.

The SECRETARY (Mr. Emanuel Allen) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The Directors beg to submit the accounts for the half year ending Dec. 31, 1880. The result of the year's working is as follows:—

Expenditure.		Receipts.	
To June 30	£14,317	To June 30	£25,014
To Dec. 31	14,319	To Dec. 31	28,928
Loss by exchange	4,383		
	£33,019	Less excess over guarantee in	
Balance	14,253	suspense	6,670
	£47,272		£47,272

From the above balance, £3360 has to be deducted for interest on the Company's debt, leaving a surplus of £3893, which the Directors propose to carry forward as before, in aid of future dividend upon the "A" shares. This surplus shows not only £1872 in excess of the sum carried forward last year, but is obtained after providing £6919 towards repayment of the guarantee or loan by the Municipality of Odessa.

It will be seen that the Government have at last begun to pay for the water which this Company has been supplying to their troops for the last six years, and it is now to be expected that the balance of their debt, which is not disputed, may soon be settled, and the Company's water in future be paid for by the Government as regularly as the article is supplied.

The actual receipts for ordinary, exclusive of military, water-rents during 1880 amount to £47,006, against £44,640 for 1879, which, considering the loss arising from the severe

weather described in the November report, and that the failure of the harvest in South Russia last summer has entirely suspended the staple trade of Odessa, indicates a steady improvement upon the business of past years.

The expediency of passing a Health and Water Act, upon the lines found so advantageous in this and other civilized countries, was receiving the serious consideration of the Imperial Government, when the dreadful murder of the Czar not only deprived Russia of a most estimable Sovereign, but interrupted the discussion of all plans for its improvement, as well as the general business of the Empire. The strong disposition already expressed by the present Emperor to devote his attention to internal affairs induces the Directors to hope that the requirements of health and the enforcement of common cleanliness, so urgently wanted in Russian cities, as well as the necessary protection and encouragement of water companies, by whose action such measures must obviously be effected, will engage the special attention of His Majesty, and that the measure above referred to will at once obtain his most gracious support. In the meanwhile the Directors have to report that the sewers are very far indeed from completion; that the death-rate at Odessa is as high, and preventable sickness as prevalent as usual; and that its inhabitants still seem to value the abundant water obtained at the cost of English shareholders chiefly as a means for laying the dust in their streets, and affording ornamental fountains out of that gratis supply which was so unfortunately conceded to them in the original agreement between the Concessionaires and the Municipality.

During the past year £4650 debenture bonds have been presented and cashed, and £23,300 are being paid off in the current half. While this has diminished the liabilities of the Company, it has, of course, absorbed the cash assets available for a dividend. It is to be hoped that the position of the Company may soon be such as to enable the Directors to issue debenture stock on fair terms. The present indebtedness of capital to the revenue account can then be discharged, and the earnings distributed.

Two of the Directors—Sir Arthur Clay, Bart., and Robert Barclay, Esq.—retire at this meeting by rotation. They are eligible for re-election, and offer themselves accordingly.

The CHAIRMAN said that before noticing the report he would make a few remarks upon one or two points in the accounts which presented some little novelty. In the capital account the Directors had carried from the general balance the expenditure hitherto placed in suspense, and which was included in the judgment against the contractors. It would be remembered that the Directors obtained last year a judgment for £20,000 against these gentlemen—they having previously claimed £70,000 of the Company. Until this judgment was given, of course the Directors were obliged to keep in suspense the item that formed part of their claim against the contractors. As the judgment was now in the Company's favour, they were entitled to remove it from this position, and they had placed it to capital account, and it remained for them to recover as much as they could from the contractors. At present he was sorry to say they had not recovered much. He could only assure the Shareholders that the Directors would get what they could. With regard to the revenue account, he did not see any item requiring special notice. He might perhaps explain that the excess over guarantee was put down at £6670, whereas in the report it was stated at £6919, the reason being that there was £248 in excess last year which was in suspense, and was now included in the whole amount due to the Municipality. Since the report was drawn up the amount had been paid to the Municipality, and it was therefore practically no longer in suspense. In the general balance-sheet there was a large amount put in outstanding accounts, £8535. This included the £6919 liability to which he had referred. The capital account was reduced from £41,219, at which it stood last year, to £30,145. This was caused by the item to which he had already alluded as having been in suspense, and been transferred to capital account—£6424—and also the debentures, amounting to £4680, which had been paid off since the account of last year was made up. Referring to the report, he might say the Directors endeavoured to lay before the Shareholders, as clearly as they could, the actual position of the Company, and he had some little hesitation in making the statement which it contained, because so much was in the nature of prospects. It was, however, impossible to conceal the real position of the Company, and it would not be fair to the Shareholders or to the world to do so. They had encountered numerous dangers and great difficulties in their journey, and though they had at last come pretty nearly to the end of them, they were not yet "out of the wood." He wanted the Shareholders to understand this; and although the report faithfully stated the matter as far as the Directors could put it on paper, still it should be borne in mind that they had all the difficulties to contend with which they had hitherto had; and although they hoped these might eventually be removed, until they were so removed the Company must, in a country like Russia, consider that they were still *in statu quo*. In illustration of this he would just refer to different points where they were in difficulty, and where they ought not to, and would not be in difficulty if they were in any other country but Russia. It was perfectly true, as stated in the report, that the Russian Government had paid them £4000 odd; but the balance ought to have been paid long ago, and it was now to be expected that the balance of the debt might soon be settled, and the Company's water in future be paid for. It must not be forgotten that it was very difficult to get money out of the Russian Government, or out of anybody in Russia. While the Company were in these difficulties, he was very sorry to say the Russians were exceedingly strict in enforcing any claims they might have against the Company, and at the present time a claim had been brought forward which ought never to have been advanced, and which the Directors always considered had been remitted. Two years ago an edict was passed by the Emperor exempting the Company from liability in future for what was called the "zemstroe tax." A claim, however, had been made against them for two years preceding the exemption, which the Directors were doing their best to have set aside. With regard to their general position there was no doubt, as matters of figures and facts, the returns did show a steady improvement, especially considering what a very bad harvest and absolute dearth there had been in the south of Russia last year. There was no question it was the worst harvest known for a great many years, and it depressed the trade of Odessa; nevertheless the town was not much affected by it—buildings were proceeding, tramways were being developed, and a good harvest would restore the national progress which had been retarded. In the face of these difficulties, he thought the Company's returns were encouraging. He now came to what was really the most important matter as affecting the Company. He had for several years past told the Shareholders that their great difficulty arose from a want of legislative recognition of the position of water companies in Russia. The Russians did not appear to know what a water company was; in fact, a company was no more than a private individual. They had not those rights and powers which were essential to the carrying on of their business, and which were granted in all other countries in Europe. At present a great many schemes in reference to the improvements which might be desirable, and which might be carried out in Russia, were being talked about, but he did not think any measure was of more importance than a Health and Water Act. He had forwarded to the Legislature in Russia copies of the English Acts of Parliament on this subject, and was in hopes that similar Acts would, sooner or later, be passed in Russia. He referred to statistics to prove the prevalence of typhoid fever, small-pox, and other diseases, to show that a Sanitary Act was absolutely necessary. No doubt, the original founders of the Company did not anticipate the difficulties it would have to encounter. At the time the enterprise was started the Russian Government was an autocracy, and it was believed its promises would be fulfilled; but since then municipalities had been formed. He thought the Russian Government were bound to pass a Bill to protect the Company, if only to show that foreign capital, which was much needed in Russia, could be safely invested there. He did not think

there was at present sufficient guarantee or security for any water undertaking. The only thing for the Company to do was to be patient, and to wait. They must not be too sanguine, because nothing was certain in Russia until it was an accomplished fact. The last paragraph of the report referred to the position of the debentures, and he would just say that having, as he believed he had, honestly stated the position of the Company, he thought that any one who would look at the accounts would see that they offered security such as was seldom offered with 6 per cent. interest. If a few more debentures were placed, it would enable the Company to square their accounts, and if the events took place to which he had referred, they would be able to issue debenture stock at a lower rate of interest. The Company had limited themselves to £200,000. He then moved—"That the report and accounts of the Directors, submitted to this meeting, be received and adopted."

Sir ARTHUR T. F. CLAY, Bart., seconded the motion.

Mr. BLAYDON said he had watched the Company for the last two years, and there was a decided improvement in their affairs. The fact was they had earned sufficient to pay 2½ per cent. dividend if the funds were in hand to distribute, and he suggested that deferred dividend warrants be issued for this amount, with power to the Shareholders to convert them into debenture stock at some future period.

The CHAIRMAN said he was much obliged for the suggestion thrown out, but neither he nor his colleagues could concur in it. Some years ago they issued deferred warrants, but it proved to be a mistake. As soon as they could they would pay in cash, and no one would be more benefited by this than the Directors, who had a large stake in the undertaking. As soon as the position of the Company warranted it, the Directors would issue a 5 per cent. debenture stock, but it would not do to attempt this and fail.

The motion was put and carried unanimously.

The retiring Directors were then unanimously re-elected, and a vote of thanks having been passed to the Chairman and Directors, the proceedings terminated.

HALIFAX CORPORATION WATER SUPPLY.

THE SALE OF SURPLUS WATER.

An adjourned Meeting of the Halifax Town Council was held on Wednesday, the 13th ult.—the MAYOR (Alderman Bairstov) in the chair—for the purpose of considering a motion made at the meeting of the Council on the previous Friday, by Alderman Parkinson, in reference to the sale of surplus water.

Alderman PARKINSON moved—"That it be an instruction to the Water-Works Committee to offer to all Local Boards, at half price, all water consumed by them respectively above the quantity paid for by them in the year 1880; and that the trade consumers within the borough be charged 8d. per 1000 gallons for all water consumed by them respectively above the quantity paid for in the year 1880. The above arrangement to continue two years." He said his reason for proposing this resolution was that there was a large quantity of water running to waste regularly. He would not have proposed it had he not thought it would add more to the income of the Corporation than the natural increase in the consumption of water would produce. Another reason was his knowledge of how the large users of water in Halifax were handicapped compared with those of Bradford and Manchester, where there were two of the oldest water undertakings in England. Consumers under £20 were favoured in Halifax. It was when they went above £20 that the shoe began to pinch. A person in Halifax taking 70,000 gallons of water would have to pay £2 6s. 8d. in winter and £2 18s. 4d. in summer; in Manchester, £4 19s.; in Bradford, £3 7s. 1d. in winter and £4 6s. in summer. For 500,000 gallons—Manchester, £20 17s. 1d.; Bradford £15 12s. 6d. in winter, £18 15s. in summer; Halifax, previous charge £19 15s. 10d., by the present scale £14 11s. 8d. in winter, and £17 14s. 2d. in summer. One million gallons—Manchester, £30 19s. 8½d.; Bradford, £20 16s. 8d. in winter, £25 in summer; Halifax, previous charge £37 10s., present charge £26 11s. 3d. in winter, and £31 10s. 2d. in summer. Two million gallons—Manchester, £47 5s. 3½d.; Bradford, £33 6s. 8d. in winter, and £40 in summer; Halifax, previous charge £70, present charge £61 0s. 10d. in winter, and £59 17s. 11d. in summer. Three millions—and there were many who took more than this—Manchester, £60 13s. 6d.; Bradford, £43 16s. in winter, £52 10s. in summer; Halifax, previous charge £100, present charge £75 in winter, and £87 10s. in summer. Some persons had mentioned to him the difficulty of arranging with new consumers. He suggested that they should be dealt with in this way:—Any person beginning to take water now should continue until the end of September at the present scale, and continue to the end of the year at the reduced price. Whatever the total sum at the end of the year, the consumer must take that amount next year at the schedule price, and the rest at 3d. per 1000 gallons. There would be an argument raised that in the first three months of this year the Corporation sold from 17 to 20 million gallons of water extra, and if this went on it would come to an enormous sum. If the increase continued at 6 million gallons per month, it would amount in 12 months to 72 millions; this, at 6d. per 1000 gallons, came to £1800, and at the reduced price to £900. He thought there would be plenty of argument brought to bear to prove that the price at 3d. per 1000 gallons would bring more money in than keeping to the old price.

Alderman BOOTH, in seconding the motion, said that within the last seven or eight years there had been a large amount of money spent in trying to get private sources of supply, and if it had not been considered a cheaper method of supplying themselves, they might be pretty certain individuals would not in this way have invested their money. This would have been all right if the Corporation had had no more water than they could have consumed, or what was a fair amount to keep in stock; but seeing that last year there were 1500 million gallons of water turned to waste, he asked if it would not have been the wiser policy to have sold a portion of this water even at less than 3d. per 1000 gallons, and let this amount of money come in, in place of having a rate in aid, or to reduce the rate in aid. If this had been done, manufacturers, instead of sinking wells to obtain private supplies, would have kept their capital for the development of their business, and would have paid the Corporation the amount of money they now paid in interest for invested capital. He knew one large consumer of water who spent £1500 in sinking a well to supply himself with water; and this consumer told him that if the Water-Works Committee had held out some hope that there would be a reduction in price, he certainly would not have invested his money in this way. This was the case of many, and he had no hesitation in saying there had been thousands of pounds spent in Halifax in getting private supplies by persons who would have taken their supplies from the Corporation if the price had been moderate. It did not matter what the water had cost; it was far better to sell it at something than to allow it to be wasted. They had an article which, if they could not sell it at 8d. they must take 6d. for; if they could not find customers at 6d., they must reduce the price to 4d.; but they must sell it, because if they did not it would be wasted. He would not only reduce the price to the consumers in the town, but to the Local Boards. They could go to the Boards and say, "If you take an increased quantity of water, we will let you have it at 3d. per 1000 gallons." And if the Local Boards could consume a few

million gallons more than they had done, it would be so much more in the pockets of the Corporation, and so much in reduction of the rate in aid. Suppose by reducing to 3d. per 1000 gallons they did not add very much to the revenue, still he apprehended they would increase their trade. He had been consulted as to whether it would be policy for a very large finishing concern in Halifax, employing a large number of workpeople, to leave the town and go to some place where water was cheaper. This firm sometimes employed as many as 600 men. Look for a moment at the loss to the town if this establishment had been taken away. It would have been the loss of nearly that number of heads of families; it would have been the shutting up of a lot of houses. He mentioned this to owners of cottage property to show the importance it was to them that the checks and trammels on the trade of the district should be removed. The Corporation would not lose anything by reducing the price as proposed. It would be said they would lose the natural increase. This he granted, but not to the full extent. Instead of getting 6d. per 1000 gallons for the water, they got 3d., but it stood to reason that if the price were reduced they would far more increase the sale of the water. There had been instances mentioned time after time where people had said that if the Corporation would only reduce the price of water they would very much increase the consumption. A very large dyer, who paid the Corporation £800 or £900 a year, told him that if they would only reduce the price to 4d. per 1000 gallons, he would give up pumping. At 3d. per 1000 gallons, this would be a positive addition to revenue of £400 to £500. He knew, from applications made time after time to the Water-Works Committee, that there were others in the town similarly situated. He knew it might be said that some time ago they reduced the price to trade consumers, and it had not resulted in such a very large increase as was then anticipated; but it had induced a very much larger consumption of water, and the revenue derived from the trade now very nearly approached to what it was then. Besides, a few large consumers at that time had ceased altogether. But if it had resulted in an increased consumption of water, it must have been a benefit to somebody and a benefit to the trade. He thought they might look for a large increase from the Local Boards. As to the increase from this source in the last three months, they might ascribe a great deal of it to water-pipes having burst through frost, and a great deal of water having run to waste. If the Council would only make up their minds to sell the water, they would find in the end they would have no cause for regret.

Mr. SHAW spoke in favour of that part of the resolution which proposed reducing the price to the trade users, but against reducing the price to Local Boards.

Alderman LONGBOTTOM regretted that Alderman Parkinson had not first laid his facts and figures before the Water-Works Committee. The question had been up before, but it had never assumed any tangible shape, so that the Committee could see how it was to be carried through and worked to advantage. The Committee had thought they would get a larger income by the natural growth and extension of consumption than by the scheme proposed by Alderman Parkinson; for 150 out of every 200 of the water consumers could not use a drop more water than they were using. It was only the large manufacturers and dyers who could use water *ad libitum*. Unfortunately the Committee had fallen on bad times. During the last five or six years there had been successive seasons of bad trade, and they had not had the demand for water there was up to 1874, when the whole country was flourishing. They had not the gradual advance and expansion—the trade remained somewhat stationary. But what did they find with regard to the Local Boards? They had gone on increasing in a very nice ratio, so much so that in the first quarter of the present year they had sold nearly 18 million gallons more water than they sold in the corresponding quarter of the previous year. There was no doubt whatever that this would be sustained, and, he believed, increased. If there was to be any advantage given at all, he quite agreed with Mr. Shaw that it should be given to the tradesmen in the town, but he did protest most strongly against forfeiting half the increased income they were certain to receive from the Local Boards during the present year. They had now sent out the notes for the first quarter, to March 25, for nearly £450 more than in the corresponding quarter of the previous year. They would, therefore, have to give the Boards credit for having paid for this amount of water if they went on the principle of starting from January 1, as well as losing £225 for every quarter to the end of the present year. Not only would they be handicapping the manufacturers and dyers in Halifax, by extending precisely the same benefits without the same obligations to those outside, and who had not to pay the high rates paid inside, but they would be putting the money into the pockets of the Local Boards, and he did not believe they would add to the revenue very much more than the 18 million gallons extra they were now taking. He did not believe the Boards would send to their trade consumers a circular similar to that which the Corporation would advise. He was speaking very recently with a gentleman representing one of these large authorities, and he asked what they would do? He said they would not use any water more than their natural growth, but they should be very glad to have the benefit of any reduction the Corporation would give to them. Something might be said with regard to Soothill and Thornhill. This district was not within the range of competition with Halifax. If they would take 50,000 or 100,000 gallons a day for a year or a couple of years at a given price, let the Committee submit this to the Council, and let the Council take the responsibility of deciding whether the Committee would be wise in submitting to a special bargain of that kind. Alderman Longbottom said if it could be managed, he should be glad to sell the water to Halifax trade consumers, but by no means would he give the same advantages to those just upon their borders, who did not bear any of their responsibility. One quarter of the present year was finished, however, and the time should be taken from March 25, 1880, to March 25, 1881. He also suggested that the quantity to be charged at half price should be in excess of the larger quantity taken in any quarter during that year. Suppose 6 millions had been taken in the quarter ending June, and only 5 millions in the quarter ending September, 6 millions should be taken as the standard. He concluded by moving as an amendment that the part of the resolution referring to the Local Boards should be eliminated.

Mr. SHAW seconded the amendment.

The MAYOR said this question had been before the Council for the last nine years, but he was obliged to confess, as a member of the Water-Works Committee, it had never been taken up by the Committee in a serious manner. An objection had been raised to offering the water to the Local Boards at the same rate as to tradespeople in the borough. It had occurred to him that the ratepayers did not understand this question of the supply of water to the Local Boards. The general impression was that the Local Boards obtained the water at 6d. per 1000 gallons, and whatever difference there was between this and the price at which the water was sold was profit. This was not exactly the case. The Corporation charged 6 per cent. upon the cost of the conveyance of the water from the limit of the borough to the source of supply to the various Local Boards. In several cases it had to fall into a reservoir. First of all there was the 6 per cent. for the pipes, then there was the outlay upon the reservoir, and after this there was the cost of distribution and the cost

of collecting the rates. So that there was a considerable expenditure before any revenue was obtained. When the Committee were down at Thornhill, they were informed that the Board were losing £1000 a year by the water supply. The Southill Board were losing £1400 a year, but they preferred to sell the water at as low a price as possible for the purpose of developing the trade of the district.

Alderman LONGBOTTOM, in a rather mournful tone, said the Corporation had fallen upon bad times. Well, it so happened that from the year 1864 to the year 1878, all the Local Boards had come in as consumers. They must understand there were not eight or nine other Local Boards to flee to; they could only depend upon the increased demand of these various Local Boards. The demand for water was not going to be by leaps and bounds, for whether they took it for 7 years or for 14, it only equalled about 41 million gallons per annum. As to the frost in the last quarter, the Corporation had the benefit of the broken pipes; but although they might congratulate themselves that 18 or 19 million gallons of water had been consumed in excess of the corresponding quarter of last year, they must not depend upon the same quantity for this quarter. It had also been said there never was the probability, or the feasibility, of an increased demand for water. He had a letter bearing date Sept. 4, 1872, in which a gentleman now deceased offered for all the water that would pass through his pipes, in addition to the quantity he was taking, an additional £1 per day if he could be supplied with it without any reference to quantity. This was evidence sufficient to prove that by the niggardly policy the Corporation had adopted they had brought upon their heads this large incubus amounting to £100,000, taken from the ratepayers' pockets. What, he asked, would this be in 100 years? Over 3 millions of money; take it at 5 per cent. The time had come when they should deal with this question as men of business, and not go on as they had been doing, borrowing money at 4 per cent. and making 3 of it, and calling from time to time upon the ratepayers for rates in aid. He wanted the people to have the water; he wanted trade to be increased in the town, and they had nothing in their hands so capable of building up and raising a town as the water-works.

Mr. BARRACLOUGH said the Committee had one of the most complete schemes of water supply in the kingdom, with water such as was rarely equalled and never excelled, and practically they were only making use of one-third of the quantity they had to dispose of. They were told by their Engineer that they had from 15 to 18 million gallons of water running to waste last year. They were not asking the Council to take a leap in the dark. They were supported by some of the largest water consumers in the borough, who were prepared to take a much increased supply if they could get it at a more reasonable price. If this were so, the Council ought to make every endeavour to meet such large purchasers in the manner Alderman Parkinson had named.

[Some conversation followed as to the agreements with the Local Boards, some Boards, it appears, having the right to be supplied at the lowest price at which trade consumers in the borough are supplied.]

Mr. HANSON spoke in favour of dealing with the Local Boards on the same terms as with the large consumers, and said that if they drew the line at their own consumers, the income would be nothing compared with what it would be if the reduction were granted to the Local Boards.

Mr. DAVIS said that if the Local Boards would reduce the price of water to their trade consumers in the same proportion as the Corporation reduced it to theirs, then he thought they would be justified in letting the Local Boards have it; but if they would not, and kept the price as now, the Local Boards would sell no more than at present. He announced his intention to move an amendment that the price to the Local Boards should be lowered on condition that they supplied their trade consumers at a price corresponding with that charged by the Corporation.

Mr. RIGGS supported the resolution, and said he did not like this dog-in-the-manger principle, that, because they could not use the water themselves, they would let it run to waste rather than anybody should have the benefit of it. He suggested that the resolution should be altered so that the reduction would begin with the second quarter of the present year.

Alderman MIDGLEY said he did not think this was a question of disposing of surplus water; all they were advocating was that, from some source or other, they should increase their revenue. He had always been of opinion that if they could, by any means that would not injure them in the future, increase their revenue from any source, they ought to do so. Two years ago, when Alderman Parkinson introduced a reduced list of charges, it was accepted as the better of two proposals before the Council. He was of opinion at the time that it would have been better to let it alone, and said he believed it would lose them £1500 in the year following, and that the loss afterwards would be increased. He believed that what he said then had happened. In the year 1877 they sold—and this was one of the reasons why the Committee had taken the course they had—261 million gallons of water by meter to tradespeople in the borough. In 1880 they sold 293 millions, being an increase in the latter year of say 31 millions. In 1877 they received for the water sold £9231, and in 1880 only £8761. So that although the quantity was increased some 31 millions, they actually received less for it by £470. The Committee thought the ratepayers had to pay enough now in the way of rates in aid; if the other reduction had not been made, even this year they would have received a considerably heavier sum, and the rate in aid would have been proportionately less. In 1880 they sold by meter for all purposes 327 million gallons of water. They received for it £10,633. Had they sold the same quantity in 1880—and he knew no reason why they should not—at the higher rate, they would have received more for it by £1782. So that the last resolution they carried reducing the price, and which they were told would bring in thousands of pounds more than the old price, had reduced the income so far by £9000. He did not hesitate to say that by the present proposition he feared the revenue would be very much decreased. He felt bound to support the amendment because, having up to the end of 1880 paid out of the rate in aid over £101,000 in aid of the water-works, he thought it was time, if they had anything to give, to give it to their own large consumers. If they charged a lower rate outside the borough than inside, was it not an actual invitation to people to go and build their concerns outside the borough? Last year they sold to Hipperholme 14 million gallons, to Hebden Bridge 8 millions, to Messrs. Crossley 26 millions, and to Messrs. Ingham 31 millions. The Local Boards were supplied at 6d. per 1000 gallons, but the Corporation were charging more than 6½d. to those within the borough who were taking two or three times the quantity. Their own ratepayers might turn round and say the Corporation did not deal justly with them. There was another consideration. The water cost more than 9d. per 1000 gallons sold last year; the price paid for it in the borough was 7½d., and they had sold it outside at 6½d. In addition to this the ratepayers had had to pay the enormous sum of 6d. or 7d. as a rate in aid. Messrs. Crossley and Ingham had not only had to pay a higher price, but had had very materially to help to pay the rates. He thought they were already sufficiently handicapped within the borough without making their burdens heavier still. He should be very glad, by way of giving it a fair trial, to throw the proposal open to ratepayers within the borough until the end of the year;

and if a similar application came from the Local Boards, let the Committee consider it.

The Mayor gave an example to show that by the reduction in price they increased the consumption. In 1877 a firm took 6,532,400 gallons of water, for which they paid £231 6s. 10d.; in 1880 they took 10,905,000 gallons, and paid £296 19s. 7d. He said when he looked at the amount the Local Boards were paying, and how the revenue increased year by year, he was quite prepared to take his share of the responsibility in dealing with them just as he would deal with their own ratepayers. In 1876, according to figures given to him by the Accountant, the revenue from trade sources (and this was inclusive of all water passing through meter) was £10,285; in 1880 it was £10,633. From the Local Boards the revenue in 1876 was £5567; in 1880, £8589. This statement ought to be sufficient to induce every member of the Council to treat the Local Boards on the same lines as he would treat the tradespeople of Halifax.

After some further conversation, Alderman PARKINSON altered his resolution so as to make the year end on the 25th of March, but declined to leave out the Local Boards, saying it was to them he looked for the increased income.

Alderman LONGBOTTOM's amendment was then put, restricting the reduction to trade consumers in the borough, but it was lost by 21 votes to 14.

Mr. DAVIS then moved another amendment, that the price to the Local Boards be lowered as proposed, provided that they undertake to reduce the price to their consumers; but this was withdrawn.

Another amendment, moved by Alderman LONGBOTTOM, and seconded by Alderman WALSH, taking the highest consumption in any quarter of the year as the standard, was lost by 16 votes to 15.

Alderman MIDGLEY moved an amendment that, instead of the experiment being confined to two years, it should be discontinued six months after notice; but this also was rejected.

On the original motion being put, it was carried by a large majority. The proceedings then terminated.

THE WATER SUPPLY OF FULWOOD.

LOCAL GOVERNMENT BOARD INQUIRY.

Some short time since an application was made to the Local Government Board by the Fulwood Local Board for sanction to borrow £13,000 for works of water supply, and early in March Mr. S. J. Smith, C.E., one of the Inspectors attended at the offices of the Local Board to inquire into the application. After the inquiry had proceeded some time an adjournment took place in order to see whether the Local Board could arrange with the Preston Corporation for taking from them a supply of water in bulk, under the provisions of the Public Health Act. Some negotiations having since taken place between the parties, the Inspector re-opened the inquiry on Wednesday, the 13th ult., for the purpose of learning the result.

Mr. F. P. TOMLINSON and Mr. W. ASCROFT appeared for the Local Board; Mr. FORSHAW opposed the application as a ratepayer; Mr. HAMER (Town Clerk) and Mr. REAH (Surveyor) watched the proceedings on behalf of the Preston Corporation; and Mr. F. C. HULTON (Clerk of the Peace) appeared in the interests of the County Justices, it having been proposed that the Local Board should afford a supply of water to Whittingham Asylum. The Chairman of the Board, several members, and a large number of ratepayers were present at the inquiry.

Mr. TOMLINSON, on behalf of the Local Board, said he thought the best course for him to pursue would be to read two or three letters that had passed between the Clerk of the Local Board and the Corporation of Preston. These letters, he said, led to an interview between the two bodies, and subsequently to the passing of resolutions by the Water Committee of the Preston Corporation, to the effect that the Fulwood Local Board be informed that the Committee were willing to recommend the Corporation to assure a supply of water for a term of years to be agreed upon by the inhabitants of Fulwood, on the terms now existing, and that if the Board desired to be supplied with water in bulk, the Sub-Committee would recommend the Corporation to give such supply upon the terms now existing with the barracks and the workhouse, on condition that the Board take over the mains at a valuation, and also continue to supply the barracks and workhouse upon the terms of the present agreement between the Corporation and the barracks and the workhouse authorities respectively. He might, he said, explain that the existing terms of supply to the barracks and workhouse were, as he understood, 7d. per 1000 gallons, together with the payment of £19 10s. each for interest on mains. The question arose whether these were terms which the Fulwood Board could reasonably be expected to accept. The question as to whether this was a fair arrangement to be made might, of course, depend upon two points of view. There was the Preston point of view, and the Fulwood point of view. From the standpoint of Preston, the Corporation were a body having a supply of water more than they required for their own purposes probably for some years to come, and it was open to them to supply another body or not, as they pleased. They could not be compelled to do it, but he was prepared to show, with some figures that had been put before him, that they could, if they chose, supply Fulwood at something like half the rate they were doing. He would first take it on the principle that was applied by Parliament to the Manchester Corporation in their Thirlmere scheme.

Mr. HAMER: I wish to point out that this inquiry is not as to the present terms of the Corporation, but as to the application of the Fulwood Local Board to be allowed to borrow money for the supply of water, and on behalf of the Corporation I must state that I cannot submit to the present terms being analyzed and discussed.

The INSPECTOR thought it well to let the applicants analyze as they would. It was, he said, good for everybody concerned that the matter should be thoroughly threshed out. Let it be seen whether they could show good cause why the terms should be reduced.

Mr. HAMER said they could not enter into any question of reducing the present terms of the Corporation, who reserved to themselves the right of electing whether they proceeded under the 61st section of the Public Health Act or not.

Mr. TOMLINSON remarked that he was not seeking in the least to bid down the Corporation.

The INSPECTOR: This came out entirely upon my suggestion. I showed clearly, in opening the inquiry, that before sanction could be granted to the Fulwood Local Board to borrow the sum of £13,000, it must be seen whether they could be supplied in bulk at a more reasonable rate. It was in the spirit of carrying out the intention of the Public Health Act that they should have an opportunity of meeting together and discussing it. Therefore, if Mr. Tomlinson can show me that the price asked them is excessive—if, in fact, he desires to approach the subject in that way—let him.

Mr. TOMLINSON thought he could satisfy the Inspector that the terms offered by the Corporation were not such that the Local Board would be justified in accepting. He had, he said, taken the cost of the Preston Water-Works from the beginning down to April, 1880, and the total was £329,357. He took the proposed consumption of Fulwood at 25 gallons

per head, with a population of 4000. This would be 100,000 gallons per day, and he had taken the gross consumption of Fulwood at 100,000 gallons per day. He took the capacity of the Preston Water-Works at 1219 million gallons per annum, but believed they were capable of being extended beyond this. The proportion, going on the Thirlmere principle, would be that Fulwood to Preston would be as 1 to 33; they would take this as the proportion required by Fulwood to the water at the command of Preston. The annual cost of the Preston Water-Works at 5 per cent. was £16,467; this divided by 33 would give the Fulwood proportion at something like £500 per annum. This, at 100,000 gallons, was something less than 3½d. per 1000 gallons. He merely put this forward as one illustration of what the Board would be expected to pay if they were being treated on the Thirlmere principle.

The Inspector: Are you able to say what is the price charged for water supplied in bulk in other towns?

Mr. TOMLINSON: I have not the figures before me. I am told that Manchester carries its pipes for 15 miles, and supplies Tyldesley for 3d. per 1000 gallons; but the mere knowledge that a town pays 6d. or 6½d. per 1000 gallons is not of very much use in this case, without knowing the circumstances of the town. I am told that Liverpool supplies certain outlying townships at 9d. in the pound on the rateable value. I believe the Corporation do, in fact, supply the Lancashire and Yorkshire and London and North-Western Railway Station at 4½d. per 1000 gallons, and they take a large quantity. If it is over 750,000 gallons per quarter it is then 4½d. per 1000 gallons. Of course, the requirements of Fulwood would be considerably over this quantity. If they took the capacity of supplying water at 1216 million gallons it came to 3½d. per 1000 gallons, including piping, management, and everything. If they took it at what was really supplied, it would come to something between 4½d. and 4½d. per 1000 gallons. This is what the water costs them at present. If they could dispose of the whole of their water, they could sell it at 3½d. per 1000 gallons. If they only used the water they really did use at present, it would cost them something like 4½d. per 1000 gallons. This includes the whole expenses of management, delivery, and everything.

The Inspector pointed out that the Local Government Board would not look upon this as a trading concern at all. They would look at it in the light of the Public Health Act. The Local Board were bound to supply their district with water for domestic purposes, and it was not a question of making a profit by the transaction. They did not find the word "profit" in the Public Health Act.

Mr. TOMLINSON said of course it was for the Local Authority to obtain water at as reasonable a price as they could from one source or another, and he presumed the Local Government Board would not drive them to accept a bad bargain if they could get water at a less price.

The Inspector remarked that the point was whether by constructing their own works the Board would be able to supply themselves adequately with water at a less cost.

Mr. TOMLINSON stated that if it could be shown that Preston could not afford, without loss, to sell water at a certain price, they could not expect them to do so. The next question was as to the cost of the Fulwood scheme as compared with the cost under existing circumstances. He might state that if Fulwood supplied itself, the Justices who were in charge of Whittingham Asylum might desire water from Fulwood.

The Inspector: You are not going to construct these works in order to get custom outside the district. This point I want you fairly to face.

Mr. TOMLINSON said it was possible the out-districts might require water from them, and if they did, by requiring a large supply the cost would be diminished. He then went into the details of the Fulwood water supply scheme, and compared the revised estimate of the cost of the proposed works with the list drawn up in 1880. The revised estimate as put in was as follows:—Pipes, £1984 5s. 7d.; laying 12,000 yards, £600; fire-cocks and hydrants, £84 1s.; laying and fixing 65 do., £16 5s.; 36 sluices and valves, £145; laying and fixing do., £9; two meters and fixing, £100; sinking well and boring, £750; two bore-holes 300 feet deep, £1000; two single-acting pumps, £2900; rising main, £60; engine-house and boiler house, £384; chimney and water tower, £1465 10s.; cast-iron tank and girders, £639 12s.; cottage, £400; walls and paving road, £96 13s. 4d.; land, £150—total, £10,784 6s. 11d. Contingencies and superintendence, £1078 8s. 8d.; total, £11,862 15s. 7d.; with the Porter-Clark apparatus (£1200), £13,062 15s. 7d. By the proposals of the Local Board the Fulwood people would get a very wholesome supply of water; they would have a very much better pressure than they had at present, and all at a much less cost. Fulwood had an increasing population—it had increased in the last four years as much as 27½ per cent. Therefore, as the demand increased, the cost of supply would cheapen under one system, while under the other it would be in the same ratio.

The following evidence was then taken:—

Mr. Philip Holland, Public Analyst for Southport, put in a copy of the analysis he had made of the water on the 4th of February, and said he considered the water contained very little ammonia; it was a very good drinking water. The total solid matter in it was 31½ grains per gallon. He put it, as well as he could in the laboratory, through a process like that of the Porter-Clark, and this reduced the solid matter from 31½ to 13·02 grains. The degree of hardness was 18·06. He thought he could reduce it by the softening process to 4°, but he found in practice that it came down to 7°. He considered that a great advantage accrued by the adoption of the Porter-Clark process.

Mr. TOMLINSON: Mr. De Rance, the geologist, told us that in the case of water pumped from the sandstone rock a great many of the hardening salts would be gradually pumped away. If this is the case, would you say that this hardness of 7° would be much reduced?

Witness: As far as I understand, the sandstone rock contains sulphate of lime. If the water is pumped, the sulphate of lime will in time be removed, and I should expect the water to be softer in a few months than at present.

Mr. HULTON: Is the water good for domestic purposes when subjected to the Porter-Clark process?

Witness: The softer it is made the better it is for domestic purposes, requiring less soap and boiling. The water could be purified as well as softened.

Mr. T. H. Myres, Architect and Surveyor, produced a statement of the cost and the plans of the proposed works, and showed that several alterations had been made.

The plans were then subjected to a long scrutiny, and several important details were objected to by the Inspector, who remarked that he thought they would require another revision before they were submitted to the Local Government Board, and it might then be a question whether the whole work could be done for the £13,000 asked for. After some further conversation, the parties retired to consult. On their return,

Mr. TOMLINSON said he thought it would be better—and the Local Board agreed with him—that the plans should be thoroughly reconsidered, and the estimates revised and submitted to the Local Government Board. When this had been done, they could ask the Inspector to come down again if it was thought necessary.

The Inspector remarked that if the estimates and plans, when revised,

would satisfy the requirements of the Local Government Board, and the estimates were not in excess of the sum the Local Board had already applied for, there would be no need for a second inquiry.

The inquiry was then adjourned till the 13th inst.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, April 30, 1881.

Tar, 38s. to 40s. per ton at works.

Ammonia liquor (sp. gr. 1·03), 24s. to 25s. per ton.

" sulphate (white), about £20 5s. per ton.

" (good grey), £19 10s. to £19 15s. per ton.

" muriate (white), £35 to £36 per ton.

" (brown), about £26 per ton.

Muriatic acid, £1 5s. to £1 10s. per ton.

Sulphuric acid (brown vitriol), £2 18s. 6d. per ton.

Tar Products.—Benzole, 50 per cent., 3s. 8d. per gallon; do., 90 per cent., 5s. 6d. per gallon; solvent naphtha, 90 per cent., 1s. per gallon; anthracene, nominal.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

Notwithstanding the remit which has been made to a Committee of the Edinburgh Town Council to report upon the propriety of experimenting with the electric light, Bray's lanterns are making their appearance at different places throughout the city where large spaces require to be lighted up, or where the traffic is more than usually heavy. The Lighting Committee in the Town Council are evidently slow to move, but slow progress is better than none at all. Everybody is pleased with the appearance of the new light. It satisfies rational desire in regard to the illumination of thoroughfares, and it does so at a cost which, comparatively speaking, is insignificant to a city like Edinburgh. If, however, the Committee appointed to solve the electricity problem only spend a hundred pounds or two in jaunting about from place to place to see electric lighting, and if nothing further comes of it, probably the experience may not be dearly bought. In fact, I think the city would in the long run profit by sending a deputation to New York, the head-quarters of electric lighting, because there they would learn that although gas is sold at a price three times as high as is charged in Edinburgh, contracts for another year have been entered into with the gas companies to continue the lighting of that city with gas. Despite all the protestations of political morality to which every constituency is treated during the period of municipal elections, there is always a lurking desire on the part of the elected to profit by their appointments, if it should only be to the extent of a trip to London at the public expense. I hardly anticipate, therefore, that the Committee of the Edinburgh Town Council will base their report upon facts already well established, without at any rate having the satisfaction of seeing the light in some distant town, and in their official capacity. The season is so far advanced that I am afraid, even although experiments with electric lighting should be resolved upon, they will not take place until the dark evenings set in again; meanwhile, I trust there will be an extension of the larger lanterns to which I have already referred, so that the public may be in a position to judge between the two lights.

I have adverted once or twice to the enormous growth of the southern suburb of Edinburgh, and have endeavoured to show that the Gas Company have not been keeping abreast of the times, at least in the way of laying mains of sufficient diameter to give a full supply of gas at all hours of the day. In Edinburgh, as many are aware, there are two competing Companies—the Edinburgh Gaslight Company, and the Edinburgh and Leith Gas Company. The latter Company, from their geographical position, are better situated for supplying the northern rather than the southern portion of the city; and the former, while they have within their grasp the whole of the city, are more peculiarly fitted to supply the southern suburbs. In order, however, to avoid unseemly competition, an arrangement was come to, as I understand, that in the two extreme districts of the city active competition should cease; the one Company ceding to the other the district over which special advantages were possessed. I do not go the length of saying that the result of this arrangement has been to deprive the south-siders of a fuller supply of gas than they possess, but I think the Edinburgh Company have not increased the size of their mains with the natural increase of the district. I believe that measures are now being taken to remove all objection on this score. A new main will, it is expected, soon be laid, so as to carry a fresh supply to the extreme boundaries of the southern division of the city, and the district nearer to the works will thus have an ample supply from existing mains. I believe there is a prospect of this improvement being carried out before winter approaches.

The good people of Birnam—the Birnam referred to in "Macbeth"—having determined to light their streets after dark, some time ago appointed a Committee to superintend the erection of lamps throughout the village. The work has now been carried to a successful issue, and at a meeting of the inhabitants last Friday week, the Committee received a vote of thanks for their exertions.

In my "Notes" in the last number of the JOURNAL I mentioned that a disease of a very peculiar character had made its appearance in Aberdeen. Its ravages were principally confined to a number of families in the west-end of the city. Since last week careful inquiry has established the fact that 89 families had been affected, in which there had been 229 cases, but as there were certain families who had not made any returns, it is calculated that no fewer than 300 persons have been prostrated by this disease, and of these three or four have died. The disease has hitherto been unknown in Aberdeen, and it may be of interest, therefore, to sanitary officers in other towns to state briefly the general symptoms, and probably some one who has had experience in these matters may be able to find a name for it, or to state whether there has ever before been a similar outbreak. The symptoms begin with a sudden attack of illness, succeeded by rigours and chilliness, followed by considerable heat of skin, and very high temperature—in some cases ranging as high as 105° Fahr.—often sickness, but not always; in a few instances delirium. All these cases were dangerous. The throat, too, was always complained of. The feeling was as of something in the throat, with pain and stiffness about the angle of the jaw. Looking into the throat much swelling was not visible, but externally the glands were enlarged and tender. The acute symptoms subsided in 24 or 48 hours; but in a number of cases there appeared to be a kind of relapse—a recurrence of the febrile attack. Many of the cases stopped with the second paroxysm, but in some it went on returning at intervals; the measure of the relapses being the measure of the force of the disease. The area within which the disease made its appearance being limited, and as it was found that the water supply was good, attention was directed to the milk supply, and it turned out that in all the cases the milk was obtained from Oldmill Reformatory—an institution established for the reclamation of youths who have been unfortunate. When this became known the excitement of the public was great; the Directors of the Institution ceased to send milk to their customers; and the Lord Advo-

cate, as representing Government, ordered that an official inquiry should be made into the circumstances, in order to discover, if possible, the sources of the malady, and to suggest measures to obviate its recurrence in the future. The Commissioners appointed were Mr. A. Rutherford, Advocate, of Edinburgh, and Mr. Littlejohn, Medical Officer of Health for Edinburgh. These gentlemen heard evidence on Monday, Tuesday, and Wednesday of this week, but the result at which they have arrived will not be known until they present their report to the Board of Supervision. The evidence which was adduced reveals a very extraordinary state of affairs. I mentioned in my last "Notes" that the cistern from which the supply of water is obtained for all purposes in the Reformatory is placed in the cows' byre, and that an analysis of this water took it out of the category of "excellent," and placed it in that of "dangerous," but the query arises—How did this affect the quality of the milk? It has not been proved that water was added to the milk before it was sent out to the customers; but it has been shown that the pitchers and all the dairy utensils were cleansed with this water. It seems, however, that in three or four cases the customers, after receiving the supply for the day, took the precaution of cleansing the pitchers themselves before returning them, and in these cases there has been no disease. Then at the Institution itself the boys are all in a healthy condition. They get skimmed milk as an article of daily diet, with sweet milk on Sundays, and presumably they would use the water for drinking purposes, yet they have escaped, while people at a distance, who have used milk brought in pitchers which have merely been cleansed with the same water, have been prostrated by disease. Professor Stephenson, of Aberdeen, who was examined, said the disease was a new seed—it had never been seen before, never met with, and never heard of. To his mind it was evidently of organic origin, and it was a fuller development of a poison that was ordinarily common, or which had been brought from a distance. The report of the Commissioners may throw some light on the subject.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The office of Manager to the Kelso Gas Company having become vacant by the retirement of Mr. Clazy, a petition is being signed in the town for presentation to the Directors of the Company in favour of the appointment to the vacant office of Mr. John Burden, who has been Mr. Clazy's assistant for upwards of two years, and testifying to his obliging manner, and his attention to the wishes and interests of the consumers in regard to the supply of gas.

At the last meeting of the Burgh Commissioners of Wishaw it was reported that the Gas Committee had held a meeting with a deputation from the Wishaw Gas Company, which was of a satisfactory character. The Company were desirous that the purchase-money for the gas-works, now in the hands of the Commissioners, should be paid over by the 15th of May; and the report further stated that it was expected that the Company would be paid up in a few days.

The new gas-works at Bathgate, which have recently been completed, are giving great satisfaction. All the buildings are new, and comprise retort-house, purifier-house, testing-house, governor-house, workshop, &c. The gasholders have a total capacity of 30,000 cubic feet. A high quality of gas is being manufactured, the illuminating power being about 30 standard candles, thus comparing very favourably with the quality of the gas generally supplied throughout Scotland. The works were planned by Mr. George R. Hislop, F.C.S., of Paisley, and the arrangements are so complete and successful as to do much credit to the Engineer and give satisfaction to the public. Since the Bathgate Gas Company undertook manufacturing their own gas the works have been placed under the care of Bailie Robertson, whose duties have thus been largely increased. It is evidently the determination of the Company to produce a first-class light at the lowest possible price.

At last Tuesday's sitting of the Circuit Justiciary Court in Glasgow, before Lord Mure, David McGregor was charged with having, on the 19th of January, broken into an unoccupied tenement in West Graham Street, Glasgow, and stolen therefrom 14 lbs. weight of gas-piping. No fewer than five previous convictions had been recorded against the prisoner—one of them in 1853, when he was sentenced to eight years' penal servitude. The panel tendered a plea of not guilty. After evidence had been taken, the Advocate-Depute withdrew the aggravated charge of house-breaking. The jury unanimously found the prisoner guilty of theft, and the judge sentenced him to 18 months' imprisonment.

Fearing the continuance of dry weather, the Police Commissioners of Wishaw have recently authorized their Water Committee to take such measures as they may deem necessary for reducing the consumption of water within the area of supply.

So long as the new water supply scheme for Falkirk is unfinished there is great fear that a water famine will have to be encountered. In the meantime, however, the new works are being pushed on rapidly towards completion. Only now, apparently, is it discovered that the new supply, which is being taken from Callendar Colliery, is a decidedly hard water. There is room to fear that, in their desire to get a cheap water supply, the Municipal Authorities of Falkirk are not providing the town with what may be characterized as "a thing of beauty and a joy for ever." A local paper says: "As a seat of industry, Falkirk is increasing rapidly in population and in wealth. The last census, if it did not indicate results that entirely came up to our expectations, showed an advance of which not very many places throughout the country can boast; and, unless we are greatly mistaken, the next decade will show us much farther on in the forward march." I think it is not commendable that a town of such a high position at present, and such high hopes of the immediate future, should content itself with a "cheap and nasty" water supply, which it can scarcely fail to be if it is drawn from a working colliery.

The Gourcock Police Commissioners have just discovered that more than one-half of the town's water supply has been running to waste for some months back. For a long time last year the inhabitants were put upon a short allowance of water. Measures have now been taken for placing things on a more satisfactory footing.

A special meeting of the Parochial Board of Kilbirnie, Ayrshire, was recently held for the purpose of considering the water supply of the parish. The Sanitary Inspector read a communication from the Board of Supervision on the subject, and calling upon the Local Authority immediately to shut up nine wells found to be unwholesome by Dr. Stevenson Macadam's analyses of Oct. 19, 1871, and to provide a supply of pure water by gravitation; and intimating further that, if the Local Authority did not consider it proper to form a special water-supply district, the cost of a water supply must be defrayed by assessment spread over the whole parish. After a long and desultory discussion, it was agreed that a Committee be appointed to confer with the Paisley Authorities as to the terms upon which they would give a supply to Kilbirnie from their Rye water scheme. The meeting was adjourned till the 6th of June, when it is expected the Committee will be able to give in a report on the subject.

This week's Glasgow pig iron warrant market has been steady, and transactions have been on a more limited scale, the range of prices being

from 47s. 6d. cash, on Monday, to 47s. 10½d. on Thursday and yesterday; the close, however, was 47s. 8d. cash on the latter day.

There has been rather a better feeling in the coal market during the past week; but in some parts of Lanarkshire the colliery owners experience much difficulty in getting a supply of railway waggons.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as all classes of round coal are concerned, trade is quiet, with an easier tendency in prices. The demand for the better classes for house-fire purposes is naturally dropping off with the approach of summer, and although there is no announced reduction of list rates with the commencement of the present month, colliery proprietors in most cases are open to place orders at lower figures. The very best Wigan long Arley coal still fetches as much as 9s. 6d. per ton at the pit, but good square Arley is to be bought at from 8s. 3d. to 8s. 6d. per ton, whilst common sorts range as low as 6s. per ton, and Pemberton four-foot averages about 6s. 9d. to 7s. 6d. per ton, according to quality. For gas-making coals the inquiries in the market are but few in number, but one or two contracts have already been settled. The actual prices accepted have not yet transpired; but, judging from the figures which have been unsuccessful, they must have been extremely low, and these, too, for deliveries extending over three years. One unsuccessful tender for delivery equal to works not very far distant from Manchester was at under 8s. per ton for very good gas coals, and I hear that Yorkshire firms are coming in at very low figures. Common round coals for steam purposes continue a drug, and are offered at from 5s. 3d. to 5s. 9d. per ton at the pit; but engine classes of fuel have an upward tendency, and from some of the Lancashire collieries circulars have been sent out announcing an advance of 5d. per ton upon burgy and slack. For best classes of fuel the average prices at the pit's mouth are about 4s. 6d. to 5s. for burgy, and 4s. 3d. to 4s. 9d. per ton for good slack.

Local made cokes continue in fair demand, and prices are steady at from 12s. to 13s. for small, up to 15s. and 16s. per ton for large cokes at the ovens.

The iron trade continues extremely dull, and the tendency of prices is still downwards. Lancashire pig iron delivered equal to Manchester is about 44s. to 45s. per ton, less 2½ per cent., and common bars average from £5 12s. 6d. to £5 15s. per ton; but there is very little doing at these figures. Needy holders appear to be realizing at almost any price they can obtain, and a few sales over the year are reported at low figures.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is, if anything, rather a more depressed feeling existing in the coal trade of this district. No improvement is yet observable in the demand either for furnace or forge fuel. Furnace coal is being freely sold at the Tipton collieries at 8s. 6d. and 8s. 9d. per ton, whilst at few of the pits in the district is anything over 6s. 6d. asked for forge coal—in most cases the figures are something lower. Household qualities are receiving less call, and many of the largest buyers are holding back with an idea that the present month will see a reduction further than has as yet been made. At the Cannock Chase collieries a great falling off has been observed. Stocks have increased to a considerable extent, and masters are offering on somewhat easier terms. At a special meeting of the Arbitrators in connection with the drainage of the Tipton mines held a few days ago, an award was made of 3d. per ton on fire-clay limestone, 9d. on ironstone, and 6d. per ton on coal and other minerals. Several appeals against these rates were made by some of the largest colliery owners, and in a few instances deductions were made.

There is no noticeable improvement in the iron trade at present. The call for marked bars is quiet at £7. Makers, however, are firm at this quotation, but there is little probability of the standard of the previous quarter being attained at present. Makers throughout the district continue to turn out large quantities of marked bars, notwithstanding the almost unprecedentedly low rates. Unmarked bars have a more ready sale, though but a limited number of parcels are required. Prices range from £5 10s. to £6 10s. Boiler plates are steady at £8 to £9 10s.; sheets are in a little better demand than has been experienced within the last few weeks—singles realizing £7, doubles £8, and trebles £9; hoops sell slowly at prices averaging from £6 10s. to £7 10s.; nail rods are quoted at £6 and £6 10s.; and strip iron, for which a slightly improved call exists, is quoted at £5 15s. to £6 10s. There is little call for the export department, though a few more inquiries than usual have been made on account of the North of Europe.

The pig iron department remains unchanged. Nevertheless smelters continue to turn out large quantities. Stocks are heavier, and prices, if possible, are even weaker. Large quantities of forge pigs are in the market, not only from the South Staffordshire, but also from neighbouring counties. Parcels of Northampton and Derby made pigs are proffered at greatly reduced rates. Best qualities sell slowly at £3, and cinder pig is freely offered at £2. The average output in the district at the present time is very little below 250 tons per week, and there are 42 furnaces in blast. Ironstone and other raw materials are plentiful, and prices remain unchanged. The miscellaneous trades of the district are in an unanimated condition.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The finished iron trade throughout the country is not over active. It is true that at some works a fair number of orders are on the books for merchant iron, as well as other kinds of manufactured material; but other places are by no means well off for work. The output of pig iron is fairly sustained. There is a large quantity of ironstone received into the district from North Lincolnshire, the local measures being but scantily worked. At some of the foundries where gas and water pipes are produced, as well as other specialties connected with the trade, business is very fair, but the demand for household castings is quiet.

Taken as a whole, the pits which are in the habit of raising a good supply of the best coal are doing a fair business, chiefly in connection with contracts. Several important contracts, including Nottingham and Derby, are drawing to a close, and new ones are now in the market. Seeing that the Nottingham Corporation alone have drawn no less than 68,000 tons out of the 100,000 tons of gas coal consumed from eight distinct collieries, much interest is taken in the tenders, which will doubtless be numerous.

The house coal trade was somewhat better last week, but the slight improvement is scarcely perceptible. There is rather more doing by the Yorkshire collieries with London and the South, although prices do not improve at the pits. A slight concession in the matter of the tonnage rates from the Metropolis to various stations on the London, Chatham, and Dover and the London and Brighton Railways has been made known to several firms in South Yorkshire, who are in the habit of sending a fair tonnage of the best qualities of house coal over these lines. The demand for the Eastern Counties is also rather better, but local trade presents but little change, whilst competition is unusually keen.

There is a rather better inquiry for steam coal ; but, owing to the large output, the rates obtainable are no higher. The prospects with regard to the coming export season are favourably reported upon, and a fair trade with the Baltic ports from Hull and Grimsby is anticipated. Contracts are being well looked up, and as some of the very best steam coal is raised in South Yorkshire, a tolerably good trade is anticipated.

Since my last notice the coke trade has not varied a great deal. The output is not so large as it was a short time ago, but the number of ovens at work is larger than it was last year. At several places new slack washing and drying machinery is being provided for the purpose of making a cleaner and better quality of coke than is even now turned out. The North Lincolnshire iron smelters are consuming a good deal of what is made in the South Yorkshire district. This is having a tendency to keep up the price, and limit the supplies of small coal and slack which would find their way into the open market.

The labour market in both districts is less disturbed than it was a short time ago. At several places the "old hands," as they term themselves, have resumed work on the owners' terms, which in the case of the Church Lane colliers amounts to a reduction, whilst at Rockley the 7½ per cent. conceded during the spurt in trade has been returned. A strong effort is being made to amalgamate the South and West Yorkshire Miners' Unions, having the head-quarters at Barnsley, but with what success remains to be seen.

THE COAL AND GENERAL TRADES OF THE NORTH.
(FROM OUR OWN CORRESPONDENT.)

The shipments of Durham gas and other coals from the Tyne and Wear continue to be large. Some 95,000 tons, mostly Durham coals, were shipped from one dock alone—namely, the Tyne Dock—last week. I stated a couple of months ago that large contracts had been made at Newcastle and Sunderland for the supply of gas coals to St. Petersburg, Stockholm, and other of the larger cities and towns in the Baltic, and I mentioned that the low rate at which these contracts had been made had caused a good deal of astonishment amongst the Newcastle merchants. The contract made with St. Petersburg was for 100,000 tons; and the figure was reported to be 12s. 6d. per ton delivered. The contractors reckoned upon a somewhat low rate of freight, but they have evidently miscalculated. There is a small amount of produce comparatively speaking to be brought home. Shipowners refuse to send their steamers out at the freights offering, and instead of 6s. 9d. and 7s. per ton freight being paid, there is reason to believe that it will be 7s. 6d. and 8s.

The price of gas coals is unaltered. The steam collieries are getting into much better work, and an improvement of something like 6d. per ton is shown by recent sales of that class of fuel. As the iron trade is dull, and the mineral traffic upon the North-Eastern Railway shows that the production of iron in the Northern Counties is being restricted, there is a consequently sluggish business done in manufacturing coals and coke. This trade is disappointing; the makers of best coke, however, maintain quotations. There is keen competition amongst the manufacturers of inferior brands.

The coasting freight market favours shippers, and rates are low. The business done with the Baltic last week was large. Somewhat higher rates had to be paid to vessels loading coals for that sea. Small sailing tonnage is far from plentiful in the coal ports; but late fleets have swept the market pretty well of freights to load bricks, &c., in the South. There is very little offering in that direction at present.

The fire-clay and fire-brick trade continues to show more active shipments. Chemicals of all kinds are low, the market having scarcely ever been worse than it was last week. The iron trade is quiet.

An exhibition of gas apparatus—including cooking and heating stoves, gas-engines, burners, &c.—will be held in the Corn Exchange, Basingstoke, during the present month.

THE PUBLIC LIGHTING OF NEW YORK.—A telegram to the *Daily News* of Saturday last states that the New York Commissioners on Street Lighting have given contracts for another year to the various Gas Companies. They say they would have given a contract to light Broadway and Fifth Avenue to the Brush Electric Company had not the Mayor vetoed the ordinance according the Company permission to lay pipes and tubes in the streets.

SWINTON AND MEXBOROUGH GAS COMPANY.—The twenty-fifth annual general meeting of this Company was held on Thursday, the 21st ult.—Mr. J. Barras in the chair—when it was unanimously agreed, on the recommendation of the Directors, to reduce the price of gas to 3s. 9d. per 1000 cubic feet, making a reduction of 1s. 3d. per 1000 feet in four years. A dividend of 10 per cent. was declared on the first and second issues, and of 7 per cent. on the third issue of shares.

CLECKHEATON LOCAL BOARD GAS SUPPLY.—At the first meeting of the newly constituted Local Board for the district of Cleckheaton (Yorks), held last week, it was stated that during the past year the Board had made a net profit from the gas supply of at least £500. The quantity manufactured was 27½ million cubic feet; and the estimated value of the gas supplied to the public lamps (not taken into account when reckoning

the profit, as above, of £500) was £283. During the twelve months the price of gas was reduced from 4s. 2d. to 3s. 9d. per 1000 feet; and £750 was devoted to payments to the sinking fund and for interest on loans.

THE GAS SUPPLY OF PONTYPOOL.—At the meeting of the Pontypool Local Board on Wednesday last, reference was made to the fact that at the previous meeting of the Board a Committee had been appointed to wait upon the Directors of the Abersychan Gas Company with the view of arranging with them for furnishing a supply of gas to the public lamps in the district of the Pontypool Local Board. A letter had, it was stated, been received from Mr. W. White, the Secretary and Manager of the Company, in which an offer was made to supply gas to the Board at the price of 3s. 2d. per 1000 feet, provided the Board would lay down the pipes up to the boundary of the Company's district. Mr. Garrell moved that a Committee be appointed to estimate the cost of laying down the necessary pipes, and also to further confer with the Pontypool Gas and Water Company, in order to bring the question of gas supply to a more satisfactory issue. Mr. Eckersley seconded the motion, and it was carried.

THE OPPOSITION TO THE BEVERLEY WATER BILL.—Last Wednesday evening, a public meeting of inhabitants of Beverley was called, to protest against the Beverley Water Bill as amended by the House of Commons Committee (see *ante*, p. 609). Alderman Crosskill presided, and there was a large attendance. The Chairman, in a lengthy speech, pointed out the importance of the water-works question to the public interest. He contended that the Bill had been promoted by speculators, and that the Corporation represented the majority of the ratepayers in the action which they had taken. He said he was pleased to inform the meeting that they were advised that they could oppose the Bill in the House of Lords with every prospect of success. Mr. Green proposed, and Mr. Foster seconded—"That this meeting strongly protests against an amended Bill now before Parliament, 'For supplying with water the borough of Beverley, in the East Riding of the county of York,' and views with indignation the evidence sworn to by certain witnesses on behalf of the promoters of the Bill, such evidence being contrary to facts, and calculated to mislead the Committee before whom it was given." The motion was carried unanimously; after which Mr. E. Fox moved, and Mr. Samuel Loft seconded—"That this meeting approves of the intention of the Corporation to oppose the amended Bill in the House of Lords, in accordance with the wishes of the great bulk of the inhabitants of the borough." This motion was also carried unanimously.

WELLINGTON (NEW ZEALAND) GAS COMPANY.—The eleventh annual general meeting of this Company was held on Tuesday, Feb. 1, when the Directors reported that, "in consequence of the extraordinary business depression that has prevailed during the past year, the business of the Company has not increased to the extent that was anticipated and provided for; but economy in labour and reduction in the cost of coal enables the Directors to show a satisfactory result on the year's work." The present price of gas—reduced 6d. per 1000 feet last July—is 15s. per 1000 cubic feet, subject to a discount of 4s. 6d. per 1000 feet for prompt payment. Further reductions, the Directors state, are in contemplation. The dividend paid was at the rate of 12½ per cent. for the year; while a sum of £1000 was written off plant, for depreciation. The mains were extended about 1½ miles during the year. The number of consumers' meters in use is now 1677—an increase of 175 during the year. There are two gas-engines at work, and the use of gas-stoves is increasing. The expenditure on works to Dec. 31, 1880, was £87,036 2s.—viz., £84,670 16s. 5d. on land, works, mains, &c., in use; and £2365 5s. 7d. in stock of meters, mains, tools, &c. The cost of coal and purifying material used, wages, renewals, &c., last year was £10,145; and the general expenses were £1508. The gas-rates and meter-rents of the year were £21,448; and the residuals realized £1278. Mr. J. R. George, Assoc. M. Inst. C. E., is still the Company's Engineer and Manager.

TAMPERING WITH A GAS-METER.—At the Blackburn Police Court on Thursday last, John Battersby, a tailor, was summoned at the instance of Mr. S. R. Ogden, Manager of the Corporation Gas-Works, for unlawfully injuring and preventing a gas-meter from registering the gas supplied. The Town Clerk (Mr. W. E. L. Gaine), who appeared to prosecute on behalf of the Corporation, said the defendant was charged, under the Gas-Works Clauses Act of 1871, with fraudulently or wilfully injuring a meter supplied to him by the Corporation, so that the meter would not register the gas passing through it. A hole had been driven through the drum to prevent the gas used being registered. On the 24th of February the meter had registered 100 feet, whereas in the same period last year 600 or 700 feet were registered. When the inspector visited the house on the 7th of March he found the meter had still only registered 100 feet, and on the following day the meter was removed and was found to have been tampered with. Evidence in substantiation of this statement was given by two inspectors. The defendant said he had been away from home, and his father, in trying to make the meter, which was frozen, act, knocked a hole in it. The Town Clerk stated that he had received a letter from the defendant's father, dated the 22nd ult., after the service of the summons, stating that the injury had been caused in the way the defendant had mentioned. He did not press for a heavy penalty, but every one should know that when anything was wrong with a meter application should be made to the proper authority. A fine of 20s. and costs was imposed.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending April 27, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	18.0	17.2	17.5	11.5	8.1	9.9	0.0	0.0	0.0	None.	In excess.
	Camden Town	17.4	16.6	16.9	13.0	11.0	12.2	0.0	0.0	0.0	"	"
	Dalston	17.2	16.8	17.0	11.4	9.3	10.4	0.0	0.0	0.0	"	"
	Bow	17.3	16.2	16.8	16.1	10.9	13.6	0.9	0.0	0.4	"	"
	Chelsea	16.8	16.7	16.8	14.2	13.2	13.7	0.4	0.0	0.1	"	"
	Kingsland Road	17.0	16.5	16.6	12.8	11.0	11.8	0.1	0.0	0.1	"	"
	Westminster (cannel gas). . .	21.7	20.9	21.4	9.8	7.2	8.6	0.0	0.0	0.0	"	"
South Metropolitan Gas Company . .	Peckham	16.7	15.6	16.4	11.0	9.3	10.2	0.2	0.0	0.1	"	"
Commercial Gas Company	Old Ford	16.8	16.3	16.7	10.1	8.4	9.3	0.3	0.2	0.3	"	"
	St. George-in-the-East . . .	17.2	16.9	17.1	7.2	6.0	6.8	0.2	0.1	0.2	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

APPLICATIONS FOR LETTERS PATENT.

- 1751.—HURTER, F., Widnes, Lancs., "Improvements in actinometers, or photometers, or instruments, for measuring light." April 23, 1881.
 1763.—WATSON, W., Leeds, Yorks., "Improvements in gas-engines." April 23, 1881.
 1765.—EDWARDS, E., Southampton Buildings, London, "Improvements in motive-power engines actuated by the combustion of a mixture of gas and air." April 23, 1881.
 1776.—SPRINGMANN, H., Berlin, "Improvements in apparatus for the manufacture of vapour gas from volatile hydrocarbons." A communication. April 25, 1881.
 1777.—PUNCE, R., Middlesbrough, Yorks., "Improvements in and connected with the joints of pipes or tubes." April 25, 1881.
 1816.—MESSENGER, T. G., Loughborough, Leicester, "Improvements in valves and taps for hot and cold water, gas, steam, and other liquids and fluids." April 27, 1881.
 1818.—CLARK, F. W., Westminster, "Improvements in apparatus for regulating the flow or pressure of gases, vapours, or liquids." April 27, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 4143.—COCKEY, H. and F. C., Frome Selwood, Somerset, "Improvements in apparatus used in the purification of gas." Oct. 12, 1880.
 4419.—BENSON, M., Chancery Lane, London, "Improvements in gas-engines." A communication. Oct. 29, 1880.
 653.—SCHÖNHEYDER, W. A. G., Stoke Newington, London, "Improvements in stoves for heating, lighting, and ventilating purposes." Feb. 15, 1881.

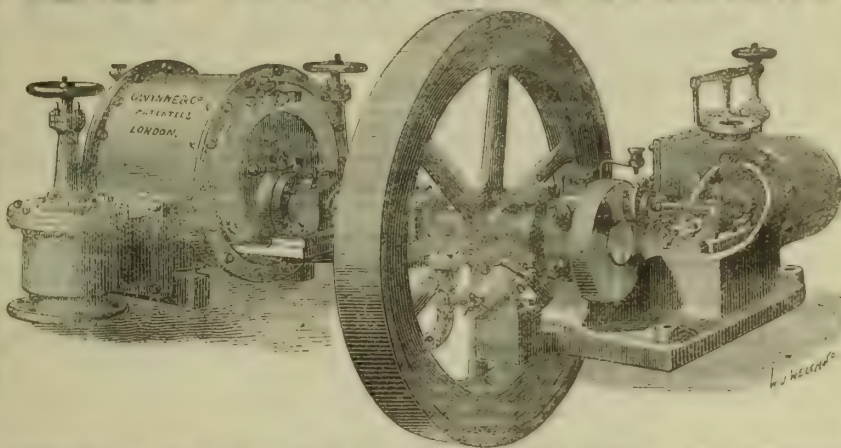
PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 1105.—LAKE, W. R., "Improvements in water-meters." March 20, 1878.
 1219.—KIRKHAM, T. N., and CHANDLER, S., "Improvements in apparatus used in the manufacture of gas." March 23, 1878.
 1267.—CLIFF, W. D., "Improvements in the manufacture of furnaces for gas and other works." March 30, 1878.
 1209.—CLARK, A. M., "An improved gas lighter." April 2, 1878.
 1306.—HULETT, D., KIRKHAM, T. N., and CHANDLER, S. and J., "Improvements in apparatus used in the manufacture of gas." April 3, 1878.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.

Have made the largest and most perfect Gas-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., E-GLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE OSCILLATION, FRICTION, AND POWER.

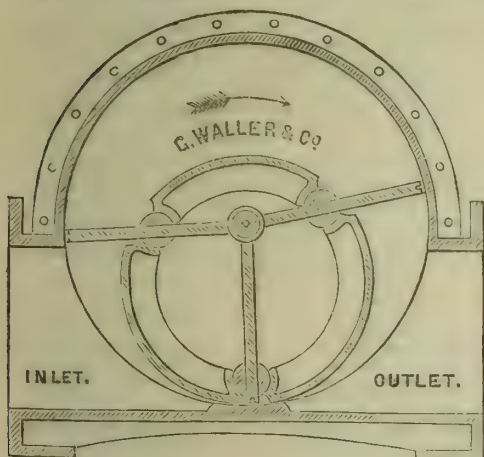
TO WORK BY BELT OR WITH

ENGINE COMBINED.

GEORGE WALLER & CO.,

MAKERS OF

BEALE'S EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, SELF-ACTING BYE-PASS VALVES, TAR, LIQUOR, & OTHER PUMPS, SCRUBBERS & PURIFIERS, CONDENSERS, BOILERS, &c.



Descriptive Catalogue of New Patent Gas Exhauster can be had on application.

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.

THE Advertiser, having completed a Three years' engagement as Clerk of Works at the New Gas-Works, Tunbridge Wells, is desirous of Employment in a similar capacity; or would assist in preparing Drawings for Alterations, Extensions, &c. Address W. G. C., 84, Bentham Road, SOUTH HACKNEY. [Reference, as to character and ability, kindly permitted to R. P. SPICE, Esq., C.E., 21, PARLIAMENT STREET.]

SITUATION Wanted, by a respectable Young Man, as GAS-FITTER. Address H. T., 12, Priory Cottages, Sanley Road, CATFORD, S.E.

WANTED.—The Advertiser, a young man, aged 31 years, will shortly return from a foreign engagement. Has a thorough Practical Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 13 years. A Situation in a like capacity preferred, either at home or abroad, and security to any reasonable amount given for the due performance of all duties in connection with the Office. Unexceptional testimonials as to character and ability. Understands the Spanish language well. Satisfactory reasons for change. Apply, by letter only, to No. 741, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, for a seaside town in Kent, an experienced man to Lay small Gas-Mains and Connect Services, &c.; five or six weeks' work. Apply by letter, addressed No. 743, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., stating wages required, and testimonials for strict sobriety and efficiency.

RE-ENGAGEMENT wanted as Manager or SECRETARY and MANAGER of Gas-Works, or ASSISTANT in large Works, by one who has for the last 12 years been Manager of Gas-Works in a large provincial city. Aged 34; married; abstainer. Can leave present situation at brief notice. Highest recommendations. Address No. 727, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gasholder. Must be thoroughly sound. Price and particulars to be addressed to Mr. EDWARD BAKER, Engineer, Reading Gas-Works.

FOR SALE—A 12,000 feet per hour STATION-METER, Cylindrical Case. In excellent condition, with Tell-Tale, Index, &c. ALEX. WRIGHT and Co., 55, Millbank St., LONDON, S.W.

FOR SALE—Station-Meters (second-hand). A 12,000 ft. per hour, square case, new drum, in perfect order. Price erected, exclusive of carriage, £90. Also a 6000 ft. per hour, cylindrical case with three 8-in. Valves and Connections. Has been overhauled. Price, f.o.b. Edinburgh, £64.

Apply to JAMES MILNE AND SON, Milton House, Edinburgh; or King Edward Street, LONDON, E.C.

ON SALE—One 12-in. Governor, with By-pass and Hydraulic Valves, never worked. Maker: Newton, Oldham.

One WROUGHT-IRON ROOF, 48 ft. span, in good condition.

One MORTAR MILL, 4 ft. 6 in. pan.

For particulars, or to view, apply to Mr. HARTLEY, Gas Manager, Middleton, near MANCHESTER.

ON SALE—Four Purifiers 4½ ft. square, (cast-iron Lids), near Lifting Gear, and Hydraulic Centre-Valve. Also a STATION-METER, with 6 in. Connections; 164-in. Ascension and H-Pipes; and a 12-in. HYDRAULIC MAIN, with Dip-Pipes—all in good condition.

Apply at the Gas-Works, ORMSKIRK.

TELESCOPIC Gasholder for Sale, 100 ft. by 53 ft., with excellent Guide Framing; only been in use 12 years. Now being removed from a large Provincial Gas-Works to make room for extensions, for which there is no other space. If properly re-erected, will be equal to new, and the cost much less.

Particulars on application to SAMUEL CUTLER AND SONS, Millwall, LONDON, E.

BOROUGH OF SAFFRON WALDEN—GAS AND WATER DEPARTMENT.

IN consequence of recent Enlargements of the Gas-Works the following SECOND-HAND ARTICLES are offered FOR SALE:—

Four Purifiers, 6 ft. by 3 ft., with Centre-Valve and 6-in. Connections.

One 6-in. Governor, and By-pass Valve.

JOHN WILSON, Surveyor.

April 26, 1881.

THE Gravesend and Milton Gas Com-pany have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 8-in. GOVERNOR, by Sugg, of Westminster.

For further particulars apply to the undersigned.

S. Sowood, Manager

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned,

R. MORLAND, Engineer.

GAS PLANT FOR SALE.

THE Gas Committee of the Corporation of Newbury having ceased to manufacture Gas at their Old Works, have the undermentioned APPARATUS for SALE:—

25 15-in. Circular Mouthpieces, Wrought-Iron Lids and Cross-Bars.

25 4-in. Bridge-Pipes.

25 4-in. Ascension-Pipes.

1 Wrought-Iron Riveted Hydraulic Main, 36 ft. long, and pierced for settings of 5 Retorts.

5 Furnace Frames and Doors.

1 6-in. Double Vertical Condenser, with Tar Boxes, &c., complete.

4 Purifiers, 6 ft. by 6 ft. by 4 ft. 6 in., with Covers, Lifting Gear, Hydraulic Centre Valve, and 6-in. Connections.

12 Brackets suitable for carrying a 12-in. Main Pipe.

1 6-in. By-pass Valve and Connections.

5 6-in. Rack and Pinion Valves.

1 30-ft. Gas-holder, with Cast-Iron Tank, 18 ft. deep, Columns, Girders, Syphons, and 8-in. Valves, in good condition.

1 Four-way 12-in. By-pass Valve by Cockey, and a sundry lot of different Pipe Connections.

For further information, &c., apply to the undersigned,

J. G. O'FARRELL, Engineer.

TO COAL PROPRIETORS.

THE Directors of the Cheltenham Gas-light and Coke Company invite TENDERS for the Supply of the Best quality of COAL for making Gas, for One, Two, or Three years from the 1st of August next.

For quantity, particulars, and conditions of contract, application to be made to the Engineer.

Tenders, addressed to the Engineer, must be forwarded on or before the 15th prox.

The Directors do not bind themselves to accept the lowest or any tender.

R. O. PATERSON, Engineer.

Gas-Works, Cheltenham, April 27, 1881.

PADIHAM AND HAPTON LOCAL BOARD—GAS

AND WATER DEPARTMENT.

THE Gas and Water Committee of the above Board invite TENDERS for the Supply of COAL and CANNEL, for Gas purposes, during a term of Two or Three years, commencing July 1, 1881.

For her particulars as to quantities, times of delivery, &c., may be obtained from Mr. J. R. Smith, Gas and Water Manager, Padiham.

Sealed tenders, endorsed "Tender for Gas Coal," to be sent to me not later than Saturday, May 14, 1881.

ROBT. DUCKWORTH, Clerk to the Board.

Padiham, April 27, 1881.

DOLGELLY GAS-WORKS, NORTH WALES.

TO be Sold by Private Treaty, the whole of this FREEHOLD and LUCRATIVE UNDERTAKING, consisting of Retort-House, with three Benches recently erected and supplied with Cliff's Oval Retorts; Station-Meter; Governor-Room; two Purifiers; and Gas-holder (10,000 ft.), with Iron Tank; Condensers; Street-mains; Lamp-Posts; Lamps; and other Plant and Apparatus; Manager's House; Workshop; large Coalsheds; a large Garden for extensions if required; the whole property consisting of about half an acre of land. Annual make about 2 million feet.

Personal inspection invited.

Possession August 12, 1881.

Tenders, sealed and endorsed "Tender," to be delivered not later than May 31, 1881, addressed to the undersigned.

The Directors do not bind themselves to accept any tender if not approved of.

JNO. ELLIS, Secretary.

Dolgelly, April 25, 1881.

GUILDFORD GASLIGHT AND COKE COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the TAR and AMM NIACA LIQUOR produced at the Gas-Works, Guildford, during the year ending June 30, 1882.

Tenders, properly endorsed, to be sent on or before May 18, 1881, to Mr LONGWORTH, Gas Offices, Guildford, from whom any required information can be obtained.

Guildford, April 27, 1881.

TENDERS are invited by the Directors of the Armagh Gaslight Company, Limited, Ireland, accompanied with designs and specifications complete for a Single-Lift GASHOLDER, 74 ft. 2 in. diameter by 18 ft. deep, with 10 Columns and 10-in. Inlet and Outlet Pipes, &c.

Tenders not accepted will be returned as soon as possible.

Sealed tenders, endorsed "Tender for Gasholder," to be addressed to John S. Biggs, Esq., Chairman, not later than May 23, 1881.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,

JOSEPH GIBB, Manager.

Armagh Gas-Works, Ireland, April 27, 1881.

THE Gas Committee of the Leeds Cor-poration are prepared to receive TENDERS for all the AMMONIACAL LIQUOR produced at their Meadow Lane Works, during a period of One, Two, or Three years, from the 1st of July next. The quantity produced is about 1,500,000 gallons per annum.

Forms of tender may be had on application to the Engineer, at the Gas-Works, Meadow Lane.

Tenders, addressed to the Chairman, Gas Offices, Boar Lane, and endorsed "Tender for Ammoniacal Liquor," will be received not later than Wednesday, the 18th inst.

The Committee do not bind themselves to accept the highest or any tender.

By order of the Directors,

JOSEPH GIBB, Manager.

Armagh Gas-Works, Ireland, April 27, 1881.

TO COALOWNERS.

THE Gas Committee of the Leeds Cor-poration solicit TENDERS for Supply of CANNEL and Best GAS COALS (Screened or Nuts) for Twelve months ending June 30, 1882.

Samples of every description of Coal intended to be offered will be received not later than the 15th of May inst. for the purpose of being tested—if sent by cart, to the Gas-Works, New Wortley; and if by truck, to the Gas-Works siding, Geldard Junction, Leeds.

Forms of tender may be had on application to the Engineer, Gas-Works, Meadow Lane; or the Secretary, Gas Offices, Boar Lane.

Tenders, addressed to the Chairman, Gas Offices, Boar Lane, and endorsed "Tender for Coals," will be received not later than Wednesday, June 15 next.

The Committee do not bind themselves to accept the highest or any tender.

TO COALOWNERS.

THE Gas Committee of the Leeds Cor-poration solicit TENDERS for Supply of CANNEL and Best GAS COALS (Screened or Nuts) for Twelve months ending June 30, 1882.

Samples of every description of Coal intended to be offered will be received not later than the 15th of May inst. for the purpose of being tested—if sent by cart, to the Gas-Works, New Wortley; and if by truck, to the Gas-Works siding, Geldard Junction, Leeds.

Forms of tender may be had on application to the Engineer, Gas-Works, Meadow Lane; or the Secretary, Gas Offices, Boar Lane.

Tenders, addressed to the Chairman, Gas Offices, Boar Lane, and endorsed "Tender for Coals," will be received not later than Wednesday, June 15 next.

The Committee do not bind themselves to accept the highest or any tender.

TENDERS FOR COALS.

SPECIFICATION.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the Supply of 30,000 tons of SOFT COALS and SOFT COBBLES or NUTS, to be divided into Six Contracts of 5000 Tons each, and to be delivered in the following monthly quantities, viz.:—

1881—May 240

June 240

July 300

August 420

September 500

October 560

November 570

December 570

1882—January 500

February 400

March 400

April 300

Total of each Contract 5000

The Company will undertake to receive from the party or parties contracting the total quantity of 30,000 Tons, in one, two, three, four, five, or six contracts, as the Board may decide; but they do not bind themselves to accept the lowest or other tender or tenders, until after a satisfactory trial of the Coals and Cobbles or Nuts to which such tender or tenders may relate shall have been made. They are to be the best of their kind, and as free as possible from sulphur, bats, bind, refuse, dirt, and shall be weighed upon a correctly-adjusted machine.

Payments will be made monthly, if, and so long as, the Contracts shall be duly fulfilled, to the extent of nine-tenths of the amount of the invoices, and the balance will be discharged on the satisfactory completion of the Contract.

Sealed tenders (to be made on forms obtainable at the Company's Office), specifying the description of Coals and the Pits at which they are to be raised, and stating the prices for delivery by canal at Derby, at the New Gas-Works adjoining the Midland Railway Company's premises, or at the Canal Wharf, and also the price delivered at either of the Midland Railway Stations, or at the Great Northern Station, Derby, and in manner and subject to the conditions aforesaid, must be delivered at the Offices of the Company, Friar Gate, on or before Saturday, the 7th day of May proximo.

The respective contracting parties will be required to execute an agreement to be prepared by, and to the satisfaction of the Secretary of the Company.

By order of the Directors,

ISAAC FISHER, Secretary.

Derby Gas Office, April 19, 1881.

THE Middlesbrough Gas Committee are

prepared to receive TENDERS for the Supply of about 17,000 tons of Best Screened GAS COAL, to be delivered at the Gas-Works Siding, Middlesbrough, in such quantities, and at such times, as may be directed from June 30, 1881, to June 30, 1882. Payments to be made monthly, immediately after Council meeting.

Tenders, specifying the description of Coals, with analyses of the same, together with the names of the pits at which they are raised, are to be sent to me, on or before Saturday, May 21, at my Offices, Corporation Hall, Middlesbrough.

The Gas Committee do not bind themselves to accept the lowest or any tender.

GEO. BAINBRIDGE, Town Clerk.

TO COAL MERCHANTS, SHIPOWNERS, & OTHERS.

THE Directors of the Torquay Gas Com-pany are prepared to receive TENDERS for the Supply, for One, Two, or Three years, of about 9000 tons per year (or such other quantity as may be agreed on) of approved GAS COALS.

Tenders to state the price of the Coals, and the freight to Dartmouth, separately and together; and also for delivery into the Company's works, adjoining the Great Western Railway, free of all charges.

Payment by cash for freight on delivery, and by three months' bill for the Coals.

Further particulars to be obtained from Mr. Greenfield, the Manager of the Company, Hollacombe, Paignton; and tenders to be sent to the undersigned, on or before the 14th of May next.

By order,

JOHN KITSON, Secretary.

Torquay, April 29, 1881.

HALIFAX CORPORATION GAS-WORKS.

TO OXIDE MANUFACTURERS, MERCHANTS,

AND OTHERS.

THE Gas-Works Committee of the Hali-fax Corporation are prepared to receive TENDERS for the Supply of the whole of the OXIDE required at the above Works for a period of Three years, commencing the 1st of September next.

Particulars and forms of tender may be obtained on application to Mr. Wm. Carr, Gas-Works Manager.

Parties tendering will be required to furnish samples of the Oxide proposed to be supplied.

Tenders, endorsed "Tender for Oxide," must be sent to me on or before the 10th of May.

By order,

KEIGHLEY WALTON, Town Clerk.

April 16, 1881.

TO COLLIERY OWNERS.

THE Corporation of the Borough of Dewsbury hereby invite TENDERS for the Supply and Delivery of the following quantities of the best GAS COAL and CANNEL:—

12,000 Tons Gas Coal.

1,000 Tons Cannel.

The Coal to be well screened and dressed, free from scales, sulphurous pyrites, or other objectionable matter. Deliveries to be made in such quantities and at such times as the Manager may direct, from July 1, 1881, to June 30, 1882. The Coal to be delivered at the Savile Town works, or, if sent by boat, to be delivered into boxes ready for hoisting by the steam crane.

The Corporation do not bind themselves to accept the lowest or any tender.

The Contractor to state in the tender the seam and the pit from which he intends to send the Coal.

Sealed tenders, endorsed "Tender for Coal," to be sent to Jesse Smith, Esq., Town Clerk, Dewsbury, not later than Wednesday, the 1st day of June.

Further particulars and forms of tender may be had on application to the undersigned.

C. ARMITAGE, Engineer and Manager.

Gas-Works, Savile Town, Dewsbury.

TENDERS FOR GAS COAL AND CANNEL.

THE Gas Committee of the St. Helen's Corporation invite TENDERS for a One, Two, and Three years' supply of GAS COAL and CANNEL, from the 1st of July next, viz.:—

For the year ending June 30, 1882:—7200 tons of Coal, and 4700 tons of Cannel.

For the year ending June 30, 1883:—7560 tons of Coal, and 4940 tons of Cannel.

For the year ending June 30, 1884:—7940 tons of Coal, and 5180 tons of Cannel.

The monthly deliveries of Coal not to exceed 1200 tons or to be less than 300 tons; and the monthly deliveries of Cannel must not exceed 700 tons or be less than 240 tons.

To be delivered at the Gas-Works, St. Helen's (into which there is a siding from the L. & N. W. Railway), in such weekly quantities as may from time to time be specified in writing by the Manager of the Gas-Works.

The Coal and Cannel to be the best of their respective kinds; to be well screened, and free from all dirt and refuse.

Sealed tenders, stating the net price per ton for each period, properly endorsed, and addressed to the Chairman of the Gas Committee, to be delivered to the undersigned, with an analysis of the Coal and Cannel offered, not later than Tuesday, the 10th day of May, 1881.

The Committee do not bind themselves to accept the lowest or any tender.

By order,

EDWARD DYON, Secretary.

Gas Office, Warrington Old Road,

St. Helen's April 27, 1881.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had

considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, hereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

GAS MANAGER.—It is not legal. See section 98 of the Companies' Clauses Consolidation Act, 1845, if the company be under parliamentary control; or section 67 of the Companies' Act, 1862, if it be a limited liability one.

A COUNTRY SECRETARY.—What you have done should, under the circumstances, be quite sufficient. Leave it to any one interested, if there be such, to ask for other accounts in reference to past years.

T. W.—We do not consider the date (April 23) was fixed at all too early, bearing in mind that the examinations are held in conjunction with those on science subjects at South Kensington—all of which take place during the month of May.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 10, 1881.

THE PROPOSED NEW STANDING ORDER—DEPUTATION TO THE PRESIDENT OF THE BOARD OF TRADE.

THE second part of the proceedings in the opposition of Gas and Water Companies to Mr. Stanhope's proposed Standing Order on the subject of Companies' Money Bills was carried out, as anticipated, on Friday last, when a similarly constituted deputation to that which had previously waited on Dr. Lyon Playfair was received by the President of the Board of Trade. Mr. Michael, Q.C., was again the spokesman of the deputation, but from the nature of the case he had little to lay before the Minister in addition to what he had pre-

viously stated to the Chairman of Committees. There was, of course, the difference—which Mr. Michael did not overlook—that in Mr. Chamberlain he had to convince a man whose official life may be said to have filled him with the principles and motives of the local government authorities, whose powers the deputation wished to keep restrained. Hence Mr. Michael dwelt at greater length on the existing restrictions upon these authorities, in order to show their inefficiency for the purpose desired. He also laid great stress upon the fact that the Court of Referees, whose practice was sought to be overruled by the new Order, had had experience of both kinds, and had deliberately adopted, as being better for all parties, the policy condemned by Mr. Stanhope. A point as to the wording of the proposed Order was also raised by Mr. Baxter, who maintained that the admission into committee-rooms of the Metropolitan Vestries, and other "local authorities" of the same character, would be a consequence thereof. Mr. Chamberlain, in reply, expressed his opinion that by limiting the capital authorized to be raised by Gas Companies, and thus compelling a periodical application to Parliament, the Legislature has shown a disposition to make the extension of capital an opportunity for re-arranging the circumstances of an undertaking, in accordance with altered conditions which might have arisen subsequently to the last previous application for extension of powers. Besides this, the Minister appeared to think that the Referees had fallen into a practice at variance with that of the House of Lords and of the Board of Trade, and should therefore be made to return to the old and uniform principle.

In the former observation Mr. Chamberlain showed that the deeper and less obvious effects of the sliding scale and the auction clauses upon Gas Companies working under both of these modern conditions, had not fully penetrated his mind. This is not at all to be wondered at, as those who have closely watched from their introduction the operation of the same conditions, are not satisfied upon all points which have become noteworthy in this connection, and—what is of greater importance than anything else—the conditions have hitherto only acted in one way; that is, in the direction of cheap gas and high dividends. But with reference to Mr. Chamberlain's observation, it may be remarked that whatever may have been the motives for limiting Gas Companies' capital in earlier days, and so providing frequent opportunities for overhauling the administration of the undertakings, the new conditions have made a radical change in all these considerations. It would be useless to discuss the wisdom of legislative restrictions as to the amount of capital employed in gas undertakings; the principle has taken root, and will not be called in question, at least in this generation. It may, however, be maintained with undoubted cogency, that even if such restrictions are still politic, there was a time when their utility was much more obvious than it is now. Under the old dispensation, which is fast becoming historical, the question of price was far more closely connected with capital than it is under the new conditions. Gas Companies then, as pointed out by Mr. Michael, were merely trading associations with power to pick and choose their customers, and therefore to stretch their capital powers over as many years almost as they desired. Meanwhile, they were enabled to so allot their shares as to keep the undertaking as snug as possible, and in respect of the capital employed they had the power of distributing maximum dividends earned by the sale of gas at or below the price considered reasonable when their Act was passed. Hence there was no other than a moral inducement to adopt new processes—such as the profitable utilization of residuals—which might arise during the time a Company, enjoying a fixed rate of dividend and a fixed selling price, and doing business limited by strictly selfish considerations, could postpone a fresh application to Parliament.

Not to dwell too much on this aspect of the question, for the era wherein these things were possible is happily gone for ever, what is the nature of the change which has been recently brought about? First, and chiefly, the duty of enforcing laggard Gas Companies to adopt methods of cheapening the price of gas has been taken away from the dead letter of the law, left to be enforced more or less intelligently by Local Authorities, and transferred to the parties more immediately concerned, who are urged to good husbandry by the conviction that they shall directly benefit thereby. "A spur in the head is worth two in the heel;" and, as a matter of fact, it is found that, under the sliding scale, reductions in price are frequently made when the local authorized inspectors, though never so keen, would not have dared, under the old regulations, to demand them. As, under the new rules, every reduction in price carries the permission to

divide a higher dividend, it is evident that the more capital there is to share the profits, the less must every proprietor receive. This would tend to render Companies slow to issue new capital, were it not that the lower selling price, coupled with the obligation to supply all comers, makes the continuous expenditure of capital, for extensions of works and plant, a necessary evil. It must be remembered that all these consequences flow simply and directly from the essential impulse which is imparted to the life of a Company by possessing a variable price.

This variable selling price is intended to act from the initial price in two directions—up and down—as necessity enforces. It must be considered as the two arms of a balance oscillating upon the initial as a centre. As a matter of fact, since the introduction of the system, the course of trade has been such that the action has all been in one way, and this is not pleasing to those *quondam* inspecting bodies who abdicated some of their functions in its favour. We do not wish to descend from the general into the particular, but for the sake of illustrating these remarks it is convenient to refer to the threatened action of the Metropolitan Board of Works in opposition to the Bill of the South Metropolitan Company now before Parliament. Notwithstanding the fact that the Company's initial price is below that of any other Metropolitan Company, having been fixed so lately as 1876, the Board desire to have it revised, in connection with the Company's attempt to obtain sanction for their raising more capital and securing a site for an additional manufacturing station; and why? Because, by repeated reductions of price, the Company are able to divide two per cent. per annum above the standard rates of dividend; and the Board, in their wisdom, look at the latter part of the question and forget the former. Consequently, if the action of the Metropolitan Board becomes fashionable, we shall be constantly edified by the spectacle of Companies, whenever they come to Parliament for money facilities, being involved in a struggle to maintain those conditions of existence which have caused the application, and which alone can render the new capital fully beneficial to the gas proprietors and gas consumers. For what does a high rate of dividend amount to under the auction clauses? Simply to a rapid and continuous course of cheapening the production by the help of the premiums paid for the new issues of capital. But to realize this condition to the utmost, it is necessary that the investing public should feel that the security of the high dividends is at least equal to that of the old maximum profits, and this can only be secured by letting it be seen that Parliament will not sanction wanton interference with the initial price by which such dividends are secured. The sliding scale is an infliction upon the consumers, in so far as the initial price is liable to disturbance. The initial price, once fixed, must be left to show its influence in good times and bad, before the policy of interfering with it is even fit for discussion. Therefore, we advocate the adoption of Mr. Pemberton's amendment to the proposed Order, the terms of which are published elsewhere, convinced that the propensity of Local Authorities to meddle with initial prices, as they were once, and with more reason, in the habit of doing with standard prices, is the outcome of ignorance of the true principles of modern gas polity, and is calculated to disturb the investing public, to harass the gas interest, and put difficulties in the way of reductions in the price of gas.

THE CORPORATION OF LONDON ON GAS CONSUMPTION.

It will be within the recollection of our readers that the winter of 1879-80 was signalized, in recent Metropolitan annals, by the occurrence of an almost universal outcry against the Gas Companies, in respect of the increase in the Christmas and Lady-day gas bills. From Hampstead Heath to Peckham Rye, and from Bayswater to Bow, there was dissatisfaction, and murmurs loud and deep arose from hundreds of consumers, and filled the ever-hungry columns of the daily papers. At most of the Metropolitan Vestries there was impassioned debate on this touching question; and, above all, the great Common Council of the City of London took the matter in hand betimes, and—in order to show that the power of the City was not to be restrained from attacking even the Gas Companies, if necessity for such action arose on behalf of the interests of gas-consuming ratepayers, always so carefully guarded at Guildhall—the full consideration of the whole subject was referred to the Gas and Water Committee. This was on Nov. 24, 1879, and a further reference was made on the 4th of the following month. As the Committee were directed to find out the immediate cause of the increased charges, and to determine as to the advisability of taking

parliamentary or other action thereon, it might be supposed that they lost no time in opening and prosecuting their inquiry. What they actually did, however, was to hear the mover of the reference, Mr. G. C. Boor, at length thereon; and then, feeling still very much in the dark, they wisely determined, after an interval of fourteen months, to take the advice of Mr. Charles Heisch, the experienced Gas Examiner to the Corporation. It cannot, therefore, be urged that the Committee acted with undue precipitation up to this point, and they certainly did not subsequently alter their mode of progress. Mr. Heisch received his instructions on the 10th of February of the present year, and reported his opinions next day in a sensible letter which was embodied in a report submitted by the Committee to the Court during the following week, and has just been printed and issued. It is fortunate, in many respects, that the evil complained of with such bitterness at the time has wrought its own cure, for otherwise the late wisdom of the City Authorities would be more regarded, and the disappointment following a perusal of their limp report of three pages would have been greater. As it happens, nobody is likely to care much for an official pamphlet which has been so carefully allowed to grow stale before its issue; but the kind of assistance shown by the present example to be all that oppressed gas consumers can expect from their representatives at Guildhall, is to be commended to the thoughtful consideration of those citizens who may be disposed to rely upon it on a future occasion. In the name of common sense, why did not the Council, instead of hearing Mr. Boor "at length," and taking the trouble to solemnly refer him to the Gas and Water Committee, to be heard "at length" again, call upon Mr. Heisch to give his opinion on the subject at once, so that any advice he might be able to offer to the suffering consumers might have been immediately available? What has been gained by waiting fourteen months before going to the only authority whom they meant to consult, and then trying to swell this man's short and rational letter into a blue-bound pamphlet loaded with various pompous forms of address and dedication? Mr. Heisch has but few words to say on the matter referred to him. He briefly describes how the Company supplying the City, having laid larger trunk mains, supplied gas during the period referred to at a much higher pressure than consumers had been accustomed to, and as there happened to be many foggy days at the same time, much gas was flared away unregarded—until the bills came in. Mr. Heisch happily puts it that by laying down new and large mains, the Gas Companies relieve themselves from a heavy charge for unaccounted-for gas, by throwing it on those consumers who still retained old and unserviceable fittings and wasteful burners. To Mr. Heisch's report the Committee append the sapient remark that "it would appear that to a certain extent the question of controlling the quantity of gas consumed is in the hands of the consumers;" and as, under these circumstances, no further steps remained to be taken in the matter, they asked to be relieved of their onerous responsibility in reference to it. *Parturiunt montes, nascetur ridiculus mus.* The fourteen months' labour of the Committee is represented in substance by the passage above quoted! And yet there are people who think this Metropolis has not a model government.

THE GLASGOW EXHIBITION AWARDS IN SECTION III.

In another column will be found the full authorized text of the report of the Jurors in Section III. of the late Glasgow Exhibition of Gas Apparatus, &c., as approved and adopted by the Executive Committee. We have hitherto refrained from noticing in this column the curious circumstances which have attended the public announcement of the Jurors' awards in this section; but the opportunity now offers for dealing with the subject in a comprehensive manner, and, as far as we are concerned, probably for the last time. The exhibition took place in September and October last, and at the time much eager expectation prevailed to learn the official opinions of the Jurors on the various competing exhibits, as it was generally felt that, under the circumstances, the prizes gained at this exhibition would be more noticeable than usual. It was, in fact, the most pretentious thing of the kind that had ever taken place, and the struggle for awards between rival exhibitors was expected to be keen. Months passed away, and there was no sign from the Executive Committee of the publication of the result of the labours of the Jurors in Section III., or in any other division, except in the case of the abortive electric light trials. At length, on the 29th March, we published a statement of the Jurors' awards, which was subsequently called in question, somewhat feebly, it must be owned, by the Secretary to the Executive Committee. It

has been sought to disparage the announcement published by us, on the ground that the report referred to had not been approved by the Committee; but the substantial accuracy of our information was not impugned. Now we are enabled to give the authorized version of the same thing, and, after all, it may be doubted whether the average reader would be able to detect the differences between the two reports. It is not for us to point out here the differences that undoubtedly exist; diversions of this kind must be left to those who are sufficiently interested to take them in hand. We are, however, free to maintain, more confidently than ever, that we have pursued the right course in this matter. It has never been clear to our mind why the deliberate verdict of a body of skilled observers, such as Dr. Wallace and his brother experts, should be considered untrustworthy until it should have received the indorsement of a very miscellaneous assemblage, such as the Executive Committee of the Glasgow Philosophical Society. We say this in no disparagement of the Committee. Its composition is necessarily heterogeneous, as the duties to be performed are very various; but it could hardly have been expected by Dr. Wallace and his friends, that one of those duties would be the supervision of work for which they are primarily and indeed solely responsible. If jurors are to be edited by general committees, the sooner this is understood the better for all parties, including the public; for it may well happen that the conscientious, if uncomplimentary, remarks of the jurors with reference to the exhibits of one manufacturer and another, may be considerably cancelled by benevolent but unskilled editors, until there results a weak and mangled production, as unreliable as a portrait of a Chinese Emperor from which all shadows are omitted. Rival manufacturers and patentees are frequently as thin-skinned as so many poets; but it is hard on the public, who are expected to buy their wares, if, when they willingly send samples to be tested by certain authorities, it is to be understood that only what is pleasant is to be published concerning them. We take it that a faithful juror is expected, on his own responsibility, to frame his award in consideration of the best and the worst that can be truly said of the article submitted to his free judgment, and for such work only is it necessary to have thoroughly competent and independent jurors. For less than this, inspectors or examiners of any class or rank would be competent, especially if their work were to be in all cases subjected to superior authority for approval. It would be matter for regret if the chief import to practical men of the late exhibition were to be now obscured by mismanagement, arising from weakness or any other cause; and it is to be hoped that there will be no further signs of the shadow of disagreement or uncertainty as to the awards that have still to be made.

A STRUGGLE FOR THE PURITY OF MANCHESTER GAS.

For a gas undertaking to show the consciousness of its managers of the progress of electric lighting by delivering unpurified gas, would, to most people endowed with average common sense, appear the surest way of furthering the interests of the rival system. It did not thus appear, however, to a small fraction of the Manchester City Council, when, at the last meeting of this body, the minutes of the Gas Committee, recommending an expenditure for an extension of purifying plant at the Gaythorne station, were brought forward for adoption. It cannot be laid to the charge of the Manchester Gas Committee that in times past they have been unduly extravagant in the matter of purifying plant; indeed, sulphuretted hydrogen has not always been a stranger to the gas coming from Gaythorne or Rochdale Road; but latterly the Committee have wisely decided that it is not creditable to keep their stations going with purifying power about twenty-five or thirty per cent. below the requirements of the manufacturing department. They now wish to put the Gaythorne station right in this respect before next winter, whereupon their action has met with opposition on the score of the competition of the electric light—as if the battle could be better fought out with foul than with good gas! The majority of the City Council, however, approved of the resolution of the Committee, so it may be expected that the asperities of the next Manchester winter will not be aggravated by the presence within doors of clouds of sulphurous emanations from the Corporation gas.

THE CITY OF LONDON IN ECLIPSE.

WHEN the intention of the Commissioners of Sewers to introduce electric lighting in several miles of the City of London streets and bridges was first announced, we were somewhat puzzled to find out the reason why such a heavy

undertaking was to be entitled an "experiment." Now we know. On Monday night the Brush lamps, which have been so much admired since they were lit up on the last day of March, suffered an unexpected total eclipse of several hours' duration. On this occasion the line of thoroughfares lit by the Anglo-American Electric Light Company, extending from Blackfriars to the middle of Cheapside, was left in darkness on a rainy night, until the gas could be lit up by a suddenly improvised gang of lamplighters. The electric light appeared again on the following evening, but on Thursday last and several subsequent nights the gas was permitted to resume its wonted duty, while some extensive alterations were being carried out by the electricians, with a view, it is understood, to prevent the possibility of another failure, which is said to have been caused by defective insulation of the buried line-wires. Being an "experiment," of course the electric light is not supplied under any penalty for interruptions or defects in the arrangements; but although we have no desire whatever to attach undue importance to the circumstances in question, the great fact still remains that the system of street lighting by electricity has again broken down. The heavy rain of Monday night is credited with having either induced or betrayed the faults in the cable from which the current escaped, with the result of extinguishing all the lamps on the circuit. This may be so, but the excuse is surely almost as bad as the accident itself. In any case, the event is clearly another illustration of the absolute necessity for perfection in a number of interdependent parts, by which alone dynamo-electric force can be generated, distributed, and used. We are continually being told by enthusiastic electricians, such as Mr. Lane Fox and others, that it is much easier to distribute and use electric currents than it is to do the same by gas. These gentlemen doubtless believe what they say; but we candidly own that we should more readily give credit to the tale if were not repeated quite so frequently. Here, at least, we have a positive fact, in the late failure of the Brush system, that the distribution of electricity, to be used for street lighting, is as yet by no means free from difficulty. The present trouble will, of course, be soon got over, but perhaps not so quickly forgotten.

FRENCH GASHOLDER CONSTRUCTION.

IN the present number of the JOURNAL the exhaustive memoir on gasholder construction, adapted from the French of MM. Monnier and Thibaudet, is concluded. The net result of all the researches of the French Engineers is represented in the gasholder and tank of which we to-day give a full illustration. Without enumerating the details of wherein the practice of the two countries differs, it may be said that, starting with the same data, a similar work, if executed in England, would be found to present a marked difference in many respects of appearance and construction. In the single matter of inlet and outlet pipes, it is well known that the articulated pattern is traceable solely to the initiative of the Paris Gas Company, who, if we mistake not, adopted them originally for a gasholder built in a natural tank formed out of an old dock, or river inlet. They have never found favour in this country, chiefly because they must necessarily be much more expensive to make and maintain than pipes for the same purpose built into the tank. It may be said that faulty buried inlet and outlet pipes have ruined many tanks and caused enormous expense in many instances, and that a dry-well greatly increases the cost of such fixed pipes. On the other hand, a leaky joint in the upper portions of articulated pipes must be difficult to detect, and their life can be little, if at all, longer than that of the holder. The subject is well worth discussing, and, on the whole, the profession is indebted to MM. Monnier and Thibaudet for a careful elaboration of the principles involved in the construction of one of the most important classes of structures necessary for the operations of gas-works.

MIDLAND ASSOCIATION OF GAS MANAGERS.—This Association held their Thirteenth Quarterly Meeting at Birmingham last Thursday week, the 28th ult. We have already in type part of the report of the proceedings, but are waiting to give the members an opportunity of revising the notes of their speeches in the discussions on the papers read—viz., by Mr. H. Peaty (Burslem) on Condensation; by Mr. T. Layton (Redditch) on Differential Charges; and by Mr. J. Tindall (Walsall) on Distribution.

It was announced at the meeting of the Institution of Civil Engineers last Tuesday, that the Council had recently transferred Mr. George Garnett, Engineer and Manager of the Ryde Gas-Works, from the class of Associates to that of Members. The last ballot for members during the present session will be taken on the 31st inst.; and all nominations, to be disposed of before the recess, should have been delivered to the Secretary by this time. Possibly, however, they may be in time if received by Tuesday next.

Water and Sanitary Affairs.

A STRONG gathering of landed proprietors and others connected with the Valley of the Upper Thames took place yesterday afternoon at the Institute of Surveyors, Great George Street—Mr. W. H. Smith, M.P., in the chair—to consider measures for the mitigation of the damage caused by Thames floods. A report was presented from a Sub-Committee, recommending that steps should be taken to enlarge the powers of the Thames Conservancy Board. Reference was made in the report to the contribution, amounting to several thousands of pounds, paid annually to the Conservators by those Metropolitan Water Companies who take their supplies from the Thames. The amount thus paid was declared to be “vastly” insufficient, and this idea was endorsed by some of the speakers. We can quite conceive that the sum in question falls very far short of what is wanted, if it is expected that the London Water Companies, or some of them, are to be at the major part of the expense of curing the Thames floods. But so far as the Companies are concerned, we should fancy that the Conservators were no losers. In the next place, any burden of this kind falls not altogether on the Companies; but, ultimately, on the Metropolis, which may object to any further impost. Further, as the riparian owners and occupiers above Teddington complain of the floods, they ought to feel exceedingly obliged to the Companies for drawing off so much of the water—a substantial “mitigation” which was apparently overlooked yesterday.

In the analyses of the public water supplies of England given in this month's *Analyst*, King's Lynn is reported as having a supply which appears as “dirty milky yellow” in a two-foot tube, and having the smell of vegetable matter when heated to 100° Fahr. The Bristol supply is “faint brown” “green, cloudy,” but without smell. The Salford water is “opaque yellow.” In London, a microscopical examination of the deposit was “satisfactory” in the case of the Kent and the New River water. The West Middlesex and the Grand Junction water did not exhibit any deposit, the Southwark and the Lambeth had traces of mineral matter and diatoms, the East London had vegetable *débris* and fibres, and the Chelsea had animalculæ and diatoms. The Kent water had most of chlorine, while the Southwark and the Grand Junction had the least. Of phosphoric acid as phosphates there was but a trace in the London water, while at King's Lynn there was a “heavy trace.” Enlarged instructions with regard to the analyses are shortly to be issued, and the dates on which the samples are drawn will be added to the tables. We appealed last week to Mr. Crookes and his two analytical colleagues, Dr. Odling and Dr. Tidy, to make their reports agree with the calendar month, instead of carrying them up to the 20th day. Now we find that Mr. Wigner and his coadjutors are to give analyses of samples drawn at any date between the 15th of one month and the 14th of the next. Comparisons, therefore, will not be convenient.

The Plymouth Town Council have at length decided on doing something to render the water supply of the borough more secure and abundant. The peril which beset the town some time ago, owing to the freezing of the Leat, or open watercourse, will be generally remembered. Last week a report was presented from the Water Committee, recommending the construction of a storage reservoir on Roborough Down, with a minimum capacity of twenty million gallons, the water to be conveyed from thence to the reservoir at Knackersknowle by means of pipes. The reservoir thus proposed would hold twenty days' supply, and the piping would prevent waste in transit, from which cause it was computed that several hundred thousand gallons were now daily lost. The total estimated outlay was £36,000, exclusive of the cost of the land required. When this report came before the quarterly meeting of the Town Council last Wednesday, an amendment was moved that the piping from Roborough to Knackersknowle be proceeded with, and that a receptacle dam be constructed, of sufficient capacity to convey the water through pipes to Plymouth. It was argued that if the pipes, by the waste which they prevented, did not sufficiently increase the supply, further steps could then be taken. Ultimately the amendment was accepted by the gentleman who moved the adoption of the report, who observed that it was at least a step in the direction in which he wished to go, and must lead up to the storage reservoir. The Mayor also agreed with the amendment, and on a vote being taken it was carried unanimously. During the discussion it was remarked that while conveying the water in pipes protected it from pollution, it also interfered with the purifying effect

of the atmosphere, and was not desirable in all parts of the route by which the water travelled.

Some sensible remarks on “The Impurities in Water” occur in a paper on this subject, recently read before the Chemical Section of the Society of Arts, by Mr. G. Stillingfleet Johnson, M.R.C.S. This gentleman undertook to show “the great usefulness” of many of the so-called “impurities” in natural waters, and he wished it to be understood that in using the word “impurity,” he employed it in its strictly chemical sense, indicating something beyond the bare chemical compound of hydrogen and oxygen. At the close of his paper, Mr. Johnson expressed a hope that he had convinced most of his audience that though they did not drink pure water, “it would be very much worse for them if they did.” Of course, it was possible for water to be polluted in a manner which was injurious, and instances of this kind were pointed out. Organic impurities, including “the detritus of living beings, sewage, and the like,” were not discussed, Mr. Johnson explaining that his reason for “keeping silence upon this great subject” was founded on the incompleteness of our knowledge concerning it. The Chairman of the meeting, Dr. Allen Thompson, F.R.S., said he had experience of remarkably pure water—namely, the supply in Aberdeen and Glasgow—and he was practically aware of the disadvantage which might thus arise, more especially from the solution of the leaden pipes through which the water passed, or from the cisterns in which it was kept. We trust there is less need now than there was a few years ago for enlightening the public mind with regard to the real nature of mere chemical impurity in water. Inorganic matter is not necessarily injurious, and in some forms its presence is desirable. The existence of certain dissolved gases in water appears to be, as Mr. Johnson stated the other evening, “in every way beneficial.” When the public first began to hear from Dr. Frankland, and others of his school, that the London water supply contained various “impurities” and strange gases, the effect was somewhat like that produced on the mind of the individual who was so astonished to see water converted into gases which gave rise to flame and explosion, that he declared he never had much opinion of water, but he had no idea it was so dangerous.

An elaborate and important report on “Some Methods of Disposing of all Kinds of Refuse by Cremation,” has been laid before the Sanitary Committee of the Commissioners of Sewers, by Dr. Sedgwick Saunders, the Medical Officer of Health for the City of London. The report is now in a printed form, accompanied by coloured diagrams and plans, constituting a stout pamphlet, well worthy the attention of those Sanitary Authorities who have not already mastered the problem which is thus expounded. Some of the facts have been discussed at different times in the columns of the JOURNAL, and we look with confidence to the rapid spread of a better method than that which has hitherto prevailed for the treatment of town refuse. A deputation from the Sanitary Committee of the City Commissioners of Sewers visited Leeds and other places a short time back, in order to examine the crematory method as employed by the authorities of these towns for the disposal of their refuse, and the investigation resulted in a very favourable conclusion as to the merits of the plan. Thus impressed, the Committee directed Dr. Saunders to report fully on the subject, and the direction thus given has been certainly fulfilled in a very able manner. Dr. Saunders does not shrink from pointing out the painful characteristics of the present system. Thus he says: “In all the great Metropolitan dust-yards I have visited, the principles which should govern the conducting of the business have been grossly violated, and noxious manufactures on a gigantic scale, and of the most pungent and unwholesome kind, have arisen, and are connived at by those whose primary and statutory functions are the suppression of everything tending to create nuisance or propagate disease.” The City refuse is a tremendous and increasing quantity, and the deplorable condition of the poor creatures who sift and sort the rubbish at Letts's Wharf is feelingly described. “Degrading and loathsome work” is the phrase which Dr. Saunders employs to designate the nature of the employment. There are other abominations which are even worse, as affecting the surrounding neighbourhood, and, on the whole, it seems sufficiently clear that a radical reform is necessary in regard to this matter. A furnace is employed at Letts's Wharf, but it fails to work satisfactorily, and the local Sanitary Authority will not allow it to be used during the daytime. Dr. Saunders describes the “destructor,” invented by Mr. Alfred Fryer, of Nottingham, and gives particulars concerning its operation at Armley Road, Leeds.

The report of Mr. Morant, the Borough Engineer of Leeds, is cited with regard to the "carbonizer," also invented by Mr. Fryer. The Sanitary Authorities of Kralingen, near Rotterdam, have adopted the carbonizer, and appear to be highly satisfied with it. Particulars are likewise given with regard to the working of the destructor at Bradford. At Warrington the destructor and the carbonizer are both at work, as also Firman's "patent double-effect dryer." An important passage in the Medical Officer's report is to the effect that where Sanitary Authorities have adopted the system of cremation for the disposal of refuse, information was obtained by the City deputation which satisfied the latter of the economy effected by the new, as compared with the older methods. The deputation are said to be of opinion that the establishment of the new system in the City of London "will effect an enormous saving" in comparison with the charges now incurred. In one of the northern towns the old cost was £17,000 a year, as compared with £12,000 under the process of cremation. For the disposal of the meat seized as unfit for human food, Dr. Saunders recommends a "carcase crusher." The machine is described, and it appears that it is possible in this way to reduce a dead horse—bones and all—into a state of "exaggerated mince-meat" in thirty seconds. Other processes follow, achieving two results—extracting the fat, and producing "a coarse brown powder, almost devoid of odour," which is received into bags. Carcases of all kinds can be thus disposed of, "without the faintest chance of nuisance." Firman's "desiccating and rendering apparatus," which is to be used in conjunction with the carcase crusher, is the invention of an American whose name it bears, and who has not only surrendered his proprietary rights, but has generously offered to erect one of his machines in the City of London, solely upon public grounds, and at his own cost.

A STUDY ON GASHOLDER CONSTRUCTION.

(Continued from p. 744.)

WE now proceed to describe and illustrate* the gasholder and tank, the principles of construction of which have been considered in the foregoing investigation. The execution of the work was provided for by three distinct contracts, in the first of which was included the tank, which was completed in 1877; while the guide framing and holder, forming the other two contracts, were constructed in 1878.

THE TANK.

We are informed, in the voluminous memoir of MM. Monnier and Thibaudet, that the depth of the tank and all the other points of measurement in the vertical plane of the new work was taken in relation to a previously constructed gasholder, a dressed stone being inserted in the curb of the old tank, from the datum of the level surface of which all the required measurements were made. The centre of the tank was marked by the intersection of lines drawn from two fixed points, selected with reference to their being always undisturbed and visible during the progress of the work. The circle of the tank was preserved by the use of a trammel in the ordinary way. The site was drained by a sump-hole suitably placed, 35 feet deep and 10 feet in diameter, in which was a centrifugal pump.

For the erection of the tank wall—there being other gasholders close at hand—an annular trench about 15 feet in width, and well timbered, was first excavated to the right depth, and the wall was finished in this trench to the full height, and backed up, before the excavation of the dome was commenced. The tank wall was built entirely in Portland cement concrete, while the flooring of the dome was of hydraulic lime concrete. Every cubic metre of cement mixture used as the basis of the concrete (*béton*) consisted of 0.9 cubic metre of washed sand and 450 kilos. of cement. The hydraulic lime mortar consisted of an equal bulk of sand with 350 kilos. of lime. The concrete was composed of broken stone or clinkers mixed with one or other of the above-described mortars, according to its destination, in such proportion that the volume of added mortar was 20 per cent. more than would be required just to fill the interstices between the broken stone. The stone was broken into pieces of between $\frac{5}{8}$ -inch and $2\frac{1}{4}$ inches, and was screened and washed at the same time, every care being taken to remove all traces of clay from the stones as well as from the sand used in the concrete. After the right proportions of the various mixtures had been experimentally settled at the commencement of the work, mixing machines were employed to secure uniformity in the materials.

The tank wall, of the dimensions previously determined (see *ante*, p. 607), was built, as stated, of cement *béton* laid in suitable frames by layers of about 4 to 6 inches thick, the frames being about 3 feet high. The verification of the diameter was carefully repeated by means of the trammel before and after every frame was filled, a variation of not more than $\frac{3}{4}$ -inch being permitted in the radius. The bed of already-laid concrete was always wetted, without pressure, before another layer was laid down, and the last course of every frame was left at an angle of 45°, sloping alternately to the back and front, in order to give a better bond to the following layer of the next frame. Every layer was left 24 hours to harden before the succeeding one was laid upon it. The backing was effected with

soil specially set apart for this purpose, and followed the rise of the wall after about a week's interval. It was carefully watered and rammed until it did not give perceptibly under the blows of the rammers.

The wall being finished, the formation of the dome was proceeded with. The earth was formed to the required spherical shape, and any springs found were traced out and drained towards the sump-hole, by culverts passing under the wall. The *béton* was then laid over the floor.

There were 36 rest-stones, set in cement, fixed in the bottom of the tank. Blocks for securing the tank-guides were also set in the vertical wall. The interior of the tank was plastered all over with equal parts of cement and sand. The surface of the concrete was scratched, and then well wetted by a jet of water, the plaster being laid on about $\frac{3}{4}$ -inch thick and well trowelled. The anchorage-plates for the holding-down bolts were fixed by the builder, and the curb of the tank was finished off with a course of bricks in cement, leaving an overflow at one point. When the plastering was completed, water to a depth of about 16 feet was run into the tank, and the pumping then ceased.

The total cost of the tank as executed, including expenses of supervision and the few works executed by the Gas Company, was about £7520.

In some notes descriptive of the progress of the work of executing and building the tank, it appears that the method adopted of determining the proportion of interstices to the bulk of broken stone to be used in the *béton* was by saturating various samples of stone with water, and placing them in a suitable measure; the quantity of water that could be then poured among the stones until the measure was full representing the amount of the interstices. Gauged in this way, there was a mean of 46.8 per cent. of spaces among the stones. The quality of the hydraulic lime was tested by forming a block of 4 cubic inches from the mortar, mixed as specified, immersed 40 hours in water. These blocks should resist the penetration of a needle weighted to 500 grammes; in reality, the mortar resisted the needle when weighted 130 to 223 grammes above this minimum.

THE GUIDE FRAMING.

The guide framing consists of 18 wrought-iron columns with bases and capitals of cast iron. Against these columns are fixed the guides, which are continued to the bottom of the tank. Each column is composed of 13 cylindrical rings, the higher fitting into the lower, so that the diameter of the column diminishes from 3 ft. 3 in. at the base to 2 ft. $7\frac{1}{4}$ in. at the top. The lowest ring, however, which enters the socket of the base, is not tapered, but is formed out of a plate the ends of which are butt-jointed, with an internal cover-plate, countersunk riveted. This first ring is fixed to the shoe by six bolts, 1 inch in diameter; the base being held down by 3 bolts of $3\frac{1}{2}$ inches diameter.

The girders are formed in three pieces, two of these being part of the column, and the third being fixed in its place between them after the columns had been hoisted. The joints are provided with cover-plates. The girders are of the simple plate form, 1 ft. $11\frac{1}{2}$ in. deep. The columns were put together on the ground and hoisted in one piece; when fixed, the 8 in. by 8 in. H-iron guides were bolted in their places.

The cost of the 18 columns and girders with the H-guides was about £3565, and the weight of cast and wrought iron used was about 188 tons $4\frac{1}{2}$ cwt.

THE HOLDER.

This construction of the holder was undertaken by the same firm who obtained the contract for the guide framing. As shown in the drawing, the inner lift is 125.75 feet in diameter and 26.25 feet deep, with a dome commencing 3 ft. 3 in. from the curb, thus leaving a flat annular row of plates outside, and rising 6 feet in the centre. The outer lift is 128.5 feet in diameter and 26 feet deep.

Inner Lift.

The sides of the inner lift are in eight rings of sheets, arranged to break joint. The top or hanging row of sheets is 10 mm. ($\frac{3}{8}$ -in.) thick, butt-jointed, with $\frac{3}{4}$ -in. rivets; the bottom row is 5 mm. (3-16ths in.) thick; middle rows 3 mm. ($\frac{1}{8}$ -in.) thick. The light sheets are riveted with 7 mm. (about $\frac{1}{4}$ -in.) rivets at about 13-16ths in. pitch. The outer ring of the crown is composed of 54 sheets 10 mm. ($\frac{3}{8}$ -in.) thick, butt-jointed. The inner lap is turned up to form the commencement of the rising dome. It is remarked that this is the heaviest strained part of the crown. The top curb is made of unequal-sided angle-iron, the shorter side being used for the side or hanging sheets. Another angle-iron is riveted round the inner edge of the first flat row of crown sheets. The number of sheets in the spherical portion of the crown, which is composed of nine rings, all 4 mm. (5 32nds in.) thick, has been thus determined:—(1) The width not to exceed 3 ft. 3 in. (2) The number of sheets composing a ring to be a multiple of 9, in order to facilitate the execution of the work by the observance of symmetry between the rings, while preserving the broken joint.

Dome Framing.—This framing is composed of 18 principals, starting from the curb, and terminating in a cast-iron centre-piece. Every principal is formed from plain 8 in. by $4\frac{1}{2}$ in. by $\frac{3}{4}$ in. T-iron top and bottom beams, connected by diagonals of 4 in. by $2\frac{3}{8}$ in. double T-irons placed back to back, and struts of similar design of 3 in. by 3 in. by $\frac{3}{8}$ in. T-irons. The struts are so placed as to radiate from the central point of the sphere of the crown. It will be observed that the lower beam of the principals is horizontal. The deepest part of the girders is therefore in the centre—a form suggested by the absence of a central pillar, which necessitates the con-

* See the lithograph plate accompanying the present number of the JOURNAL.

struction of a principal to act like a bridge-girder from one vertical post to another on the opposite side of the holder. There are eight tiers of purlins, composed of rolled girder-iron, the outside ring being 8 in. by 2½ in. by 5-16ths in., and the remainder diminishing to 3½ in. by 1½ in. by 3-16ths in. next the centre. A system of triangulation by means of 4½ in. by ½ in. flat iron maintains the rigidity of the whole framing.

Vertical Bars.—The 36 vertical stays of the inner lift are of double T-iron, 8½ in. by 3½ in., riveted to the side sheets with 9-16ths in. rivets, and connected in the middle by a T-iron ring. Half of these vertical stays are connected by gussets to the ends of the principals of the dome, which they serve to support, and the remainder are connected, also by gussets, to the top curb.

Manhole.—A manhole 6 ft. 6 in. diameter, with a lid ½ in. thick, is provided in the centre of the dome.

Hydraulic Cup.—This is formed of channel iron 9½ in. by 3½ in. by 3½ in. by 9-16ths in., with a cup-plate 5-16ths in. thick and 17½ in. deep, edged with two half-round irons. The inner lift having no bottom rollers, the guiding is done by the friction of the outer half-round iron against the vertical stays of the outer lift.

Outer Lift.

The Grip.—This is similarly constructed to the cup. The vertical grip-plate is about 2 inches shorter than the depth of the cup, in order to avoid damage to the seal arrangements by the accidental presence of any foreign substance which may have fallen into the cup.

The Sides.—The sheeting is similar to that of the inner lift. The hanging row is 3-16ths in. thick, and the bottom row is of equal thickness. There are 36 vertical stays of double T-iron riveted against the side sheets. These stays are provided at bottom with small cast-iron shoes, to give a larger bearing upon the rest-stones. There are two bottom angle-irons, between which are fixed the bottom roller carriages.

Guiding Arrangements.

The system of guides consists essentially of 54 pairs of tangential rollers in three different horizontal planes—(1) On the top of the inner lift. (2) On the top of the grip of the outer lift. (3) At the bottom of the outer lift. Besides, the bottom of the inner lift is guided by the friction of the half-round iron on the cup against the vertical stays of the outer lift. The top carriages are all made to carry two tangential and one radial roller, in bearings of "anti-friction" metal. Play to the extent of 20 mm. (¾ in.) is allowed to the radial rollers, and of 15 mm. (9-16ths in.) to the tangential rollers.

Inlet and Outlet Pipes.

These pipes are alike, and are situated opposite each other. Each is composed of a fixed cast-iron column, secured to a masonry base. The top of the column carries a knee-joint, after which comes a sheet-iron pipe 20 inches in diameter. Another knee-joint intervenes between this and the next sheet-iron pipe, which, in its turn, is connected to the outer row of the crown plates by a third joint. Walker's valves, 700 mm. in diameter, are used for the inlet and outlet.

Execution of the Work.

The inner lift was built up from the rest-stones in the tank, and the dome was fixed by means of a travelling scaffold. The outer lift was erected on the ground, and lowered by screws in the usual way. The sheets were put together without paper or hemp, and were set up where necessary. The inner lift alone gives a working pressure of 74-10ths, and the two lifts together give 92-10ths pressure. The cost of the holder was £7200, making, with the cost of the tank and guide framing, a total cost for the whole work of £18,285, or about £28 5s. per 1000 cubic feet of useful holder capacity. The holder has continued to give complete satisfaction since it has been in operation.

We hear that Mr. James Braddock, who recently resigned the position of Manager at the Rochdale Road station of the Manchester Corporation Gas-Works, has accepted the post of Manager and Secretary to the Radcliffe and Pilkington Gas Company.

THE READING NEW GAS-WORKS.—The Reading Gas Company have commenced the extension of their works, on land lately purchased by them adjoining their old premises, and conveniently situated in close proximity to the railways on the one side and the river on the other. The first portion of the new works that has been undertaken is the construction of a telescopic treble-lift gas-holder and tank, 132 feet in diameter, of which the first brick was laid on Tuesday last by J. O. Taylor, Esq., J.P., the Chairman of the Company. A report of the proceedings at the ceremony will appear next week. A remarkable feature in connection with the work, and an instance of the difficulties sometimes to be encountered in undertakings of this nature, is the vast quantity of water found in the excavation, necessitating the adoption of arrangements of a very extensive character for pumping. To enable progress to be made, this water has, of course, to be pumped out, and it is computed that upwards of 5 million gallons have to be removed daily from the foundations. Some idea of this quantity may be better realized when we mention that it is more than four times sufficient to supply with water the daily requirements of the town of Reading. For this purpose machinery, consisting of pumps and engines, with an aggregate of 90-horse power, have been fixed, and are in active operation day and night; but even these, we understand, may have yet to be supplemented by further additions. The contractors engaged on the works are Messrs. John Aird and Sons, of Belvedere Road, Lambeth.

Notes.

THE COMPOSITION OF TAR FROM CORK.

As stated a short time since in this column, M. Combe d'Alma has succeeded in some degree in his attempts to make illuminating gas from cork. M. Bordet has recently examined the liquid residual products of M. Combe d'Alma's process, and has communicated some of his observations thereon to the *Comptes Rendus*. The aqueous portion of these products was slightly acid, and was generally similar to the water obtained from the distillation of wood, containing chiefly acetic acid and methylic alcohol; but it also contained a very considerable proportion of ammonia which almost neutralized the acid. Hydrocyanic acid, propionic acid, and other superior homologues of acetic acid, were also detected, together with a small proportion of methylamine. The tar was of a reddish-brown colour, and very fluid, being little heavier than water. It was much more aromatic than coal tar. It completely separated from the water by standing a short time. Distillation was very easy, and gave the following constitution:—Light oil, distilled over below 410° Fahr., 27 per cent.; heavy oil, 27 per cent.; oil showing green fluorescence, 11 per cent.; coke and waste, 35 per cent. The less volatile portions of the light oil exposed to cold yielded much naphthalene; this oil when treated with soda losing only slightly in volume, and sulphuric acid exerts only a feeble action upon it. After these trials it remains a mixture of aromatic carburets. Benzene and toluene are most abundant. From results obtained by a series of fractional distillations, M. Bordet values the richness of the tar in benzene at not less than 4 per cent., and about 3 per cent. of toluene. These numbers are higher than those for coal tar. The heavy oil treated with soda only gave a small quantity of phenols; these bodies being therefore less abundant in cork tar than in coal or wood tar. Lastly, the fluorescent oil which is obtained from the distillation of cork tar at a temperature superior to the boiling point of mercury is, like that obtained from coal tar under similar circumstances, characterized by the presence of anthracene. The conclusion to be drawn from M. Bordet's experiments is that besides illuminating gas, the destructive distillation of cork gives various products analogous yet different from the corresponding derivations from coal or wood. This is due to the fact that cork contains much more hydrogen than coal, and much less oxygen than wood; this double difference accounting for the greater richness in hydrocarbons of cork tar as compared with coal tar, and its comparative poverty in oxygenic compounds as compared with wood.

HEATING GAS FOR PITTSBURGH.

It is announced that the long talked-of idea of supplying gas for general trade and manufacturing heating purposes, in a similar manner to that by which illuminating gas is distributed, is about to be put into practice at Pittsburgh, U.S. Two Engineers, Messrs. Smith and Mackle, have, it is said, invented a cheap and reliable method of transforming all the products of coal into a gaseous mixture of about 8-candle power, eminently capable of being used as fuel. We are not informed to what extent this process differs from that of Dr. Siemens, but it is described as possessing several new features. The choice of Pittsburgh for the introduction of the system into practical working is partly due to the fact that any promising attempt to do away with the innumerable small furnaces, the smoke from which clouds the locality, is certain to attract attention; and there are also a great number of large iron and glass works in the district which would consume a great quantity of heating gas, and render its distribution profitable. It is computed that a consumption of 140,000 cubic metres of gas per day will be sufficient for the requirements of 900 puddling furnaces, 1000 steam-boilers, 6000 houses, and numerous glass-works which already use gaseous fuel. It is intended to charge for the new gas about 3 dols. per day for a puddling furnace, 1 dol. for a boiler, and about 4d. for a dwelling-house. It is affirmed by Mr. Smith that the presence of carbonic oxide in the new gas is immaterial on the score of danger to life, since the insidious character which its lack of distinctive odour gives to this gas is removed by the fact that the proposed mixture has a decided smell, which would at once betray a leak. As the gas is not to be purified in any way, it of course remains to be seen whether the smell evolved from it when burning or otherwise will be found too objectionable for any but the roughest factory uses.

AN IMPROVEMENT IN BUNSEN BURNERS.

M. Terquem has made some experiments with the Bunsen burner, with a view to rendering the flame less fluctuating, and to obtain a means of mixing the maximum quantity of air with the gas, even in large burners, without risk of igniting the gas at the inlet. He endeavoured in the first place to give an equal velocity to the gaseous mixture as it issues from the vertical Bunsen tube, by correcting the influence of the friction of the gases against the sides of the tube, which causes the central portion of the jet to move with a higher velocity than the outside. To attain this end, M. Terquem divides the orifice of the burner into several sectors, by two, four, or more vertical partitions, fixed on the edge and very slightly entering the tube. The central jet, which is richest in hydrocarbons, is stopped by the cross-bars in the centre, and is thrown outward against the sides. In tubes of from 5-16ths inch to 1 inch in diameter two angular partitions are sufficient; for larger tubes up to 1½ inches M. Terquem has four partitions dividing the orifice into eight sectors. He also places a small plate, or a button, in the centre of the orifice, the obstruction being of about half the diameter of the tube. Practically, however, the vertical divisions are better, being more easily

fixed, and causing less constriction of the orifice. M. Terquem fixes his division-plates in the orifice of a Bunsen tube which can be so adjusted as to draw in any desired proportion of air. When the greatest possible quantity of air is being admitted, so that the whole of the carbon of the gas is being burnt with an excess of air—there being, say, four open sectors at the orifice of the burner—at the base of the flame will be seen four little cones of a clear green colour, hardly higher than the partition-plates inserted in the tubes, surmounted by a uniform purple flame with a blue border. If the supply of air is now lessened, the green cones will commence to elongate until they unite in one, occupying the centre of the flame. As the air diminishes the green colour is lost, the purple part of the flame becomes smaller, and lastly, just as the flame is on the point of losing its smokeless character, an internal blue cone (observable in ordinary Bunsen burners) occupies almost all the length of the flame, and mingles with the external blue portion. After this, if the air supply is still further restricted, a luminous point appears at the top of the burner. A sample of gas aspirated from the centre of the flame when the small green cones were apparent—that is, when the burner was working at its best—was incombustible. It is a reducing flame in the interior, and oxidizing only on the outer edge. The production of carbonic oxide in this burner is indicated by the constant presence of the bluish halo surrounding the flame, irrespective of the proportion of air admitted. When the green cones are present the temperature of the purple portion of the flame is very uniform throughout; and is at least equal to the melting point of copper. The flame being solid, it is possible to heat a platinum capsule to between 1800° and 1900° Fahr. inside.

THE COMPETITION BETWEEN GAS AND CANDLE LIGHT.

The effect of the introduction of gas lighting upon the trade in candles may be surmised from a statement recently published by Price's Patent Candle Company, to the effect that this single firm of manufacturers consume annually 25,000 tons of coal, for the production of paraffin, &c., and work up 7000 tons of palm oil, besides large quantities of tallow, grease, cocoa-nut oil, and other materials. From these were made, so long ago as 1877, no less than 147 millions of candles, and 32 millions of night-lights, besides nearly a million gallons of oils and a quantity of other products. It is calculated that the year's produce of candles named above would suffice to give the continuous light of one candle during about 84,000 years, and the night-lights would in like manner give the continuous light of one night-light during about 25,000 years. Significant is the remark made by the compilers of these statistics, that candle-making, in earlier times, was a rough trade, but the modern competition of gas and petroleum has revolutionized the manufacture. What a competitor with candle-light is gas may be imagined from the fact, taken in comparison with Price's Candle Company's figures, that in 1877—the same year to which their statement applies—about 15,184 million cubic feet of gas were sold in London by the six Metropolitan Gas Companies then in existence. Assuming that every one of the candles mentioned was equal in illuminating power to the standard sperm candle, and that the gas in question was of no more than the legal minimum of 16-candle power, it follows that the gas light used in London during that year was equal to 48,588·8 million candles, or more than 330 times the production of Price's Candle Company's factories; consequently, if all their candles made in one year would give the light of one of them spread over 84,000 years, an equal amount of light would be given by the gas during no less than 27,720,000 years—beyond which there is little need of reckoning, in order to include the "night-lights."

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

VOTING BY PROXY.

SIR,—May I ask, through your columns, if any of your readers can enlighten me as to the proper course to be adopted in a case which occurred in my experience similar to the following:—A shareholder issued forms of proxy accompanied by a circular in which he sought election as director. At the same time, another shareholder also issued forms of proxy accompanied by a circular in which he sought election as auditor. The proxies in both cases were in the form of Schedule F of the Companies' Clauses Act, 1845. At the meeting a poll was demanded, when it appeared that several proprietors—doubtless thinking they could give a proxy for each purpose—had given the candidates a proxy apiece, and in some instances the two proxies were dated on the same day. I shall be obliged if any of your correspondents can answer the following:—

1. Does the lodging with the secretary of more than one proxy nullify all?
2. If not, which proxy is to have the priority?
3. How is such priority to be decided, seeing that it is possible to insert a date other than the true one?
4. Can a proxy be withdrawn after being lodged with the Secretary?

May 7, 1881.

RUS IN URBE.

WASHERS AND SCRUBBERS.

SIR,—A circular is being largely distributed by Messrs. Dempster and Sons, of Elland, which is calculated to do injustice to an admirable invention, as well as to discredit the good sense of all those who have adopted it. I trust, therefore, you will grant me space for a correction of their too palpable blunder.

In drawing comparisons between the "standard" and the "tower" scrubber as manufactured by themselves, Messrs. Dempster quote returns from, amongst other places, Leeds, where it is stated the quantity of liquor produced per ton of coals is 10 gallons, of from 10

to 13 oz. strength = 115 oz.; which result they contrast with 280 oz. produced at Elland, and 250 oz. at Wigan.

The explanation is simply that, as regards the "standard," the quantity recorded is only that of the water run into the vessel; and this, very strangely, the advertisers have conceived to be the whole produced.

Since reading the circular, I have kept a strict account of stocks and manufacture over a period of three days; and I find that we have obtained not less than 40 gallons of 8 oz. liquor = 320 oz., which exceeds by 40 oz. per ton of coals the highest result claimed by Messrs. Dempster for their "tower" scrubber.

Leeds, May 6, 1881.

H. WOODALL.

SIR,—I have before me a circular of Messrs. R. Dempster and Sons, which refers to the quantity of crude ammoniacal liquor obtained by the use of the "standard" scrubber at these works, as compared with other scrubbers in use elsewhere. I beg a little space to show the fallacy of the comparison.

The quantity of ammonia arrested by an apparatus must depend on the quantity which enters it with the gas, and the test of comparison of one apparatus and another should be—Which abstracts the largest proportion? Here a quantity is removed by another apparatus placed before it, and all the remainder is abstracted by the "standard." As the whole ounce-strength of liquor realized per ton of coal at these works, during the year ending the 30th ult., was 343·91, and Messrs. D. and Sons credit the "standard" with 144·6, it only proves that 199·31 were given off before the gas arrived at the "standard;" and not that the "standard" could perform the impossibility of removing more ammonia than was associated with the gas.

In my monthly report to the Committee of these works last Monday, I was able to show an increased income from tar and liquor (with a decreased quantity of coal) of £599 18s. 11d. for the ten months ending the 30th ult. This increase, partly due to an advanced price, is mostly creditable to the use of the "standard" scrubber, and may be considered as paying for the first cost of it in ten months.

The suggested procession of a washer, a "tower" scrubber, and a "standard" scrubber, is a capital one. Its adoption would stop all discussion in future as to the merits of the rival machines; but how about the comments of our critics, who are fond of remarking that "we have more money than we know what to do with"?

Dukinfield, May 6, 1881.

HARRISON VEEVERS.

THE BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—Kindly allow me, through the medium of your JOURNAL, to respectfully suggest to the Committee of the British Association of Gas Managers, the desirability of having a synopsis of the proposed changes in the Association printed, and a copy sent to each member along with his meeting circular.

Guildford, May 5, 1881.

WILLIAM LONGWORTH.

THE GAS APPARATUS EXHIBITION AT GLASGOW.

SIR,—My attention has lately been called to the Jurors' report in Section III. of the Glasgow Exhibition of Gas, &c., Apparatus of 1880; and in which I find myself mentioned as an exhibitor.

It was with considerable reluctance, and under the repeated promise of adjudication by the Secretary of the Executive Committee, that I consented to exhibit my patent compensating wet meter; so it is right I should state for the satisfaction of readers of the JOURNAL, and in the hope that I may yet receive an explanation from the Executive Committee—and which I was unable to obtain from their Secretary—why it was that my meter did not receive adjudication.

Adjudication could not possibly be given upon the merits of the meter (unless the Jurors called in *clairvoyance* to their aid) since the meter offered and accepted for this object lay unpacked in a box throughout the exhibition, and is unpacked to this day.

Musselburgh, April 29, 1881.

A. G. HENDERSON.

Parliamentary Intelligence.

HOUSE OF LORDS.

THURSDAY, MAY 5.

Petitions against the following Bills were presented:—

- Beverley Water Bill, from (1) Committee of Visitors of the East Riding Pauper Lunatic Asylum, (2) Corporation of Beverley.
- Birkenhead Corporation (Gas and Water) Bill, from London and North-Western and Great Western Railway Companies.
- Bradford Water and Improvement Bill, from Leeds and Liverpool Canal Company.
- Egremont Local Board Bill, from Lord Leconfield.

A petition against alteration in the Brighton and Hove Gas Bill was presented from the Corporation of Brighton.

FRIDAY, MAY 6.

The CHAIRMAN of COMMITTEES informed the House that the opposition to the Holland (Parts of) and Sutton Bridge Water Bill was withdrawn.

HOUSE OF COMMONS.

MONDAY, MAY 2.

LOCAL GOVERNMENT PROVISIONAL ORDER BILL.—This Bill (to confirm a Provisional Order of the Local Government Board, under the provisions of the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, relating to the borough of Bridgnorth) was ordered to be brought in by Mr. Hibbert and Mr. Dodson. This was subsequently done, and the Bill read the first time, and referred to the Examiners.

A petition in favour of the South Metropolitan Gas Bill was presented from owners, lessees, and occupiers on and near Greenwich Marshes.

TUESDAY, MAY 3.

GAS PROVISIONAL ORDERS BILL.—This Bill (to confirm certain Provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Brentford Gas, Chichester Gas, Ely Gas, Grays Thurrock Gas, Ilford Gas, Kirkham Gas, Northfleet and Greenhithe Gas, Pinner Gas, Staines and Eggham Gas, Stone Gas, and Waltham Abbey and Cheshunt Gas; and to amend the Gas and Water Works Facilities Act, 1870, in so far as relates to places within the

Metropolis) was ordered to be brought in by Mr. Ashley and Mr. Chamberlain. This was subsequently done, and the Bill read the first time, and referred to the Examiners.

WATER PROVISIONAL ORDERS BILL.—This Bill (to confirm certain Provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Dyserseth, Meliden, and Prestatyn Water, Harwich Water, Henley-on-Thames Water, Newport and Pill-gwenly Water, Newhaven and Seaford Water, and Poole Water) was ordered to be brought in by Mr. Ashley and Mr. Chamberlain. This was subsequently done, and the Bill read the first time, and referred to the Examiners.

WEDNESDAY, MAY 4.

A requisition to withdraw their petition against the London Sea Water Supply Bill was presented from the Fulham District Board of Works.

THURSDAY, MAY 5.

NEW STANDING ORDER RELATING TO GAS AND WATER BILLS.

Mr. STANHOPE gave notice that on Tuesday, May 10, he would move the following new Standing Order, for granting to municipal authorities *locus standi* against Gas and Water Bills:—"The municipal or other local authority of any town or district alleging in their petition that such town or district may be injuriously affected by the provisions of any Bill relating to the lighting or water supply thereof, or the raising of capital for any such purpose, shall be entitled to be heard against such Bill."

FRIDAY, MAY 6.

A requisition to withdraw their petition against the South Metropolitan Gas Bill was presented from the Conservators of the River Thames.

THE PROPOSED NEW STANDING ORDER.

Mr. PEMBERTON gave notice that on Tuesday, May 10, he would move, as an amendment to Mr. Stanhope's motion for a new Standing Order, as notified above, that after the word "against," in the last line, the words "any matter contained in or proposed to be enacted by" should be inserted.

SATURDAY, MAY 7.

A requisition to withdraw their petition against the London Sea Water Supply Bill was presented from the Corporation of Kingston-upon-Thames.

Legal Intelligence.

HANLEY COUNTY POLICE COURT.—MONDAY, MAY 2.

(Before Mr. H. C. GREENWOOD, Stipendiary, and Mr. E. J. RIDGWAY.)

THE STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY AND THEIR CUSTOMERS.

At the sitting of the Court this day, the adjourned summonses were heard against five children, between the ages of 14 and 16 years, who were charged with having unlawfully taken water the property of the Staffordshire Potteries Water-Works Company. From the evidence given on the previous hearing it appeared that all the defendants are employed at Davis's Pottery, and they and others engaged at the works were in the habit of going to a tap in an outbuilding, belonging to a Mr. Hampton, and obtaining water therefrom for drinking purposes. Mr. Hampton had complained of his property being destroyed by these proceedings; while the defendants knew they were doing wrong, as two summonses for similar offences at the same place had been taken out last year. The Company, however, did not wish for a heavy penalty; they merely desired to have a stop put to these proceedings. One of the defendants said that Mr. Hampton had given permission to take the water from the tap. Mr. Greenwood thereupon said that if this were the case Mr. Hampton was an offender under the Act; at the same time the wording of the Act was so very wide that he questioned if the defendants could be convicted if their parents paid the Company's water-rates. He ultimately adjourned the summons to enable Mr. Hampton to be present; and he also requested the defendants to tell their parents to attend the Court, and to bring their receipts for water-rates if they had any.

Mr. KNIGHT now appeared for the prosecution, and stated that on the previous Monday it was alleged that the defendants had fetched the water for their own drinking purposes. It had since transpired, however, that instead of the water being brought in small pinks, it had been carried in large pitchers for the manufacturer.

The STIPENDIARY: If that is so, would you not summon the manufacturers.

Mr. KNIGHT: We must summon the parties who take our water.

The STIPENDIARY: The question is whether they have done the Company wrong.

Mr. KNIGHT quoted the 59th section of the Company's Act, which defines it to be an offence punishable by a fine of £5, for a person paying water-rates to allow another person, also paying rates, to take water from his supply-pipes, unless the pipes at the house of the person so taking it were out of order. This being so, he held that it was much more an offence for a person to take it without permission.

The STIPENDIARY observed that his view was that a person, having the right to be supplied with water by the Company, might take it from anywhere in the Company's district for his own use.

Evidence was then given.

Thomas Potter, a man in the employ of the Company, stated that about 7.30 on the morning of the 12th ult., he went to an unoccupied house adjoining Davis's manufactory, where he found the five defendants, each with two ewers, which they filled with water, and were taking them away. On his asking them what they were going to do with the water, one of them replied that they were taking it to the women in the warehouse. Each of the ewers was capable of holding about a gallon of water.

[All the defendants, with one exception, it was here stated are children of parents paying water-rates. The fifth defendant having no father or mother, and lodging with the parents of one of the other defendants, the Stipendiary decided that he came under the same category.]

William Hampton, the owner of the house in question, stated that the taking of the water from his place had been a matter of complaint with him for twelve months. He had been inside it as early as five o'clock in the morning, and as late as ten o'clock at night, and found the taps full on, and the house flooded. Fastening the houses was of no avail, as the locks had been broken off, and panes of glass had been removed from the window. A week previously to the day on which the offence now under consideration was committed, witness had lodged a complaint with the Company.

All the defendants said they fetched the water for breakfast for persons employed in the manufactory.

Mr. KNIGHT said Mr. Davis should supply water for the use of his hands, and not permit them to steal it.

In the issue, the STIPENDIARY adjourned the summonses to await the

result of a special case to be submitted to a higher Court, on the ground of the view he took, that a person having a right to a supply of water at his own house might take it from any other part of the district.

Miscellaneous News.

EXPERIMENTS WITH GAS FOR COOKING PURPOSES
AT SOUTH SHIELDS.

Following up the announcement, which (as has already been noticed in our columns) was recently given by the South Shields Gas Company, of their willingness to afford facilities for their consumers obtaining and fixing gas cooking and heating stoves, it was resolved to practically demonstrate the adaptability of gas for these purposes by giving a luncheon, the whole of the viands at which should have been cooked by gas. Accordingly, on Monday last week the Directors and Officers of the Company received at the works their invited guests, who included many of the prominent gentlemen of the town and district; and much interest was shown by those present in the preparation of the various dishes to be afterwards partaken of.

There were in all eight stoves of various capacities employed, some of which were adapted for an ordinary workman's family, whilst others were sufficient for a family of the upper middle class. Very great care was taken to ascertain the capabilities of the respective stoves, and the result was found to be as follows:—One stove cooked, in 3 hours 7 minutes, a sirloin of beef, a veal and ham pie, boiled a salmon, potatoes, and vegetables. The gas consumed by this stove was 105 feet, and the cost 3½d.; the rate of hire from the Company being 4s. per quarter. Another stove, the rental per quarter of which is identical with the former one, cooked a shoulder of mutton and a tart, and boiled potatoes and peas, in 2 hours 55 minutes, with a consumption of 75 feet of gas, costing 2½d. A third stove (costing 6d. less per quarter) cooked a leg of mutton, boiled potatoes, and stewed steaks in 2 hours 48 minutes, consuming 60 feet of gas, at a cost of 1½d. A cooker suitable for workmen, and the price of which is trifling, cooked nine chops and boiled potatoes in 20 minutes, the gas consumed being about 4 feet, and the cost half a farthing. Ten gallons of water were boiled in an hour, at the cost of about ¾d. An "instantaneous," very cheap and useful water heater supplied warm water within 3 seconds. As a practical test of the relative merits of gas and coal, a leg of mutton was roasted at an ordinary coal fire, and the fuel consumed was found to amount to 3d., 28 lbs. of coals at 12s. 6d. for 15 cwt., 2½d., and a bundle of sticks ½d., which was proved to be 1½d. more than the cost of cooking by gas. There was also another striking difference, seeing that whilst in 40 minutes the coal fire was, to say the least of it, not bright, the gas-stove was ready for the reception of articles sufficient to serve between 15 and 20 persons in 40 seconds.

At the luncheon, Mr. Robert Wallis, the Chairman of the Company, presided. The vice chair was occupied by Mr. J. L. Hall; and there were also present the Mayor of South Shields (Alderman Nelson), the Mayor of Jarrow (Mr. O. H. Duffell), Dr. Armstrong, Mr. John Henderson, Mr. M. Wood, Mr. J. Robinson, Mr. S. Malcolm, Mr. W. J. Warner, Mr. J. H. Penney, &c. After luncheon—the unanimous opinion in regard to which was that it could not have been surpassed even had it been cooked in the ordinary way—a number of toasts were proposed and duly honoured.

The experiments were highly successful, and creditable to all concerned; and it is to be hoped that the spirit shown by the South Shields Gas Company will not only be profitable to themselves, but also an incentive to other companies to follow their example.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Eighth Half-Yearly General Meeting of this Association was held at Newcastle-on-Tyne on Saturday, the 30th ult., under the presidency of Mr. J. H. Cox, of Sunderland. There was a numerous attendance of members and associates.

The SECRETARY (Mr. W. Hardie) read the minutes of the last meeting. These were confirmed; and the annual accounts, which had been printed and circulated, were adopted.

Mr. John Hall, Manager of the Gas-Works, Berwick, was elected a member; and Mr. W. A. Charlton, of Newcastle, and Mr. Roger Shotton, of South Shields, were elected associates.

The PRESIDENT said he was exceedingly glad to meet the members after the severe winter they had passed through, and which had affected themselves and the works under their charge. There was only one subject deserving notice at the present time, and this was the fact that since the last annual meeting of the Association held at Sunderland, Mr. Swan, of Newcastle, had produced his electric light, which was a matter of very great importance and interest to all. He understood that the light was at present being subjected to various tests by the Corporation of Newcastle, and the Gas Company had placed new lamps in the same street, in order that people might form some idea of the respective merits of the two systems of lighting. He understood that in connection with the experiment now being made at Newcastle, there would be furnished definite data as to the cost, illuminating power, and conveniences of the system, all of which points must be taken together in order to judge of the efficiency of the mode of lighting.

Mr. T. N. Ritson (Carlisle) read the following paper:—

ON THE CONSTRUCTION OF A CONCRETE GASHOLDER-TANK ERECTED AT CARLISLE.

Perhaps there are few subjects which have attracted the attention of gas engineers more within the last few years than the uses of Portland cement in the construction of concrete gasholder-tanks; and to-day I have the permission of Mr. J. Hepworth, Assoc. M. Inst. C.E., to lay before you the methods adopted in the construction of the concrete gasholder-tank erected by him at the gas-works, Carlisle.

The first thing necessary was to ascertain the nature of the ground at the proposed site. For this purpose a well 25 feet deep and 4 ft. 6 in. diameter was sunk some short distance from where the tank was to be erected. The nature of the ground then met with was as follows:—3 ft. 6 in. of vegetable soil, loam, and sandy clay; then 17 feet of gravel and sand; and afterwards clay for the remainder (4 ft. 6 in.) of the 25 feet. The boring apparatus further showed the existence of clay at 5 ft. 6 in. lower than the bottom of the well.

The tank was commenced in March, 1878, and completed in October of the same year; the dimensions of it being as follows:—

Diameter inside	124 ft. 9 in.
Extreme depth	31 6
Working depth from top of resting-blocks to top of coping	30 0
Cone 36 feet diameter at top, with an incline of 2 to 1	
Pry well 6 feet diameter by 37 ft. 8 in. deep	

The site being fixed, a circle of the required diameter was marked out and excavated over the whole area to the depth of about 9 feet; the surplus earth being removed by means of carts and barrows, and finally by steam cranes, &c., as the excavation proceeded. In making the necessary exca-

vation for the tank walls and piers, an annular space of the required dimensions was formed, the sides being properly timbered with 14 feet lengths of 9 in. by 8 in. and 11 in. by 3 in. runners and wallings placed vertically, close to each other, and horizontal walling pieces placed 5 or 6 feet apart around the entire excavation, and wedged with strong timber struts.

Water being met with at a depth of 4 feet, pumping became necessary. The dry well was excavated to the required diameter, and carried a few feet lower than the intended structure, the whole being properly shored and timbered as before. This well was used as a pumping-station for a considerable time, and in it was fixed a small Gwynne's patent centrifugal pump, capable of throwing from 20,000 to 25,000 gallons of water per hour. This pump was used for some time, until the water began to make headway, when a second pump (Woodford's patent), of greater capacity than the former, was substituted. This pump was capable of throwing from 60,000 to 70,000 gallons per hour. At the same time the first-named pump was lowered into the well, so as to be in readiness in case of a breakdown. The pumps were driven, by an intermediate motion, by a 20-horse power steam-engine.

The nature of the strata met with during the excavation of the tank was as follows:— $\frac{1}{2}$ inch of vegetable soil, 21 inches of loam, 6 inches of sandy clay, 10 ft. 6 in. of alluvial sand and gravel, 14 feet of clay, 13 feet of running sand with blocks of sandstone, and red sandstone rock, which was only met with on excavating for the pump sump.

Previous to laying in the concrete foundations for the walls and piers, a trench was cut in the bottom of the excavation, and in it were laid 6-inch and 9-inch earthenware pipes, with 4-inch upright junctions, for the purpose of drawing and conveying the water to the pumping-station. By this means the tank was kept comparatively free from water. The whole of the bottom of the excavation was then laid with 1-inch boards, and covered with a neat layer of Portland cement, so as to ensure a perfectly level foundation. Most of the gravel taken from the excavation was used for making the concrete, the whole being first passed through sieves, and the sand and gravel separated, and placed in different heaps. The fine sand so obtained was afterwards thoroughly washed, so as to free it from any earthy matter—a thing most necessary before mixing with the Portland cement, and which should have most careful attention when constructing concrete tanks, for should the sand be contaminated with earthy or vegetable matter, the strength and impermeability of the concrete are greatly interfered with. The clay met with was of a dull red colour, very solid, and comparatively free from earthy and foreign matter. A portion of this clay was used for puddling, the remainder being afterwards worked up, and made into bricks for other purposes.

When the tank was first designed, it was not intended to use any puddle; but on meeting with a much larger quantity of excellent clay than was expected, the Engineer decided upon its being used for backing the walls. The clay was specified to be carefully selected, the best and toughest to be used for the purpose, and all sand and earthy matter rejected. When prepared, to be thrown from the level of the tank walls, and in layers not exceeding 7 inches square, and well trodden in layers of not more than 6 inches, so as to ensure perfect compactness and impermeability of the material. A layer of puddle 18 inches thick was also laid over the cone. The space left behind the puddle when the timbering was removed was carefully filled in with earth, thoroughly consolidated by ramming as the work proceeded.

Though puddle was used in the formation of this tank, there can be little doubt that without its aid the tank would have been tight. At the same time, when constructing tanks where clay is at hand, as in this case, I should think it always desirable to use it. Whether puddle is used or not, it is necessary that great care should be taken to back or support the concrete, in order to resist the pressure of water inside the tank.

The method of mixing the concrete was as follows:—Large wooden platforms about 20 feet square, made of 9 in. by 3 in. deals, were laid on the ground in convenient places, for the purpose of mixing the concrete upon. Wooden boxes, 15 or 18 inches deep, without top or bottom, and capable of holding about half a cubic yard, were used for measuring the material. On the top of these boxes was fixed a straight-edge, for the purpose of striking the levels each time they were filled. The proportions of the material used for making the concrete were as follows:—1 part of Portland cement, 2 parts of clean, sharp sand, 2 parts of gravel broken into pieces not more than $1\frac{1}{2}$ inches diameter. The whole, after being measured out on the platform, was turned over twice dry, and once again thoroughly mixed, when a sufficient quantity of clean water was added through a "rose," and the whole turned over again three or four times wet. Immediately after being mixed, the mass was placed in barrows and thrown down a suitable wood shoot into moulds. These moulds were made of wood, and were about 2 feet deep, and formed to the proper curvature and scantlings of the tank walls. Several carpenters were employed to remove, fix, and alter these moulds to the necessary dimensions of the walls. The concrete was deposited in layers of not more than 6 inches, and not more than 12 inches in depth was allowed to be built in a day. Great attention was paid to the thorough cleansing, roughing, and wetting of the set surface previously laid, before any additional layer of cement was built upon it, so as to ensure perfect contact and cohesion. The footings were prepared by laying on the whole surface of the puddle, at the bottom of the annular space, a floor of concrete 3 feet thick.

The resting-blocks and inlet and outlet pipes being laid in position, the erection of the tank walls was commenced. The mould or framework before mentioned was placed upon the work previously laid, and the space between filled in with concrete, the whole mass being properly levelled and filled in against the sides of the mould. Throwing concrete from a height should always be avoided.

The thickness of the walls at bottom is 5 ft. 3 in., tapering on the outside to 3 feet at top, the total height being 31 ft. 6 in. At every 2 feet in height in the tank wall is fixed hoop iron $1\frac{1}{2}$ inch by $\frac{1}{2}$ -inch, placed $\frac{1}{2}$ inches apart, riveted together with two $\frac{3}{8}$ -inch rivets at each joint, intersected crossways by, and riveted to shorter lengths of hoop iron of the same dimensions.

For the purpose of fixing the channel guides, small apertures were left in the tank walls by means of wooden boxes or cores, and when the bolts were fixed in position these apertures were filled in with neat cement, and well grouted in. The mooring plates are fixed 15 feet from the top of the tank walls in each pier, these plates being fixed in position as the work proceeded; the holding-down bolts were also securely cotted in at the same time. These holding-down bolts were then encased in thin sheet-iron tubes of sufficient diameter to give the bolts a little play. The tubes having a slight taper towards the bottom, are easily withdrawn on the completion of the work. The cavities were afterwards filled in with neat cement. The top of the tank walls and piers are finally surmounted with an ashlar stone coping, 9 inches thick.

The trammel, or radius-bar, used was simply a long rod made of $1\frac{1}{2}$ -inch wrought-iron tube, and the end ringed to an iron centre-pin fixed in a stone in the centre of the tank. On the end of this rod was hung a lead plumb-bob.

On the completion of the tank walls, the interior of the tank was excavated, and the cone formed. After being puddled, a bed of concrete

18 inches thick was laid over the whole area, and finished on the top with a centre pier.

In order to commence with the erection of the walls of the dry well, another pump sump had to be excavated, and the pumps refixed therein. This sump having been got into working order, the walls of the dry well were commenced and erected in a similar manner to the tank walls. The well is 37 ft. 6 in. deep and 6 feet in diameter inside, the thickness of the walls at the bottom is 2 ft. 6 in., tapering on the outside to 2 feet at the top. The bottom of the well is in the form of an inverted arch. The space between the tank and the well is filled with puddle. For some time after the gas-holder had been at work, there was some little difficulty caused by water percolating through the walls of the well, necessitating the use of a hand pump. This pump was fixed on the cover on top of the well, the pipes thereto being so arranged that the pump served to empty the syphons of the inlet and outlet pipes, and to empty the well of water. This incurred considerable expense in labour, and finally the water-pipes were re-arranged, and the well partly filled with puddle. This stopped the slight leakage in the well, and the pump is only used for emptying the syphons. The quantities as taken out for our own guidance were as follows:—

Excavation timbered	5948 cubic yards.
Ditto of interior	7439
Wood boarding under excavation	4723 super. feet.
Concrete in foundations, walls, piers, &c.	3308 cubic yards.
Cement rendering	2960 super. feet.
Puddle	1249 cubic yards.
Stone	1247 cubic feet.
Hoop iron	4 tons.

I may also add that about 800 tons of cement was supplied under the specification.

The whole of the inside of the tank walls, and the inside face of the cone, after being thoroughly washed and cleaned, was rendered impermeable with a coating of neat cement $\frac{1}{2}$ -in. thick. The outside face of the dry well was also rendered.

The cement used had to be supplied to the following specification:—
"The cement to be of the best quality, ground extremely fine, and must weigh not less than 115 lbs. per the imperial struck bushel, as poured into the measure. The cement must not contain more than 15 per cent. of its bulk that will not pass through wire gauze having 2500 meshes to the inch. It must, when gauged neat, set perfectly hard under water in seven days, by which time it must be capable of bearing a tensile strain of 800 lbs. on a cross section of 24 square inches." I must not omit to mention the general specification stipulated that "the contractor must provide a suitable dry shed or other building in which the cement shall be stored in bulk after being emptied from casks or bags, and no cement shall be used that has not been so kept for at least 14 days."

An analysis of the cement used showed the following results:—

	Parts.
Lime	60.88
Silica	23.16
Magnesia	1.01
Alumina	7.58
Peroxide of iron	3.00
Potash	0.72
Soda	0.31
Sulphuric acid	2.60
Sulphur	0.05
Chlorine	trace.
Peroxide of manganese	do.
Phosphoric acid	0.08
Moisture	0.77

I may add, in conclusion, that the tank is a complete success, perfectly cylindrical, and thoroughly water-tight—so much so, indeed, that a fall of rain can be measured—and so far has shown no signs of fracture in any way.

Discussion.

Mr. C. SELLERS (York) thanked Mr. Ritson for his interesting data upon the construction of a concrete gasholder-tank; but thought the paper would have been much more complete if Mr. Ritson had given the meeting a comparative statement of the real cost of the concrete tank at Carlisle, with the estimated cost of the same tank in bricks. He apprehended that such a comparison would be made before concrete was decided upon. Concrete might be cheaper than bricks and clay in Carlisle, for Mr. Ritson told them that good gravel for concrete had been obtained from the excavations, and therefore clay would probably be a scarce article. In York, where his (Mr. Sellers's) Company were engaged constructing a tank, the case was different. Good clay for puddle was found in the excavations, and within their own premises, sufficient for their purpose, whereas they had to fetch rough gravel for concrete from Brough—a place 40 miles off; and these local peculiarities determined them in favour of bricks, as being, in their case, cheaper than concrete. But, even under the most favourable circumstances, he believed that bricks would be cheaper than concrete in nearly all tanks of less than about 100 feet diameter; and, if there was any doubt about it, he apprehended that the local peculiarities named of a gasholder site must determine the question. Then there was another matter. Brick tanks were as old as gas itself, and should not be lightly discarded; for when properly constructed they had always been satisfactory, while he believed the first concrete tank, built by Mr. Livesey, was only about ten years old, and hence, in point of age, was in its infancy. He should like Mr. Ritson to clear up the comparative advantages and cost of each principle.

Mr. W. BROWN (New Cumnock), speaking on Mr. Sellers's question as to the relative cost of bricks and concrete, said it depended entirely on the distance that the different materials had to be brought. He had put a bridge across a river, and built the piers of concrete; and in this case the materials for making concrete were found on the spot, while bricks would have cost 12s. per 1000 for carriage alone, and stone also would have been equally dear. Therefore concrete was the cheapest. As for durability, the piers had stood the test of one of the severest winters ever known, and were likely to prove a good lasting structure.

Mr. W. FORD (Stockton) said his experience had all along been in favour of bricks and puddle for tanks, when these materials could be obtained cheap and good. He thought a brick tank preferable to a concrete one, and it had this further advantage, that it had stood the test of time. Concrete tanks were of comparatively recent date, and might be said to be still upon their trial.

Mr. W. J. WARNER (South Shields) said no doubt locality had much to do in deciding the question of bricks or concrete for gasholder-tanks. He recommended the storing of the old materials to be found in gas-works, for the making of concrete.

Mr. J. HEPPWORTH (Carlisle), referring to the question of Mr. Sellers as to the relative cost of bricks and concrete, said he found there was a saving of 25 per cent. in favour of concrete. Of course, as had been said, the situation of the tank must determine the decision of the engineer as to the materials for building it. In another case in which he was interested, he found that bricks would be cheaper than concrete.

Mr. RITSON, in reply, thanked the members for the reception he had received, and also for the observations that his paper had drawn forth.

Mr. J. Whyte (Seaham Harbour) read a paper entitled

FIRE-STONE VERSUS FIRE-BRICKS FOR FURNACES.

The following remarks are intended to show the advantage and to recommend the use of fire-stone in the construction of retort-house furnaces. Few connected with the management of gas-works have not at times felt uncomfortable, when, from some unexpected demand, being pressed to keep up the supply of gas, they have found that a furnace, which may have been only a short time at work, has given way just when most required. I have myself experienced this on more than one occasion, and have tried bricks from the most eminent makers only to find the difference in their duration comparatively insignificant. I have very seldom had more than about four months' wear out of a brick furnace before it has required renewal. Some managers speak of getting 18 months' work without once laying off; but such is the exception. In a letter I received from a brother manager some time ago, he expressed his doubt at the assertions of the men that four months would wear out the brickwork of the furnace; but when the thing came to be tested he found to his dismay that the assertion was only too true.

Having, therefore, tried different qualities of fire-bricks, and having selected, as I thought, the best, I had one setting of fire-stone put in, and having repaired three furnaces (two of them in brickwork), I had them all set to work at the same time, and, so far as I knew, under similar circumstances. I found, as usual, that in about three months' time the bricks were burned away about 4 inches on the sides of the furnace, while with the stone it was only about 1½ inches. After about another six weeks, or say 125 days' work with one brick furnace, and 136 days with the other, I was compelled to lay them off for repairs, as they were burned through; whereas with the stone I had about eight months' or 232 days' work. Being only an experiment, I was afraid to give the stone-work the credit of this result, but I tried it again until the fact was clearly established. I have had work out of them ranging from 224 up to 270 days, so that I now have all my furnaces set in stonework. You will easily imagine that the saving in fuel is also considerable, on account of the furnace required being so much less after say six weeks' service.

As to the economical aspect of the question, all I can say is that the difference in first cost will depend very much on the local facilities for obtaining the required material. In every case I think it advisable to let the stonework go back at least 18 inches, or even 2 feet behind the fire-bars, as it repays itself very soon. I find the cost of a stone setting to be about 80 per cent. above the cost of brickwork; but if the stone is carefully dealt with in heating up, then the final result will prove satisfactory.

These remarks are made not so much for their inherent worth as for the purpose of inviting discussion on a subject which I am sure has a deep interest for every member of this Association.

Discussion.

Mr. J. NICHOLLS (Southbank) said he had used stone, as Mr. Whyte had done, for 13 years, and had found it lasted better than bricks. There was one disadvantage, that stones had beds in them, and they found them coming off in layers. In order to obviate this, he obtained some rubble, or chippings of the blocks, put them through a mortar-mill, and lined his furnaces with the material every six weeks as required, so as to keep them of the same width as they were originally. He had known the stone to stand for 2½ years.

Mr. Ford said they must all admit that anything which would maintain the side linings of their furnaces would be a great advantage to them. He found that after a year's work the sides of his furnaces had to be re-lined in order to the maintenance of the retorts. If by the use of stone they were relieved of this difficulty, he thought they would be much obliged to Mr. Whyte for introducing the subject to their notice.

Mr. J. A. G. ROSS (Newcastle) asked Mr. Whyte if he could give any idea of the probable supply of fire-stone. The quantity of fire-bricks available was unlimited; but fire-stone was not, and therefore the cost of the latter might be high.

Mr. J. FORSTER (Newcastle) said if the fire-stone was laid on its proper bed it would not peel off.

Mr. Whyte, in reply, said he did not trouble himself about the supply of fire-stone. He had always obtained what he wanted. With reference to what Mr. Forster said, he always endeavoured to have the stone taken the bed way, but sometimes it would come wrong. The stone was largely used in glass manufacture, and it was there he obtained the idea of it for retort furnaces.

The President said they were greatly indebted to Mr. Ritson and Mr. Whyte for their papers, and he had much pleasure in proposing a vote of thanks to them.

Mr. WARNER seconded the motion, and it was carried unanimously.

Mr. HEPWORTH moved an alteration in the rules of the Association, that the retiring President be ineligible as a member of Committee for two years, except in so far as was at present provided by the existing rules.

The motion was seconded by Mr. WARNER, and carried unanimously.

Mr. WARNER moved that £10 10s. be contributed out of the funds of the Association to the Benevolent Fund of the British Association of Gas Managers.

Mr. ALLAN seconded the motion, and it was also carried unanimously.

Mr. D. M. NELSON (Glasgow) moved—"That the question of forming a separate section in connection with the British Association, for the purpose of more fully elucidating matters in connection with gas engineering and all the branches relating thereto, be referred to the Committee of the British Association of Gas Managers."

Mr. WARNER seconded the motion, and it was at once agreed to.

Mr. Ford moved that the rules respecting prizes of books for the best papers read at the meetings be so altered as to give the Committee power to substitute any other article of the same money value that they might consider desirable.

Mr. ALLAN seconded the motion, and it was agreed to.

Mr. MOSSMAN and Mr. COWLEY, who had been appointed Scrutineers, reported the result of the election of Office-bearers of the Association for the coming year to be as follows:—

President.—Mr. T. Trehwhitt.

Vice-President.—Mr. C. Sellers.

Committee.—Messrs. W. Ford, J. Hepworth, J. T. Joliffe, and J. Whyte.

Auditor.—Mr. J. H. Penney.

Secretary.—Mr. W. Hardie.

Mr. WARNER then moved a vote of thanks to the retiring President, Mr. J. H. Cox. In addition to his services on this occasion they could not, he said, forget how much he had contributed to their edification and pleasure at the last meeting at Sunderland.

The motion was carried by acclamation.

The President returned thanks, and announced that the next meeting would take place at West Hartlepool.

During the day an opportunity was afforded of inspecting some excellent models of Mr. Cowan's patent gas-governor, showing its principle and construction. At the invitation of Mr. J. Swan, a visit was also paid to

the premises of Messrs. Mawson and Swan, in Mosley Street, where the Swan electric light was exhibited, and the mode of production explained by Mr. Swan, to whom, on the motion of the President, a vote of thanks was given.

The Association afterwards dined in the Queen's Head Hotel. The chair was occupied by Mr. J. H. Cox, and the vice-chairs by Mr. W. Hardie and Mr. T. Trehwhitt.

After dinner, the CHAIRMAN proposed the toasts of "The Queen," and "The Army, Navy, and Reserve Forces."

Mr. J. B. SIMPSON proposed the toast of "The North of England Gas Managers' Association" and the health of the President. He expressed his belief that such associations, by bringing together gentlemen connected with the management of gas-works, must be productive of a great deal of good, both to gas companies and the public, as the intercourse which took place between managers at the meetings of the associations tended to the spread of information relative to improvements in the production of gas. They had of late heard a great deal in Newcastle about the electric light, but they need not fear that it would put out the use of gas. There was no doubt that gas had a long future before it; and most intimately connected with the manufacture of gas was the coal trade of the district. He was sorry to say that this trade had been very much depressed for some time past, but still they found that the consumption of coal for the manufacture of gas had largely increased. He had been told of an old gentleman who used to say the coal trade was often sick, but never died; and he might remark that he did not think the manufacture of gas would ever die out.

The CHAIRMAN responded to the toast. He said he was quite sure that the meetings of gas managers resulted in a great deal of good; and, in the presence of a formidable rival, such as they had been shown that day by Mr. Swan, it behoved every gas manager to do all in his power to increase the consumption of gas, to decrease its cost, and to make it as popular as possible with the public. If every gas manager did what he could, then they need not look upon electric lighting as an actual rival, but rather as a stimulant to them. It had been found, where gas lighting and lighting by means of electricity were carried on concurrently, that the consumption of gas had very much increased. The electric lamps accustomed the eye to increased light, and consequently led to a desire for more light from gas, and so caused a greater consumption.

Mr. Ford proposed the toast of "Kindred Associations." He said he had had considerable experience with the electric light as an opponent to gas lighting, and had found, from his experience at Stockton, that, instead of diminishing, it had increased the demand for gas, and he believed that so long as they attended to the three points named by the Chairman, they would be able to make butter for their bread, and good dividends for their corporations or companies.

Mr. NELSON responded.

Mr. T. Y. STRACHAN proposed "The Trade and Commerce of Newcastle and District," and Mr. J. H. BURN responded.

Mr. SELLERS submitted a novel toast, "The Platform," which he said he treated from an educational point of view. The platform was the place where the greatest freedom of speech was to be found, and where every new idea was first introduced to the public. It was on the platform where men met on an equality, and where one man was as good as another, and in many cases a vast deal better. There science found a home, and from the boards of the platform science teachers gave their knowledge and experiments to the world. He dwelt at some length upon the importance of high-class education to gas managers, and pointed out the growing necessity for the acquisition of scientific knowledge, for he felt sure that routine and rule of thumb could not succeed in the present day. He was of opinion that no class of men needed more varied knowledge than gas managers. Not only must they, to be successful, have a good knowledge of mathematics, engineering, and chemistry, but gas products, which now formed a great source of profit, made it necessary that gas managers should keep a close watch upon trade and commerce. It was true they had much prejudice to contend with, and the electric light greatly stimulated this feeling. In fact, the outside public seemed to have far greater expectations of the electric light than electricians themselves, and were often prophesying that the occupations of gas managers would soon be gone; but he (Mr. Sellers) believed that they would very soon find that their high-flown predictions, like many "swans," would merely turn out to be geese. He was proud to say that the platform had done much to help the gas cause, and whenever gas managers had stood upon its boards they had done it credit.

The health of the Secretary was then given, and was responded to by Mr. HARDIE, after which the company broke up.

THE MEETING OF THE WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(FROM A SPECIAL CORRESPONDENT.)

It was with a feeling somewhat akin to fear that on Thursday last I wended my way to the Religious Institution Rooms in Glasgow, to attend the annual meeting of the West of Scotland Association of Gas Managers. I feared that the sun of its prosperity had sunk; that its members were lifeless; and that the only duty that remained to be performed was the melancholy one of writing the obituary notice of the Association—to notify, in as delicate a way as possible, that on a given date the Association had gone the way of all flesh. But on arriving at my destination I found that, if there were to be funeral obsequies, they would be participated in by a large number of associates, and after a few minutes' conversation with some of the most active members, all my gloomy and funeral forebodings were entirely dispelled. Although the programme which had been prepared by the energetic Secretary of the Association did not at first glance appear to be one of the most inviting, hope was inspired in my breast that "In this best of all possible worlds everything was for the best." The meeting having been constituted shortly after eleven o'clock, some formal business, such as the reading of minutes of previous meetings, was transacted. And here I would incidentally mention that much of the valuable time of the Secretary might be saved if, in the minutes, less attention were paid to details which are reproduced in the annual report. Some new members were admitted, and then Mr. Dalziel, of Kilmarnock, was unanimously elected to fill the presidential chair; and Mr. Napier, of Crieff, was appointed Secretary. The retiring President, Mr. R. S. Carlow, formerly of Port-Glasgow, and now of Arbroath, afterwards delivered his valedictory address. In his opening sentences Mr. Carlow apologized to the members of the Association that, owing to recent changes, in which he himself has prominently figured, he had been unable to devote that time to experiment and research which would have enabled him to prepare an address worthy of the occasion. It is not necessary that I should do more than give a faint outline of the grounds of the President's address, as the readers of the JOURNAL will have it *in extenso* in the course of a week or two. At the outset he urged upon the members the necessity of preparing papers for these meetings. This was a duty which, he said, was due to the other members of the Association, and it was a duty which every individual owed to himself. Its performance advanced the interests of all con-

cerned, and its avoidance could only lead to one result—namely, that of decay. I have little doubt that Mr. Napier, the new Secretary, will take care that members do not forget their duty, and that the next meeting, which takes place in Dumbarton, will be more productive of papers and discussions of a more practical character than that which has just passed away. The President next quoted from an old book containing the Act of Parliament for the Glasgow New Gaslight Company, and the prospectus which was issued to intending shareholders, of date 1819, and from the figures therein given he drew a comparison between the gas lighting of that period and the present time. Glasgow, he said, had advanced with rapid strides in material prosperity, and the manufacture and sale of gas had kept pace with it. In the Act which Parliament was to be asked to sanction, the Company were restricted from allowing any of the heavy oils and liquors from passing into the Clyde. This, he remarked, was a restriction which was useless in our times. The value of the bye-products was now too well known to allow them to escape from the works. They were yet to play an important part in the reduction of the price of gas, and it was his firm conviction that just as gas companies and corporations introduced the requisite machinery to break up and convert the liquors into their marketable substances, so would be the measure of profit realized. He then went on to point out that the prosperity of Glasgow from a gas point of view was not exceptional. All over the country gas companies and corporations were increasing their business, reducing the price of the manufactured material, and still adding to their profits. While this was the case, it was claimed for the electric light that it was making great progress; but so far as he had read, he had failed to discover that there had been any material results, in the shape of profits, from the progress. Diverging for a moment, I may mention that in Greenock, where there is every night a dazzling electric glare, general satisfaction with it does not prevail, and it has been found, by some rough but approximate tests, that the illuminating power of the light is considerably under that claimed for it. In view of this extension of electric lighting, however, the President strongly urged upon his brethren to do their utmost to introduce improved burners, so that the public might quickly realize the value of the lighting agent which was at hand, and the merits of which in the past had been sadly overlooked. In this way he anticipated that the demand for gas would increase. The President also took up and dealt with the proposal of Dr. Siemens to provide two qualities of gas for lighting and heating. This he condemned on practical grounds. But apart from these, he mentioned that the gas-fire was introduced primarily to keep the atmosphere free from smoke. If instead of smoke a sulphurous gas were consumed, a larger quantity of sulphuric acid would be set free, and this would certainly be dangerous to vegetable, if not to animal life. The address, of which the foregoing is a mere outline, was listened to with much attention, and at its conclusion a very hearty vote of thanks was accorded to Mr. Carlow.

The President-Elect followed with a paper upon "Public Lighting," in which he showed the great amount of loss sustained through leakage in connection with public lamps and services. He maintained that, even in the case of the gas-works belonging to a corporation, the lamps should be paid for; but if the lamps were lighted gratis, the manager ought to get credit for the quantity of gas consumed in them. In Kilmarnock he was satisfied, from the observations he had made, that the loss by leakage on each lamp per year was not less than 360 cubic feet. Mr. Dalziel then gave some valuable practical advice as to the best mode of ascertaining the consumption of each lamp. The question is an important one, and I do not think it should be lost sight of, as its solution goes far to explain the variations in the percentage of leakage.

Mr. Johnston was on the card for a paper on mains and services; but he has been so busy of late that he was prevented from preparing his paper, and also from coming forward to tell the Association this in so many words. But Mr. D. M. Nelson, who is always so willing to step into the breach, and with his burly figure to stop up a gap, came forward and explained Ford's patent washer, for which he claimed many advantages. These, however, he will best explain in the paper which he has promised to supply for publication.

A number of other matters of lesser importance occupied the time of the Association till four o'clock, when an adjournment was made for dinner. Amongst other toasts which were proposed after dinner was "The Gas Corporation of Glasgow," coupled with the name of Councillor Richmond. Mr. Stewart, of Greenock, who proposed the toast, pointed out how unfair it was to other towns that Glasgow should reduce the quality of its gas. He would, if possible, double the quality, and so doing he thought they would hear less of the electric light in the future than they had done in the past. Councillor Richmond acknowledged the toast, and endorsed the sentiments of Mr. Stewart.

Altogether the meeting was a much more successful gathering than had been anticipated.

THE CORPORATION OF LONDON AND THE ALLEGED INCREASE IN THE CONSUMPTION OF GAS.

There has just been made public—having passed the Court of Common Council of the City of London on the 26th ult.—a report by the Gas and Water Committee of the Corporation upon certain references made to them, on Nov. 24 and Dec. 4, 1879.

The report, which is dated Feb. 17 this year, sets forth that the Committee were "to consider and report as to the practicability of taking any steps for the purpose of finding out the cause or causes of the enormous increase in the charge for gas to private consumers, and as to the desirability of taking any, and if any what action, parliamentary or otherwise, thereon;" and further "to inquire as to the causes of the increased quantity of the gas charged to the consumers during the last year." They state that they heard Mr. G. C. Boor, the mover of the reference, "at length, thereon;" but, as they "felt it very desirable that scientific information should be obtained upon the subject," they referred the whole question to Mr. Charles Heisch, F.C.S., the Gas Examiner to the Corporation. Mr. Heisch's report they give *in extenso*; and from it come to the conclusion "that, to a certain extent, the question of controlling the quantity of gas consumed is in the hands of the consumers; and, under these circumstances, as it appears no further steps can be taken by your Committee in the matter, we recommend that the reference be discharged."

The following was Mr. Heisch's report:—

"Feb. 10, 1881.

"Gentlemen,—In compliance with your resolution of the 9th inst., that I should report what, in my opinion, are the causes of the increased consumption of gas in the City, I beg to say that I believe they are mainly two.

"To understand the first, it must be remembered that for a good many years great complaints were made of a deficiency of pressure in many parts of the City. At the same time, the Gas Company were accused of bad management, on account of the large amount of 'unaccounted-for gas' which appeared in their accounts.

"At that time the City was mainly supplied through old and small

mains, in which any increase of pressure caused leakage. When the large new mains from Beckton were completed in the City, the extra pressure, which had been so long asked, was given, as the mains would now bear it, and two results were produced to the consumers. First, the fittings, which were quite sufficiently good to stand a pressure of 0·7 inch, would not stand one of 1·7 inch, and thus much of the 'unaccounted-for gas' which formerly appeared in the accounts of the Gas Company was transferred to the accounts of the consumers. Second, the servants of consumers turned on the taps as fully as in the old time, and much gas was thus wasted, as roaring flames give no proportionate light.

"The second cause, I may mention, was that at the time when the increased consumption began there was a period of very dark and foggy weather, which always causes much larger consumption than most people believe. It is too generally forgotten that darkness caused by fog is not like the darkness of night—a simple absence of light—but is the result of a state of atmosphere which has the power of obstructing the rays of the sun, and therefore a much larger amount of gas has to be burnt to enable you to see, than is wanted on the darkest night with a clear atmosphere.

"Of course, what I have stated may not cover every individual case, but I believe it will cover the general question. I may mention that much gas is often wasted by having too small a meter, and too small pipes to convey the gas to the burner; a given quantity of gas to go through a small pipe in a given time must move at a much quicker rate than if passing through a large pipe, and thus much rushes through the burner too fast to give its proper light.

"After spending nearly three years in an inquiry similar to the one you have now in hand, and consulting almost every authority in the United Kingdom, the Corporation of Dublin came to two conclusions—first, that it was useless to ask for power to prevent a gas company from giving more than a certain pressure, inasmuch as it is the interest of the Company to give as little as they can do with, and if only a minimum pressure be given in the highest part of a district, or in that nearest to the works, the lower and more distant parts would be starved;* second, that the only remedy for the increased consumption complained of is, for consumers to see that their meters are of proper size, their pipes large enough, and all their fittings sound, and then to control the supply by the tap on the meter, and prevent the carelessness of their servants by the use of governors on their burners.

"I do not say these were the precise terms employed, but they embody the sense, and are, I believe, perfectly just.

(Signed) "CHARLES HEISCH."

THE LIBEL ON THE SALFORD GAS ENGINEER.

Many of our readers are aware that, for some time past, legal proceedings have been pending in regard to a statement made by Mr. Ellis Lever, of Manchester, as to the coal contracts given out by the Salford Corporation Gas Committee. The assertions were, to say the least, capable of being construed as highly detrimental to the professional status of Mr. Samuel Hunter; and consequently this gentleman commenced an action for libel against Mr. Lever, which action has happily now terminated. A short time since a demurrer to the pleas was argued in London, and decided in Mr. Hunter's favour; so that the trial of the cause, had it not been abandoned for the reason stated below, would have come on at the next Manchester Assizes.

However, at last Wednesday's meeting of the Salford Town Council, the minutes of the Gas Committee contained the following letter on the subject from Mr. Hunter:—

To the Salford Corporation Gas Committee.

April 26, 1881.

Gentlemen,—I have to report to you that the action taken by me against Mr. Ellis Lever, of Manchester, and Cucheth, Bowdon, has been brought to a satisfactory termination. The case tried in London, on the demurrer of Mr. Lever, was decided against him, and in obedience to the order of the Court he has paid the costs on both sides. Since then, through his Solicitor, Mr. Lever has sent to my Solicitors such an apology as they deem a clear and entire vindication of my character, and in addition to the above costs he has paid the further sum of £95 18s. 4d. to my Solicitors (Messrs. Brett and Craven), as explained by their letter herewith. Under the circumstances, I consulted my Solicitors, and as a friend I asked Mr. Christopher Moorhouse, your late Town Clerk, to advise me the proper course to pursue. The opinion of each (supported by the Counsel who has all along directed us) was that Mr. Lever having made an admission of the wrong done by him, and rendered an ample apology, besides paying all the costs as between solicitor and client, it was unnecessary on my part to proceed further.

Mr. Moorhouse, after stating that it is due to myself and the Gas Committee that Mr. Leigh's letter should appear at full length on the minutes, concludes by saying, "I congratulate you heartily on your present position in this matter."

I now ask for your approval of the course I have taken, and that this letter and my Solicitors' letter shall be recorded on your minutes. (Signed) SAMUEL HUNTER.

The minutes also contained a letter from Messrs. Brett and Craven, advising Mr. Hunter not to continue the action to the assizes. The Gas Committee had resolved—"That this Committee desire to express their continued confidence in Mr. Hunter, and to record their extreme satisfaction at the result of the action taken by him to vindicate his character from the uncalled-for and unjustifiable attack made upon him by Mr. Ellis Lever, and that the letters be read to the Council."

THE NEW GAS-WORKS AT WARRINGTON.

From an account, recently published, of the various works now in progress at Warrington, we glean some particulars of the new gas-works being erected by the Corporation, under the direction of their Gas Engineer and Manager, Mr. James Paterson. This extension of the gas plant has been rendered necessary by the steady growth of the consumption as evidenced by the fact that while in 1851 the make was only 44,900,000 cubic feet, it rose during the municipal year 1880-81 to 144,665,000 feet.

The works have a communication with the London and North-Western Railway, by means of which all materials employed are conveyed to and from the works by a high and low level railway. The retort-house is 148 feet long and 60 feet wide, and has a retort-bench in the centre, to contain 84 double retorts capable of producing about 800,000 cubic feet of gas per day. The retorts-lids are hinged and self-sealing, and all pressure is removed from them by a valvular arrangement on the hydraulic dips. On each side of the retort-house, and parallel therewith, are coal stores 24 feet in width, having a railway 14 feet above the floor level, by means of which the coal and cannel are conveyed in waggons, and thence weighed out to the retorts. The coke store is 148 feet long and 36 feet wide. The roof principals of these buildings are of wrought iron, and these, together with the girders and cast-iron columns, combine strength and utility with the least possible expenditure of capital. The condensers consist of a double row of 12-inch pipes, 30 feet in height, the gas being divided into 28 parts corresponding to the number of pipes, thus maintaining a slow action in the process of condensation. The exhaust is produced by a jet of high-pressure steam in one of the Cleland-Körting exhausters. Uniform with the condensers are similar arrangements for a steam scrubber. The purifiers are of cast iron, 20 feet square and 5 feet deep, and are supported on cast-iron columns and girders. There are six in all, four designed for oxide of iron and two for lime. The purifying

* The difference of pressure caused by difference of level between Thames Street and St. Paul's Churchyard is about 0·5 inch.

material is brought alongside the house by railway, and is lifted from the lower to the upper or purifier floor by a steam-engine. The same power is also applied to lifting the purifier covers, which are of wrought iron, and weigh about 3 tons each. The house in which the purifiers are situated is 90 feet long, 60 feet wide, and 32 feet in height from the ground line. The complete arrangements in this house for the reduction of manual labour are very satisfactory. To the south of the purifying-house is a new telescopic gasholder, diameter 120 feet, height 40 feet. It is supported by 14 cast-iron columns, 3 feet diameter, and two rows of wrought-iron girders. Between the retort-house and the purifying-house is a series of buildings consisting of boiler-house, smithy, engine-house, pump-house, station-meter house, governor-house, photometer-room, and offices, &c.

In the construction of the works the aim of Mr. Paterson has been to reduce manual labour to a minimum. In their general design they are so constructed as to form a complete portion of larger works, and future extensions will only form a continuation of the same arrangements, without in any way disturbing the present unity of the whole.

THE GLASGOW PHILOSOPHICAL SOCIETY'S RECENT
EXHIBITION OF APPARATUS
FOR THE UTILIZATION OF GAS, ELECTRICITY, ETC.
REPORT.—SECTION III. ON GAS METERS, GOVERNORS, ETC.
Jurors.—Dr. WILLIAM WALLACE, F.R.S.E., F.I.C., F.C.S., Convener;
Mr. HAZELTON R. ROBSON; Mr. D. CORSE GLEN, F.G.S., and Mr.
J. J. COLEMAN, F.C.S., F.I.C.

The exhibits in this section consisted chiefly of instruments for the measurement and registration of gas, and the regulation of pressure. A few articles for which a place could not conveniently be assigned in the other sections were also examined.

All the exhibits were examined by the Jurors in the Burnbank Hall, but the gas-regulators were afterwards tested by the Convener at the gas-meter testing office. After the close of the exhibition it was determined to invite the manufacturers of dry gas-meters who had entered dry meters for adjudication, to send to the gas-meter testing office in this city, one dozen meters, including three each of the following sizes:—2 lights, 3 lights, 5 lights, and 10 lights. The firms who were thus invited to send specimens of their manufacture were, Messrs. W. and B. Cowan, Messrs. Alder and Mackay, Mr. James Keith, Messrs. George Glover and Co., and Messrs. D. Bruce Peebles and Co. The response was favourable in every case; 60 meters in all were received, and these were subjected by the Convener of the Committee and his chief assistant to an exhaustive series of tests, the results of which are detailed in the accompanying table. Each meter was tested for accuracy of registration with one gas-burner only at 0.5, 1 inch, and 3 inches pressure, and with a sufficient number of jets open to give the full capacity of the meter at one-half inch pressure, at 0.5, 1 inch, and 3 inches pressure. The quantities of gas passed by the 2-light meters varied from 6 to 24 cubic feet per hour; by the 3-light meters, from 6 to 30 feet; by the 5-light meters, from 6 to 60 feet; and by the 10-light meters, from 6 to 180 feet. It was suggested by one of the manufacturers that the meters should be tested also with the utmost quantity of gas which they could be made to pass, that is, with the outlet open; but other makers objected to this arrangement, as being entirely beyond the duty the apparatus is intended to fulfil, and upon consideration it was decided not to go beyond the quantities already mentioned. One meter of each size was tested for the quantity of gas passed per hour, with one jet open, and a number of jets giving full capacity at 0.5 inch pressure. In all 360 tests were made for accuracy of registration, and 120 tests for quantity of gas passed per hour. One meter of each size was also weighed, so as to give some idea of the strength of the materials used in the construction of the meters.

In the table the sign + indicates that the meter is fast; - slow, and 0 correct; + 2 means, 2 per cent. fast; that is, the meter passed 102 feet for every 100 feet registered by the index; - 1 means, 1 per cent. slow, or 99 cubic feet passed for every 100 feet registered. The Sale of Gas Act requires only one test—viz., at full capacity at 0.5 inch pressure, and a range of 5 per cent. is allowed—from 3 per cent. slow to 2 per cent. fast.

In all the tests made at half-inch pressure the steadiness of delivery of gas from the outlet of the meter was very carefully watched and noted. The most of the meters worked somewhat unsteadily at this pressure when only one jet of gas was burned.

When the tests were completed the whole of the jurors met in the gas-meter testing office, and the results were fully considered. One meter by each maker was opened up, the top and front plates being removed; and the works were examined. The meter makers were invited to be present and offer explanations to the jurors, and all attended with the exception of Mr. Keith.

In order to arrive at a conclusion of the comparative degree of excellence of the meters as regards accuracy of registration under the varied conditions under which they were tested, the errors, fast and slow, were added up, and the following is a summary of the results:—

2-light meters	. . . . .	Peebles, 14.5; Alder and Mackay, 18.5; Keith, 28.5; Glover, 31.5; Cowan, 39.5.
3 " "	. . . . .	Glover, 17.5; Alder and Mackay, 18; Peebles, 20.5; Keith, 23; Cowan, 27.5.
5 " "	. . . . .	Glover, 14.5; Alder and Mackay, 26; Keith, 27; Cowan, 27.5; Peebles, 42.
10 " "	. . . . .	Alder and Mackay, 10; Glover, 13.2; Keith, 15.2; Peebles, 15.2; Cowan, 29.8.
Whole number	. . . . .	Alder and Mackay, 72.5; Glover, 76.7; Peebles, 92.2; Keith, 93.7; Cowan, 124.3.

Considerable variations were observed as to the respective number of fast and slow tests; and we think it right to give the respective numbers of high and low tests, the former being favourable to the consumer and the latter to the vendor of the gas.

	Alder and Mackay.	G. Glover and Co.	Peebles.	Keith.	Cowan.
Total of fast tests	. . . 47.2	. . . 33.6	. . . 53.7	. . . 62.3	. . . 6.9
Total of slow tests	. . . 25.3	. . . 43.1	. . . 38.5	. . . 31.4	. . . 117.4

As regards steadiness at low pressure while burning only one jet of gas, an arbitrary scale was devised which served to show the comparative excellence in this respect. The numbers are these:—

George Glover and Co.	Alder and Mackay.	Peebles and Co.	Keith.	Cowan.
37 (best)	. . . 44	. . . 45	. . . 48	. . . 63

In the table of details, v. s. means very steady; l. u. a little unsteady; and v. u. very unsteady.

The following are the weights in lbs. of the various sizes of meters, and the total weight of one meter of each size:—

W. & B. Cowan.	Alder & Mackay.	J. Keith.	D. B. Peebles & Co.	G. Glover & Co.
2-light 8½	. . . 8½	. . . 8	. . . 8½	. . . 8
3 " 11	. . . 10½	. . . 10½	. . . 10	. . . 10
5 " 13½	. . . 13½	. . . 13	. . . 13½	. . . 12½
10 " 20	. . . 19½	. . . 18½	. . . 17½	. . . 18½
Total	53½	51½	50	49½

The only wet meter that was prominently brought before us was the Warner and Cowan meter of Messrs. W. and B. Cowan. This is a most ingeniously contrived apparatus, and gives, under extreme variations of water-line, complete accuracy of registration.

The gas regulators examined were of three kinds: First, those having a diaphragm of leather or other flexible material acting upon a ball and socket arrangement; to this class belonged the instruments of Peebles, Hearson, Tice, and Hingston. Second, those in which a glass bell, floating in mercury, actuated a similar device for checking the flow of gas; including the regulators of Busch and Stott. And third, "Cox's automatic lever gas-pressure regulator," consisting of a rectangular inverted vessel floating in glycerine, and acting upon a ball and socket valve. The regulator of Hearson, belonging to the first class, did not possess any means of regulating the pressure, and could not be tested; and Tice's were withdrawn from competition. All the instruments were tested by being placed upon the outlet of a meter (5 or 10 light according to the size), the inlet being connected to a gasholder in which the pressure could be varied at pleasure, while the outlet of the governor was connected with a series of gas-burners. At first the instruments were arranged to show exactly 0.5 inch pressure on the outlet, with one burner lighted (6 feet per hour); the pressure on the holder being 1 inch. The pressure was then increased to 3 inches in the holder, and the pressure on the outlet of the governor observed. The quantity of gas passed was then increased to what was considered full capacity (30 to 60 feet per hour according to size), and the regulated pressure taken with the initial pressure varying from 1 to 3 inches. The quantity of gas passed per hour was also observed. So that for each governor there were taken four tests for pressure and four tests for hourly consumption of gas. It is sufficient to give the variations of pressure.

	6 Feet per Hour.		Full Capacity.		Greatest	Percent. of
	1 In.	3 In.	1 In.	3 In.	Variation.	Variation.
Cox's governor (glycerine)	.50	.50	.45	.50	.05	.10
Peebles's " (diaphragm)	.50	.45	.48	.45	.05	.10
Busch's " (mercurial)	.50	.46	.48	.42	.08	.16
Stott's large ditto	.50	.67	.40	.50	.17	.34
Stott's small	.50	.32	.35	.30	.20	.40
Hingston's " (diaphragm)	.50	.80	.42	.20	.30	.60

There is thus a great difference in the amount of precision in the regulators; the error varying from 10 per cent. in the instruments of Cox and Peebles, to no less than 60 per cent. in that of Hingston. Of the two mercurial governors exhibited, that made by Mr. John Busch, of Oldham, was decidedly superior to that of Messrs. James Stott and Co., of the same town; although each instrument possesses valuable distinctive features.

The street-lamp regulators tested were Peebles's "needle" governor; Thorp and Tasker's governor (exhibited by Messrs. Jas. Stott and Co., Oldham); Sugg's new regulator with steatite float; and Peebles's modified regulator of small size for ordinary house burners. These were tested simply for quantity of gas passed at pressures varying from 1 inch to 3 inches, and gave the following percentages of variation:—

	Percentage of Variation.
Thorp and Tasker's lamp regulator	. . . . . 4.4
Peebles's first lamp regulator	. . . . . 7.6
Peebles's second lamp regulator	. . . . . 8.0
Sugg's steatite lamp regulator	. . . . . 9.4
Peebles's small burner regulator	. . . . . 12.8

The performance of all these instruments may be considered highly satisfactory.

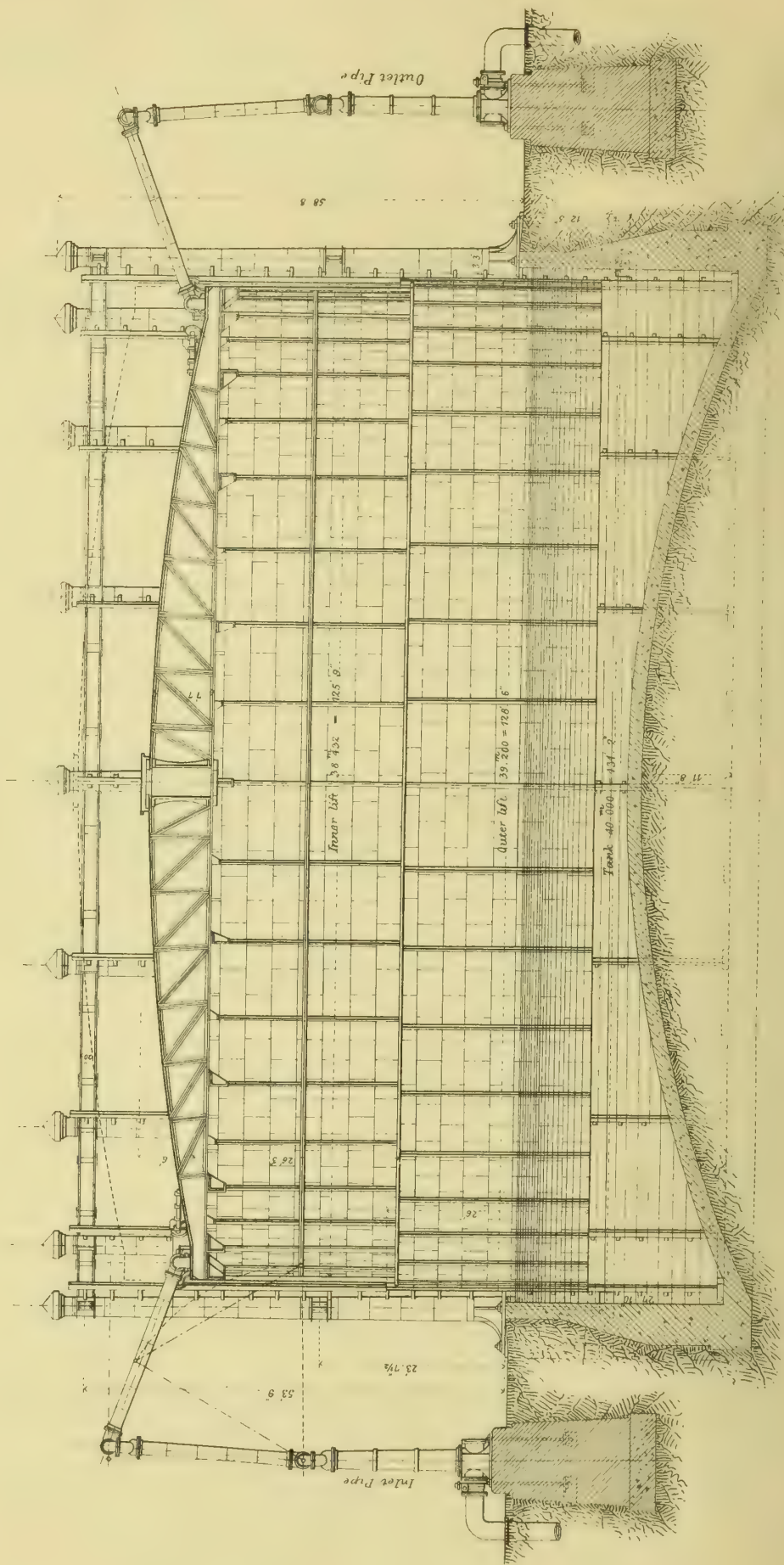
It is only necessary to give now a detailed statement of the various exhibits, with the awards of the Jurors. The exhibits are given in the order in which they occur in the official catalogue:—

44. A. G. Henderson, Musselburgh—Compensating Gas-Meter.
50. William Grice and Co., Birmingham—Patent Self-acting Gas-Retort Mouthpiece. *Medal*.
52. Alley and Maclellan, Glasgow—Foulis's Patent Gas-Governors, with and without separate Air Vessel. *Medal*.
53. James Stott and Co., Oldham—Mercurial Gas Governors or Regulators. *Honourable Mention*.
Thorp and Tasker's Street-Lamp Regulator. *Medal*.
Thorp and Tasker's Aërho-meter. (An exceedingly ingenious instrument for testing the consumption of gas-burners, and which was found to give very correct indications.) *Honourable Mention*.
54. John Busch, Oldham—Mercurial Gas-Regulators. *Medal*.
55. William Tice, Southampton—Improved Dry Gas-Regulators. (These were entered for adjudication, but were afterwards withdrawn.)
57. Alder and Mackay, Grange Works, Edinburgh—Dry Gas-Meters in tin-plate and cast-iron cases. *Medal*.
58. John Foxall, Newport, Monmouth—Patent Illumination Power Dry Gas-Meter.
60. George Glover and Co., Royal Avenue, Chelsea, London—Dry Gas-Meters. *Medal*.
63. Carnaby and Co., 13, Broad Street, Bloomsbury, London—Patent Safety Gas Apparatus. (An ingenious arrangement for operating on the gas-supply cock from any part of a house.) *Honourable Mention*.
69. D. Bruce Peebles and Co., Tay Works, Bonnington, Edinburgh—Wet and Dry Gas-Meters, District, Station, and House Governors, Lamp Regulators and Governor Burners. *Medal*.
73. William Sugg, Westminster—Lamp Regulator, with Steatite Disc. *Medal*.
76. Joshua Heap and Co., per D. M. Nelson, 48, Gordon Street, Glasgow—Pipe-Screwing Machines. *Honourable Mention*.
80. W. and B. Cowan, Buccleuch Street Works, Edinburgh—Warner and Cowan's Patent Meter. *Medal*.
Dry Gas-Meters, 10-foot Holder, Pressure-Gauges, Gas-Fittings, &c.
81. W. J. Hingston, Cork and Glasgow—Gas-Regulators.
96. James Keith, 4, Charlotte Street, Edinburgh—Dry Gas-Meters. *Medal*.
100. J. C. Stark and Co., Torquay—Cox's Patent Automatic Lever Gas-Regulators. *Medal*.
McCormack's Patent Screwing Gear and Patent Wrench. *Honourable Mention*.
106. John Finlay and Co., Rumford Works, Glasgow—Hearson's Patent Gas-Governor.
163. John L. Smallman, 23, Temple Lane, Dublin—Buckley and Leech's Patent Hinged Stocks and Dies, Tube Cutter and Shearer combined, and Adjustable Taper Die Stock. *Honourable Mention*.

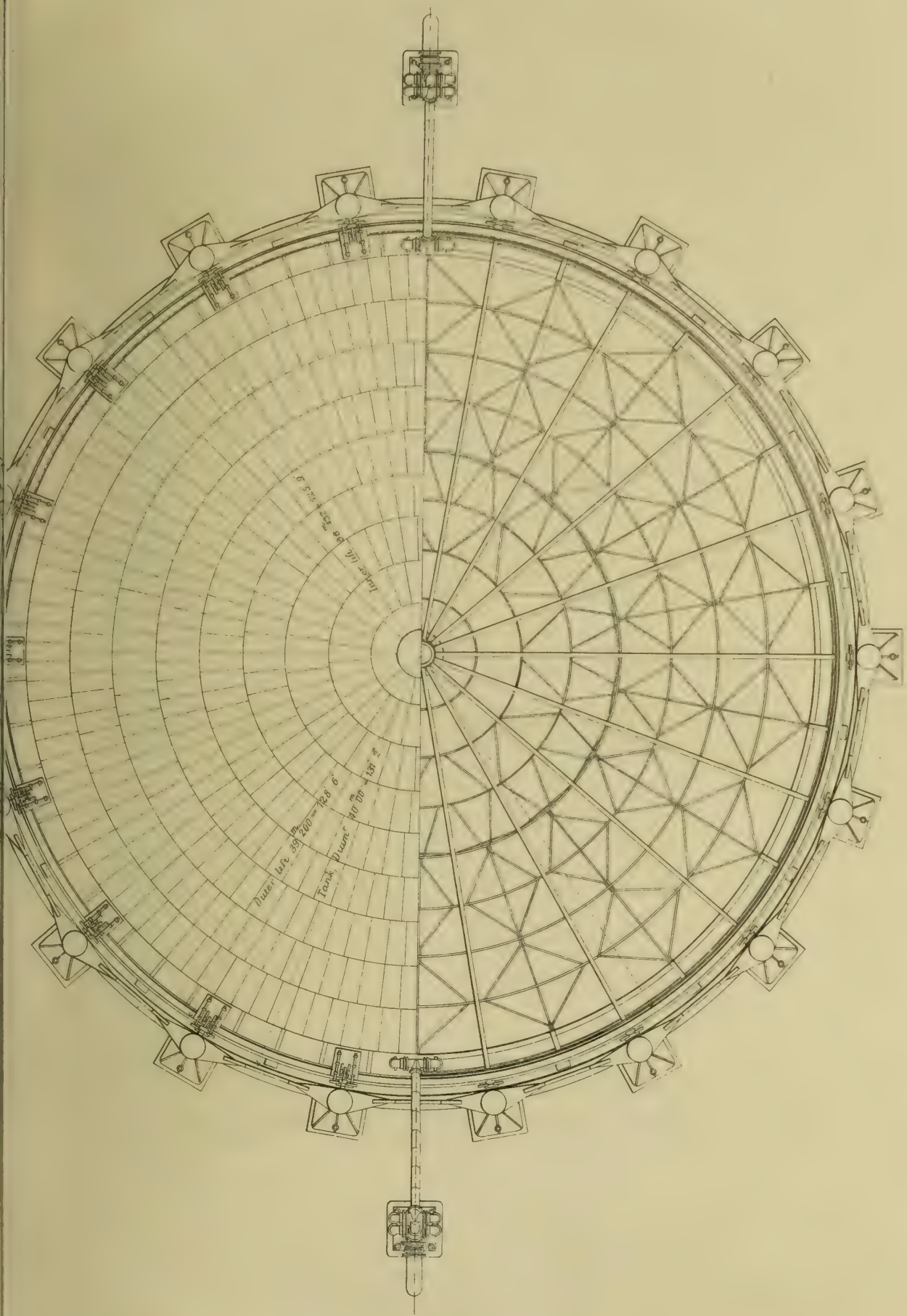
WILLIAM WALLACE.
HAZ. R. ROBSON.
D. CORSE GLEN.
J. J. COLEMAN.

Glasgow, April 22, 1881.
Approved and adopted by Executive Committee, April 29, 1881.
JNO. MANN, Secretary.

THE MARSEILLES GAS COMPANY, TELESCOPIC GASHOLDER.



Sectional elevation of Gasholder & Tank.



Plan

Scale $\frac{1}{1000}$ in - 0 004 m m

M. M. MOXYIER & THIBAUD ET.
ENGINEERS.

Table of Tests of Dry Gas-Meters.

Size of Meter.		ALDER & MACEAY.				W. & B. COWAN.				GEORGE GLOVER & CO.				JAMES KEITH.				D. BRUCE PEEBLES & CO.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of this Association was held at the City Terminus Hotel, Cannon Street, E.C., on Tuesday last—Sir JULIAN GOLDSMID, Bart., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice convening the meeting, and the following report of the Directors:—

The present ordinary half-yearly general meeting of the Proprietors has been convened, in conformity with the Company's Acts of Parliament, for the purpose of receiving a report from the President and Directors upon the affairs of the Association, and of declaring a dividend for the half year ended Dec. 31, 1880.

The following summary shows the results of the Association's operations during that period:—

	<i>Gas Made.</i>	<i>Cubic Feet.</i>
The quantity of gas made in the half year ended Dec. 31 last was		3,126,000,000
The quantity made in the corresponding half year of 1879 was		2,896,000,000
Showing an increase of		230,000,000
or at the rate of 7·94 per cent.		
<i>Lights.</i>		
The total number of lights on Dec. 31 last amounted to		1,316,263
At the close of the corresponding half year of 1879 the number was		1,273,969
These figures give an increase of		42,294
or at the rate of 3·32 per cent.		
<i>Mains.</i>		<i>Miles.</i>
The entire length of mains laid on Dec. 31 last was		1,284
The length of mains laid on Dec. 31, 1879, was		1,266
Being an increase of		18

Rental and Profit.

The rental for the half year under review was in excess of that of the corresponding half year of 1879; but, owing to the enhanced cost of coal, the augmentation in the profit was but slight.

Coal.

A comparison of the cost of the coal employed during the half year with that of the coal used in the corresponding period of 1879 shows an advance of 9·19d. per ton.

Secondary Products.

There was a satisfactory increase in the value of coke and in that of tar. The receipts derived from the sale or treatment of the ammoniacal liquor have also considerably increased.

General.

The outlay incurred in the maintenance of the plant in an efficient state was somewhat larger than in the corresponding half year of 1879. It was also found necessary to expend a larger amount than usual upon the extension and enlargement of mains in order to meet the increase in the consumption of gas.

The principal items of expenditure consisted in the purchase of land at Antwerp for the erection of new works, which the growing demand for gas has rendered necessary; in the erection of a dwelling-house and offices and of a boiler-house at the Tabor works of Vienna.

The works at Forest, near Brussels, and those at Berlin, received additional purifiers, and new exhausters were put up at the latter station. Three tower scrubbers were erected at Lille, and the tar distillery at Forest, near Brussels, was completed and set in action.

The alterations carried out at the French stations included the erection of gasholders at Armentières, Evreux, and Estaires.

The President and Directors have to report the renewal of the contract with the town of Meaux for a further period of 30 years, and the sale of the works and concession for lighting St. Yrieix, a very small town included in the French stations purchased in 1878.

The works at Flushing, which were taken over by the Association on the 1st of July last, were in a fair condition. The erection of a scrubber and condenser was, however, necessary, and some other alterations will hereafter be required.

The lawsuit which, as the Proprietors are aware, was brought against the Association by the town of Ghent, was decided in favour of the latter, in November last, by the Court of First Instance. The Association has appealed against this decision, and the judgment of the Superior Court may shortly be expected.

The President and Directors desire, in conclusion, to draw the attention of the Proprietors to the accounts for the half year ended Dec. 31 last. These have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which the President and Directors recommend now to be declared—namely, a dividend of 5 per cent. for the half year ended the 31st of December last, and a bonus of 1 per cent., payable free of income-tax on and after the 1st day of June next.

The Directors who go out of office by rotation are George Simpson, Esq., Thomas Henry Goodwin Newton, Esq., and Col. Josiah Wilkinson. These gentlemen are all eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office is Joseph Sébag, Esq., who is also eligible, and offers himself for re-election.

The CHAIRMAN: Gentlemen, on behalf of the President I have again to express his sorrow at his inability to attend this meeting in consequence of the state of his health. He says it would have afforded him very great pleasure to have joined us on this occasion, for he "cannot refrain from bearing in mind the great improvement in the position of the Association since the time when, in lieu of being called together for the declaration of a dividend, the consent of the Shareholders had to be obtained for application to Parliament for powers to raise fresh capital." I do not think any of us will consider that this position is anything like our position to-day, and as Sir Moses Montefiore can go back for so many years, the contrast that offers itself to his notice must be indeed remarkable. The report which has been read gives you the materials on which you can found a judgment with regard to our affairs on the Continent. When we come to consider the enormous extent of some of our works, when we notice this simple fact—that we are now not only in the hundreds with regard to the number of miles of mains we possess, but have long passed the first thousand, and are going on for the second—that we have 1284 miles of mains in all parts of the Continent, we can, from this simple fact, picture to ourselves the very large area of ground, and therefore the great extent of business, we have to manage. Now this business is conducted with considerable ability by our Engineers on the Continent, as has often been explained to you; but even in the present day, when the scientific requirements of gas making have at least progressed as the scientific requirements of most other businesses, I do not think we can fairly say that our Association is behindhand in any respect. That constant vigilance is requisite I am prepared to tell you, as I have often said before, but it is clear that, with our able staff, this vigilance will be given. You always like us to notice any special matters which have occurred in the conduct of our business in the half year under consideration, and I generally refer to any others which have arisen since the date at which the accounts were closed. We have had during this period, and we have had since, much anxious consideration with regard to a variety of questions, and with regard to none more than the position of affairs at Ghent, which I have frequently referred to at our meetings. I do not think it is necessary for me to go over the information which I have given you before, but the report points out that the Court of First Instance decided against our claim, which was that we had a right to continue the private lighting. Well, our appeal to the Superior Court, which has already been partly heard, and the hearing of which will be continued in a very few days, has been conducted with the most marked ability by M. Guillery, who was lately the President of the Belgian Chamber, M. Metdepenningen, and M. Delcour, all men of the highest ability and standing, who have put our claim in the best possible light, and it appears to us that our case is a very good one. What the result of this appeal will be it is impossible to say; but, as I have men-

tioned to you, we have from time to time made some provision to meet the loss, should the case be decided against us in the Superior Court, and consequently we have done the right thing, as prudent men of business, with regard to the Ghent station. The next place to which I would refer for a moment is the latest of our purchases. You will remember that I told you at the last meeting that we had arranged for the purchase, and had entered into possession of the gas-works of the Dutch town of Flushing. Flushing will hereafter, there is not the least doubt, be a port of considerable importance, and the Municipality, from whom we purchased the works, made a very reasonable and fair contract for both sides with us when we took possession on the 1st of July last year. We have, of course, the experience of the first six months' working; but this gives us at present very little information, for a reason which I have explained to the Proprietors on more than one occasion—that when you come into possession of works, however modern or well arranged, there are certain requirements to be provided and charges to be made, and the whole has to be put on a serious business footing. That there is something to be done still at Flushing the report indicates; but I think that the little knowledge obtained by the working of the first six months confirms our expectation that we shall have a fair return for our capital at Flushing, as we have at our other stations. Then I would also just mention, with regard to our French stations, that these 15 stations, to which reference has also been made in the report, are certainly showing the results of improved management, and are now bearing their fair share in the dividend work of the Association. Therefore this has been a satisfactory purchase as far as the Association are concerned. We have had a variety of negotiations with a number of the authorities at the places we light. Some of them will ultimately result in considerable reductions of price, because we do not, in the majority of instances, possess freeholds, but only leaseholds, or contracts for terms of years; and consequently when we endeavour to negotiate fresh contracts or make fresh arrangements with the authorities, it must always be by means of considerable concessions in price and other matters. All I can say, however, is that we have endeavoured, and shall always endeavour, to bear this in mind—that we ought to share our prosperity with the inhabitants of the towns we light. The comfort and convenience of the persons supplied ought to be the first consideration with the supplying company; but at the same time I do not think this consideration need interfere with the prosperity of well-managed concerns like this. Consequently, I trust that in the various negotiations—some of them of a very difficult character—which we are carrying on, we shall be met by the authorities in a fair spirit, and if so I am certain we shall come to arrangements which will be satisfactory to both parties. I have during the last year or two referred from time to time to a question which has considerably agitated the minds of gas shareholders, perhaps the minds of London gas shareholders more than of those in this Association—viz., the question of the electric light. Two years ago I ventured to express an opinion, which was shared with me by the majority of the Board, but with regard to which a few of the scientific members told me I was too sanguine, that in no circumstances and in no way could electricity carry on a real competition with gas; and notwithstanding all that has occurred from that day to this, I am still of the same opinion, and for this reason: Electricity can be used for lighting, and especially for public lighting, to a very considerable extent; but that it will interfere with the private business of gas companies I do not for a moment believe, because I am quite certain that there is a very large field for both, and that the part of the business we undertake to conduct—and I believe conduct well—cannot be carried on upon such cheap terms by any electric lighting company. I should like to see some more accurate figures than I have yet been able to obtain with regard to the real cost of electric lighting, because I am satisfied in my own mind that it must be dearer than gas, for this reason—that the apparatus is exceedingly expensive, and that there are no secondary products; whereas our plant may be equally expensive, but we obtain residual products of the greatest importance. Consequently, in my opinion—although it is not shared by all the members of the Board, still it is by many of them—there is no serious competition to be feared by gas from electricity. I should now like to refer to the experiment which is being carried on in the City of London for testing the different systems of electric lighting one against the other. If you are to make a fair comparison between these systems of electric lighting and gas, I say that the City authorities ought to have done what the Paris Municipal Council did—namely, assign to the Gas Company who light the City a certain district in which they could show one of the many improved systems of gas lighting. I venture to say that those who saw the lighting of the Rue du Quatre Septembre, and those who go and look at the new Siemens system of lighting by gas in the Place du Carrousel—where there is one of these magnificent burners to be seen every night—will all be of opinion that gas light is as pleasant and as effective as, if not more pleasant and effective than the electric light. Moreover, the gas light is provided at less cost. Not very long ago Mr. Sugg's improved lamps and burners were shown in Waterloo Place. This system of illumination was continued for six months at the expense of the Company lighting the thoroughfare; but when the Vestry were asked if they would continue the mode of lighting, and make an arrangement with the Company that the improved burners should remain as a permanency, they declined to expend any more money than the small amount they had been paying for the moderate quantity of gas they had previously been using. If it had been a question of electric lighting, I venture to say they would have voted twice the amount; but there are, somehow or other, many municipal authorities, especially in England, who do not appear to be ready to pay a very moderate sum for gas, but are ready to pay a large amount for the electric light. I do not think this is treating the two things on an equal footing, or giving opportunities for a fair comparison. I undertake to say that there is no gas company who would not be willing, on equitable terms such as I have indicated, to enter into a fair competition, and undertake to beat any system of electric light yet invented. Perhaps you will ask me what are the best systems of street lighting with improved burners for the purposes of gas. Sugg's is an excellent burner, and Bray's is a first-rate burner; but the most extraordinary invention up to the present time is the one that I have referred to—Siemens's new street gas-burner, which makes use of the heat that is generated at the same time as the light, and produces, at a very moderately increased cost, an enormously improved light. It is up to the present time the first invention in public street lighting that has been made. It was not made by Dr. Siemens, who resides here in England, but by a nephew of his, living at Dresden. As far as it goes, I think you know that public lighting in all cities is very onerous, and consequently a gas company does not look to this for a profit so much as it must necessarily look to private lighting. I do not believe that gas lighting will be interfered with, and I think that the future before us for lighting and heating is very great indeed, and that no reasonable gas shareholder need be afraid of competition. So much for that question. I have told you that our business on the Continent is of a character which is increasing daily in magnitude, and I have indicated this by the number of miles over which our mains extend. You are aware that even before the death of Mr. G. W. Drory, and since, we have been, as it were, dividing the departments of management of our business, and placing them in separate hands, so that

and the gas-rent had increased to the extent of £526, notwithstanding that a smaller quantity of coal had been consumed. He thought this compared exceedingly well with their former accounts. He observed that in the accounts to Christmas, 1879, which would be the corresponding period to those now presented, the profit was £5164, whereas on this occasion it was £7331, an increase of over £2000 on a sum of £5000; and in the June half of 1880 the profit was £5607, showing also on that very much improved state of the accounts a still further improvement. He thought he had mentioned before that he had always avoided holding out great prospects to the Shareholders, and really the present account had improved so vastly that if, on a future occasion, the Directors did not give a better one, or one quite so good, the Proprietors would still have very good reason to be satisfied. He thought the Directors could hardly go beyond what they had done, seeing that on this occasion they had written off £1000 from preliminary expenses, and proposed to carry £1000 to the reserve fund, and to divide 7½ per cent. on the ordinary stock. These two amounts carried to reserve fund and written off preliminary expenses really amounted to 4 per cent., being an actual profit of 11½ per cent. on the half year, which he thought, under all circumstances, was not by any means an unfavourable account. He now had to come to a painful subject, and to state that the gentleman who had been in great measure the cause and the carrier out of all this, who had done so much good for the Company, had passed away. Last month the Directors received a telegram which stated that their Manager, Mr. Muriel, had died, and they had since received a letter stating that he was ill only three days, having died from a most virulent form of yellow fever. Immediately on receiving this, the Directors telegraphed powers to Mr. Hope to carry on the works as they were for the present. They had also had an interview with Mr. Muriel's father, and had unanimously voted him their condolence in his affliction. It was to be hoped that the sad event would not interfere with the carrying on of the works; still, it was a very serious thing for a Company, at so great a distance, to lose a man who had proved himself so capable in managing its affairs. He might, for the consolation of the Shareholders, mention that about 18 months ago they sent out a gentleman who was conversant with the language, who was perfectly able to manage the accounts of Company, which they sent him out to do, and he had been educated and brought up as a Gas Engineer. He was, therefore, able to take charge of the works in case of any event of this kind happening. They had every reason to believe that they had a most efficient man, who had immediately taken charge of the works, and they hoped the same good management would still be continued. It was too early for the Directors to have arrived at a decision as to what their ultimate course would be, but they had at present at Bahia gentlemen who were quite able to carry on the concern.

The DEPUTY-CHAIRMAN (Mr. H. Brothers), in seconding the motion, also expressed great regret at the loss the Company had sustained in the death of such a very able Manager as Mr. Muriel.

The motion was carried unanimously.

The CHAIRMAN then moved the payment, less income-tax, of the dividends recommended in the report.

Mr. MAGNUS OHREN seconded the motion, and it was carried unanimously.

Mr. BODY, in moving a vote of thanks to the Directors for their able management of the affairs of the Company, said he was sure the Shareholders sympathized with them in the difficulties they would have to contend against in supplying the place of Mr. Muriel.

Mr. ANDREWS seconded the motion, which was carried unanimously.

The CHAIRMAN expressed the acknowledgments of his colleagues and himself. The interests of the Directors and Shareholders were, he said, identical, and whatever the Directors could do for the Company the Shareholders might depend upon it they would do—as, indeed, he thought they had shown by the progress exhibited. They would continue to do their best to promote the welfare of the Company.

On the motion of Mr. BOSTOCK, seconded by Mr. GUYATT, a vote of thanks was passed to the Secretary, Auditors, and other Officers of the Company.

The SECRETARY and Mr. OHREN (one of the Auditors) expressed their thanks, and the meeting then separated.

MAURITIUS GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held at the London Offices, 14, St. Mary Axe, on the 4th inst.—W. WHITE, Esq., in the chair.

The SECRETARY (Mr. A. Hersee) read the notice convening the meeting, and the following report was presented:—

It is with pleasure the Directors have to report improved results from the operations of the Company during the past year. Owing to the earnest and able exertions of the Manager, Mr. Darney, in carrying out the instructions of the Directors, the revenue has increased, whilst the expenditure has been diminished; and apart from the deteriorating effect of adverse exchange, the accounts are not discouraging. In public lighting there has been an addition of 27 street lamps. An order has lately been received for the erection of 13 new lamps. Private lighting has also progressed, and shows an increase of 117 burners.

The average price paid for coal in 1880 (though in excess of the original estimate) was lower than in the previous year. Improved arrangements for the landing and delivery of our coal have been introduced by Mr. Darney, whereby it is hoped that this year's consignments may be stored at a still further reduction of cost.

The requisite legal formalities connected with the alteration in the nominal value of the shares are being complied with, and a final settlement may be looked for shortly. Delay has been caused by the necessity of advertising the official notices in Mauritius.

The balance of profit and loss account for the year, after providing for interest on debentures, is £1645 1s. 8d., out of which the Directors recommend a dividend of 3 per cent., payable free of income-tax on the 14th day of May next.

The Director who retires by rotation is William White, Esq., and the retiring Auditors are John Robinson Peill and Thomas Newton Stokes, Esqrs. All are eligible for re-election, and offer themselves accordingly.

The CHAIRMAN, in moving the adoption of the report, observed that with regard to the operations of the past year the Directors considered that, under all circumstances, the results were fairly satisfactory. In spite of the enormous charge of £1105 on account of exchange, there was an available profit of £1645 compared with only £399 last year, and on an average £1110 for the past five years. It was true that even the result of the past year's working was a very inadequate return for the capital expended; but it had been made clear to the Shareholders long ago that no great amount of prosperity could now be expected, owing to the altered condition of Port Louis. The altered condition was this: Consequent on the spread of fever which occurred some years ago people left off residing in the place; scarcely any inhabitants remained all night but those who were compelled, and there was not really the consumption of gas which the Directors had reason to expect. And again, with regard to the exchanges, when the Company first commenced, the utmost they ever paid was about £83 a year for the loss on exchange, whereas in the past year alone they lost £1105. There was, however, a hope of improvement, should the island be again favoured with a succession of good sugar crops. In the meantime the attention of the Directors was given to reducing the expenses and increasing the revenue. They had every cause to be satisfied with the conduct of the present Manager. He appeared to take the greatest interest in his work, and he bewailed the limited results

attending his efforts to extend the business. The working was conducted with the utmost care, and every economy practised. By the improved arrangements for landing coal, a saving of about 2s. a ton had been effected, irrespective of other advantages. The cost of the coal was a matter of the greatest anxiety to the Directors. Their original estimates contemplated the supply of coal at a maximum average price of 35s. per ton, including exchange; but in 1879 the average rate for coals was 42s. per ton, and in 1880 37s. 6d., exclusive of exchange. Both the public and the private business showed an increase, which would have been larger but for the closing of the theatre. There was still a good demand for coke, but tar did not sell freely. The quality of the gas must be satisfactory, for no complaints were reported, and the Company appeared to be on very good terms with the authorities. The Directors regretted that the arrangements for reducing the nominal value of the shares were not yet completed; but there was not likely to be much more delay. He could not say much with regard to the Company's prospects for the current year; but there was nothing to discourage the expectation that the Shareholders would be as well off as now, and perhaps better.

Mr. T. C. SMITH seconded the motion.

Mr. H. M'L. BACKLER remarked that one of the most favourable portions of the report was that which referred to the present Manager. If they had an indifferent Manager, all efforts of the Directors were neutralized. He thought, from what he saw in the report, that Mr. Darney was likely to render the Company very good service, and whatever was to be got out of the undertaking he seemed a likely man to secure it.

The motion was carried unanimously.

Mr. SMITH then moved, and Mr. J. S. STOPFORD seconded, the re-election of Mr. White as a Director, and the motion was carried unanimously.

The CHAIRMAN having briefly expressed his acknowledgments, the retiring Auditors were re-elected.

On the motion of the CHAIRMAN, seconded by Mr. STOPFORD, the dividend recommended by the Directors was declared.

Mr. SOLOMON moved a vote of thanks to the Chairman and Directors. He was, he remarked, sure the Directors had had great difficulties to go through, but he hoped they now felt they were getting into smooth water.

Mr. WATERWORTH seconded the motion, and it was carried unanimously.

The CHAIRMAN, in reply, observed that the Directors hoped there was now a little more "daylight" in the concern, and the Proprietors might rely on the Directors doing their best to improve matters.

A vote of thanks was then passed to the Secretary and to the Manager, to which the former gentleman responded, and the proceedings closed.

BIRMINGHAM CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Birmingham Town Council on Tuesday last—the MAYOR (Alderman Chamberlain) in the chair—reports from the Gas and Water Committees were under consideration.

The Gas Committee's report stated that the new retort-house at the Windsor Street works was sufficiently advanced towards completion to enable the Committee to estimate the additional manufacturing plant that would be required in the winters of 1881 and 1882 to meet the additional carbonizing power which would then be at their disposal. The plant in use at Windsor Street was sufficient for the manufacture of about 5 million cubic feet of gas per day. It was estimated that the new retort-house would give an increased production of about 7 million feet per day, and it was proposed, for the sake of economy in manufacture, to transfer the whole of the carbonization from the old retort-houses to the new house on its completion. This would give an immediate increase in the carbonizing power of more than 2 million feet per day, with a reserve in the old retort-houses of nearly 5 million feet per day. As the present purifying, measuring, and exhausting plant was only sufficient for a make of 5 million feet per day, the Committee, after careful consideration, had come to the conclusion that it would be the most economical course to provide, in the course of the next two years, an increase of such plant for 3½ million feet per day. This would bring the complete manufacturing capacity of the Windsor Street works up to 8½ million feet per day, or an increase of about 75 per cent. in the present capacity of the works, and would leave an excess of carbonizing power in reserve of about 3½ million feet per day, for which additional purifying, exhausting, and measuring plant would ultimately be required. The Committee, therefore, recommended the expenditure of £23,600 in the provision of additional manufacturing plant at the Windsor Street works. They also recommended that they be authorized to expend a sum not exceeding £1900 for sheds to cover the purifiers and ground at Adderley Street. The Committee reported that, consequent on the reduction in the price of gas, they had revised the terms for public lighting, to come into force on the expiration of the present contracts. The Harborne Local Board had given notice that they intended to light, clean, and extinguish the lamps in their own district after the 1st of September next. The Committee had accepted the notice, and informed the Board that they would have the requisite meters attached to the lamps in the Harborne district for that purpose. The Committee had from time to time urged the local authorities whose districts were supplied with gas from the Swan Village works to perform the duty falling upon them of having periodical official tests made of the gas supplied from these works. Having failed to obtain the appointment of an official tester in this way, they now thought it desirable to make provision for impartial tests of the gas issued from Swan Village, and they had arranged with the Magistrates of Birmingham to make and publish such official tests. With a view of encouraging thrift among the workmen employed by the department, the Committee had placed a room, at the Sallay and Windsor Street works, at the disposal of the postmaster during the time that wages were paid on the weekly pay-day, and had arranged with him that they would pay the cost of the weekly attendance of savings-bank clerks from the post office at that time.

Alderman KENRICK moved that the Committee should be authorized to expend £25,500 in the provision of additional plant at the Windsor Street and Adderley Street works. He explained that the extension of plant was proposed with the view of enabling the Committee to keep somewhat in advance of the increasing consumption of gas, it being necessary, as in the case of the Water Committee, that they should be able to meet not only the ordinary requirements of the town, but any special emergency. It was more economical in the end to make such provision as was now proposed, sufficient to enable the Committee to meet the estimated requirements of the next three years, than to make small hand-to-mouth additions during this period.

Mr. J. E. BAKER seconded the motion, and it was carried.

Alderman KENRICK then moved the approval of the report. In doing so, he said, in reference to the arbitrations that had taken place between the Corporation and certain neighbouring townships in regard to their undertaking the supply of gas in their own districts, that it was very gratifying that the Smethwick authorities had agreed to conduct matters in such a way as to save considerable expense, and he could only regret that the other purchasing districts did not accept the same offer when it was made to them.

The resolution having been seconded,

Mr. M. DAVIS said he was glad to hear of the amicable way in which the Committee had been met by the Smethwick authorities; and now there was an end to the litigation, he wished to know what the total law costs had been.

Alderman KENRICK said the time had hardly come for replying to this question. The printed report for last year gave the law expenditure up to date, which was £13,000. It was an enormous sum, and he wished it could have been saved. He also wished that the purchasing authorities had saved their ratepayers a correspondingly large expenditure. The subject of the legal expenditure would be reported upon in its entirety by the Gas Committee when the whole of the transfers were completed.

The report was approved.

The Water Committee, in their report, stated that they had received plans and specifications for the new storage reservoir at Shustoke, upon which the following report had been received from the Water-Works Engineer (Mr. J. W. Gray):—

The reservoirs are two in number. The smaller, into which the water will first be drawn from the brook, will receive the heavier portions of suspended matter, by deposition, while flowing through to the main storage reservoir. Provision is made for drawing water direct from the brook course into the large storage reservoir, when it is necessary that the smaller reservoir should be emptied and cleaned. The smaller reservoir will have a surface water area of 8 acres, and an average depth of 10½ feet, and be capable of containing 20 million gallons. The storage reservoirs will occupy all the land available for the purpose. The water area of the storage reservoir is 90 acres, the average depth 17½ feet, and the contents equal to 400 million gallons. The two reservoirs together will therefore contain 420 million gallons.

The design for the engines is for two compound differential condensing engines, with five of Root's patent boilers. Each engine to have one high-pressure cylinder of 33 inches diameter and 10-foot stroke, and one low-pressure cylinder of 60 inches diameter and 10-foot stroke. Under each cylinder there will be a ram-pump 26 inches in diameter and 10-foot stroke. Each of these engines will be equal to an 80-inch diameter cylinder Cornish engine, the present Cornish engines at Whitacre being 72 inches diameter cylinder. The quantity of water each engine will be capable of delivering is 4½ million gallons per day, together 9 million gallons per day. The engine power at Whitacre will then be equal to 11½ million gallons per day, with one engine at rest; but if all four engines are at work together, it will be raised to 14 million gallons per day. As all four engines at Whitacre will force the water through the same main to Plant's Brook, it will be advisable to have an air vessel at the junction of the mains, so that the pressure on each engine may be as nearly uniform as possible.

I estimate the whole of the cost for the reservoirs, engines, cottages, and works, including contingencies, extras, &c., if any, at the sum of £125,000.

Alderman AVERY, in moving that the report of the Committee be received and adopted, said it was a continuation of one presented to the Council in January last.* Upon that occasion the Water Committee recommended, and the Council saw fit to adopt the recommendation, that they should be authorized to take measures for the construction of a great storage reservoir at Shustoke, together with the pumping-engines and other works appertaining thereto; and the Committee were authorized to prepare plans and specifications, to obtain a tender or tenders, and to submit to the consideration of the Council such tender or tenders as the Committee recommended should be accepted. In the view of the Committee, these large works were absolutely necessary in consequence of the considerable increase in the demand for water, shown in the revenue arising from the Water Department, which in 1876 was £93,000, and had increased in 1880 to £121,000. Whilst the average supply for 1876 was 8½ million gallons daily, in 1880 it had increased to 10 million gallons daily throughout the year. But this increase, considerable though it might be, did not sufficiently indicate the necessity for making further provisions for the extension of the water supply, for in all well-equipped water undertakings it was necessary to make provision not only for the ordinary daily average requirements, but for maximum requirements. If such provision was not made, some one, perhaps large classes of the community, must go without water. In the week ending Jan. 28 last, 15 million gallons of water were pumped and delivered each day, mainly on account of the frost and waste that then prevailed; and in times of great drought the same state of things occurred. Some provision must be made for this additional demand, or serious consequences would follow, and the Water Department would not be discharging their statutory obligations. On Jan. 22 the Water Department pumped and delivered 18½ million gallons of water, showing how necessary it was to go beyond the actual daily wants, and make some provision for occasional requirements as well as for the future. As this large extension of the works would take at least 2 years—perhaps 2½ years—to carry out, the Committee were of opinion that they were not moving a day too soon, but that the time had now arrived when it was absolutely necessary that the additional provision should be made. What they were proposing to do was to utilize to a greater extent than had been done the water of the valley of the Bourne. The Corporation had power over 17 square miles, extending over seven parishes, with a population which, so far from increasing, was really decreasing. This population was so very scant that upon the average there was only one person to 4½ acres, so that the site, from this point of view, was remarkably advantageous. The present total capacity of the storage reservoirs under the control of the Corporation was 200 million gallons. It was now proposed that these great reservoirs should be so constructed that they would give a further 420 million gallons. The circuit of both reservoirs would be 2½ miles. The Committee had obtained a number of tenders. For the reservoir they took four tenders, and for the engines they took four, but for the boilers they only took one, because they were so highly in favour of Root's boilers.

Alderman TAYLOR seconded the motion.

Mr. F. WRIGHT moved as an amendment that the question of the acceptance of the tender for the supply of the engines and boilers be referred back to the Committee for reconsideration.

The amendment was duly seconded; and, on it, a discussion took place, as to the course adopted by the Committee in obtaining tenders for the new works. At its close,

Alderman AVERY, with regard to questions asked as to the laying of mains and pipes, said the Committee had gone beyond the actual requirements on the ground that they thought the time specially advantageous for carrying out this description of work. He thought that on the whole the Committee had expended some £200,000 since the transfer of the water undertaking. It was estimated that if the same work had been done some years ago, when prices were higher, it would have cost £400,000. One member had said that the expenditure was nearly equal to one year's rent of the Water Department. So it was, but it was a most prudent expenditure.

A division then took place on Mr. Wright's amendment, which was lost—10 voting for it, 36 against, and 6 remaining neutral. The resolution was therefore carried.

Alderman AVERY then moved the approval of the report, which was seconded by Mr. W. H. DIXON.

Mr. BRINSLEY asked when the reduction of the water-rate was to take place.

Mr. THOMASON remarked that he heard complaints in many districts

that while a great reduction had taken place in rents there was no reduction in the water-rates.

Alderman AVERY said the reduction of the water-rate commenced in January last, and on the 30th of June next the charges for water for the half year would be based upon the revised rental, which was read to the Council a few months ago. It was the settled policy of the Committee, and had been their settled policy from the beginning, to make, first, an abundant provision for a good supply of pure water, and then to reduce the charges. The Committee had been having returns made of the different classes of water consumers, and in a few months' time they would be prepared to come before the Council with full particulars of the proportions of payment of all classes of the community. Particulars would be given of the quantity of water consumed, and the amount of money paid by the various classes of consumers. Upon these returns the Water Committee hoped to submit, for the consideration of the Council, a full and comprehensive scheme for the revision of the rates.

The resolution was then carried, and the Council proceeded with other business.

BURSLEM CORPORATION GAS SUPPLY.

At the Quarterly Meeting of the Burslem Town Council on Wednesday last—the Mayor (Mr. Maddock) in the chair—the Gas Committee reported that a statement had been submitted to them, which showed a balance of profit from the gas-works for the past year amounting to £3316 7s. 11d., leaving, after providing for the sinking fund, £490 12s. 9d., the net balance being £2825 15s. 2d. The sum of £2500 might therefore, they stated, be placed at the disposal of the Council.

Mr. W. WOODALL, M.P., moved the adoption of the report, and gave a brief statement with regard to the working for the past year. He said the Chairman of the Finance Committee had told them how the depression of trade, followed by the closing of several large manufactories and the vacation of some 400 or 500 houses, had affected the income from rates. This statement would therefore prepare the Council for the statement from him, as Chairman of the Gas Committee, that there had been an actual diminution of about 3½ per cent. in the gas-rental. This fact had engaged the close attention of the Gas Committee, and they were glad to find that they had been able to economize in every direction to such an extent as to show what he considered to be a favourable profit on the balance-sheet. As they would see from the report, the balance of profit was £3316. They had, however, the responsibility of not only paying interest on a large capital account, but also of providing for the repayment of the capital itself. For this purpose a plan was adopted by which a sinking fund was formed, to which out of the year's profits they had paid £490, reducing the profits, as had been stated in the report, to £2825. Many of them had doubtless seen sensational statements in the papers of the immense profits made by some gas undertakings in different parts of the country, and respecting them he was not in a position to speak authoritatively; but he thought he should be safe in saying that these undertakings did not make their immense profits on the plan adopted by the Gas Committee of their own Corporation. He thought that it would be undesirable that they should increase their capital account; therefore all improvements and enlargements must be provided for out of the year's earnings, in addition to providing for the repayment of the capital account and the provision for the sinking fund. He believed that gas undertakings generally had been managed under far less favourable conditions than the present; and he hoped they would consider that the low price of their raw material—coal—would not continue when the long looked-for, and he hoped not far distant, revival in trade set in. They also now obtained a very fair price for the residual products in connection with the works. He mentioned this because, whilst he was extremely gratified at the success they had achieved, he should not like the ratepayers to rely upon the assistance they received from the gas profits as of a permanent character. The Committee had handed over £2500 for the relief of the pockets of the ratepayers, after meeting all other calls upon them, and he thought that such a sum as the earnings of the year's undertaking could not be placed at the disposal of the Corporation at a better time.

After some further general remarks, the motion for the adoption of the report was seconded, and unanimously agreed to.

PROPOSED EXTENSION OF THE DUMBARTON GAS-WORKS.

A Special Meeting of the Dumbarton Town Council was held a few days ago—Provost BARTIE presiding—for the purpose of considering the propriety of adding to the storage capacity of the Corporation Gas-Works.

The Provost said the Gas Committee had been carefully considering the question for some time, and although they were very reluctant to ask that a new gasholder should be erected so long as they could do without it, still they now felt compelled to come to the Council and ask that the proposed work should be undertaken. For a number of years, and more especially during last winter, the strain on the works had been so great that it was considered imprudent to delay the matter any longer. The increase in the manufacture of gas had been going on for years progressively to a very considerable extent. The Manager of the works, Mr. J. McGilchrist, had supplied him with some figures, which he would submit to the Council. The manufacture of gas was—

In 1877-78	17,077,600 cubic feet.
In 1878-79	19,567,300 "
In 1879-80	20,222,600 "
In 1880-81	20,114,700 "

There was still a portion of the current year to run, and when the year was completed the consumption would be little short of 22 million cubic feet. He pointed out that gas-works were unlike most other works, where a steady trade was done, inasmuch as the manufacture of gas at mid-winter and mid-summer would not bear comparison; and in order, therefore, to have the works in an efficient state they must have them equipped so as to be able to produce the maximum quantity used on any day. In the year 1877 the maximum daily manufacture was 94,000 cubic feet, and last year it rose to 188,900 cubic feet, being an increase of 47½ per cent. The increased consumption was very large—larger than might have been supposed from any increase in the population, which during the last ten years was at the rate of 20 per cent. But the increase in the consumption of gas was more than double this quantity, which showed that gas was almost essential to town life. After referring to the extent to which gas was being used in Dumbarton for heating and cooking purposes, and to the propriety of always having the storage capacity of gas-works equal at least to the maximum daily consumption, he (the Provost) went on to say that under the careful and efficient management of Mr. McGilchrist things had progressed extremely well; but should anything occur like what happened last winter—a fire in the retort-house—or should a hitch take place with the holders, the town might be greatly inconvenienced. Even though the town should stand still, the storage capacity would require enlargement; but they knew that the town was not going to remain as it was. Indeed, at no time in her history were the prospects of Dumbarton fairer than at present. He concluded by moving that the necessary steps be taken for carrying out the Committee's views. The motion was adopted.

* See ante, p. 60.

EXETER CORPORATION WATER SUPPLY.

At the Meeting of the Exeter Town Council on the 27th ult.—the Mayor (Mr. W. Pring) in the chair—the Water Committee presented an abstract of the Treasurer's account of income and expenditure for the past half year, audited by the City Auditors. The account, however, could not, it was stated, be taken as an indication of the financial position of the undertaking. This would be shown in the annual balance-sheet and profit and loss account, which the Water Committee hoped to present to the meeting of the Council as the Urban Sanitary Authority in May, after the Committee should have considered the report on the accounts of the undertaking presented by the Finance Committee. The abstract of receipts and payments by the Treasurer from September 30 to March 25 showed on the receipt side—Balance due from the Treasurer in September, 1880, £400 12s. 7d.; water-rate, made March 24, 1880, £85 0s. 1d.; do., September, 1880, £396s 14s. 4d.; Urban Sanitary Authority, for watering and flushing, £500—£4553 14s. 5d.; meter-rents, £453 19s.; land-rent, &c., £41 9s. 6d.; incidentals, £25 4s. 3d. On the payment side, the principal items were—Rates and taxes, £608 11s. 9d.; weekly wages, £541 12s. 6d.; coal, £325 2s. 6d.; sand for filter-beds, £231 13s.; iron pipes, £240 1s. 4d.; Urban Sanitary Authority, on account of interest due prior to Sept. 29, £929 16s. 5d.; half year's interest, due Dec. 31, 1880, £2340; sinking fund, 1879, £406 16s. 6d.; do., 1880, £406 16s. 6d. The total expenses amounted to £6824 17s., leaving a balance due to the Treasurer of £1349 17s. 3d.

The Treasurer presented his estimate of the receipts and expenditure for the current half year, as follows:—Income, £5000; working expenses, £1950; interest on £120,000 original capital and proposed new capital, £2430; sinking fund, £233 10s.—£4613 10s.; estimated surplus, £386 10s.

The Water Committee reported that the subject of the charge to be made for water supplied by meter for trade purposes had received their careful consideration, and the following scale had been adopted by them as the rate of charge:—If the quantity consumed yearly does not exceed 100,000 gallons, 1s. 6d. per 1000 gallons; above 100,000 and not exceeding 500,000 gallons, 1s. 3d. per 1000 gallons; above 500,000 and not exceeding 1,000,000 gallons, 1s. per 1000 gallons; above 1,000,000 gallons, 9d. per 1000 gallons. The Committee recommended that a water-rate of 6d. in the pound on the rateable value of the premises supplied be approved by the Council for the half year ending the 29th day of September next.

THE LIFE AND LABOURS OF BUNSEN.

Our contemporary, *Nature*, in its issue for the 28th ult., contains a steel-plate engraving of Robert Wilhelm Bunsen, whose name is so familiar to our readers in connection with his inventions and discoveries in relation to gas. The portrait forms one of a series of "Scientific Worthies," and is accompanied with a notice, from the pen of Professor H. E. Roscoe, of Bunsen's life and labours, some extracts from which will interest many.

Bunsen was born on March 31, 1811, at Göttingen, and, on completing his education, occupied many responsible positions. "In 1838, he was appointed to the Chair of Chemistry in the University of Marburg, where he remained for 13 years; afterwards he was for a short time at Breslau, whence he removed to Heidelberg, of which renowned University he has been one of the chief ornaments and attractions for the last 30 years."

After detailing some of his earlier discoveries and investigations, our contemporary continues: "Taking a totally different direction, Bunsen's next important investigations were concerned with the examination of the chemical changes which occur in the blast-furnace. In 1838 he proved, by accurate analyses of the gases escaping, 'that at least 42 per cent. of the heat evolved from the fuel employed is lost, and that in view of the ease with which such combustible gases can be collected and led off to a distance for subsequent use, a new and important source of economy in the iron manufacture is rendered possible.' This research is, however, not only noteworthy as pointing the way to a method of economical working without which probably but few ironmasters at the present day could exist, but also as being the first experiment in which an accurate method of gas analysis was employed. This important branch of analytical chemistry has been created and brought to its present wonderful degree of precision solely by the head and hands of the Heidelberg experimental philosopher. Simplicity and accuracy constitute the rare merits of Bunsen's system of gaseous analysis. To have gone completely through his course of gas analytical manipulations from the sealing-in of the platinum wires in the eudiometer to the absorption and explosion analyses of the Heidelberg coal gas, under the eye and with the guiding help of the hand of the master, is in itself an experimental education of no mean order. But it is only on reference to his 'gasometric methods' that we learn the general adaptability of this marvellously accurate system to all those numerous problems in which the analysis of a mixture of gases is required."

After dealing with other of Bunsen's physico-chemical investigations, the writer says: "Another group of researches is formed by those which are closely related to his gasometric methods. One of the most interesting and important of these refers to the law of absorption of gases in water. This subject was first examined by Dalton and Henry at the beginning of the century, and the well-known law which gases follow in absorption is known by the names of these two Manchester philosophers. But although generally admitted, its limits of error had not been ascertained, and the crude experimental methods of the year 1803 required to be replaced by the refined ones of the latter half of the century. These researches, carried on by Bunsen and by several of his pupils, proved that Henry's law of direct—as well as that of Dalton of partial—pressures is exactly true within certain limits; but ceases to be so beyond a given increase of pressure, whilst some gases which obey the law at one temperature do not do so at others, and some again, whilst obeying it in the pure state, do not do so when mixed with other gases."

"The mere mention of his other researches in the wide field of gaseous chemistry is sufficient to indicate his devotion to this branch of experimental inquiry. We find experiments on laws of gaseous diffusion, on applications of gaseous diffusion in gasometric analysis, on the phenomena of the combustion of gases, on the temperature of ignition of gases, and all these, be it remembered, involving exact measurement, and in many cases elaborate calculations."

"Brief reference must next be made to a series of investigations in a totally different direction—viz., on the measurement of the chemical action of light, with the carrying out of which the writer of this article had the great good fortune and pleasure to be connected, and in which he had full opportunity of admiring Bunsen's untiring energy and wonderful manipulative power. In all the difficulties and perplexities by which the experimental investigation of such a subject is beset, the writer never knew Bunsen discouraged or at a loss for an expedient by which an obstacle could be overcome. Cheerful and self-reliant under the most depressing circumstances, he never gave up hope, and thus it was that these somewhat intricate and difficult investigations were brought to a successful close."

"Again, in the department of 'analytical chemistry' how numerous and valuable have been his contributions! There is scarcely one important problem in this subject which has not benefited from his extensive experience and keen insight. Then his original method for the estimation

of nitrogen in organic bodies will always be remembered as one of the most accurate of its kind when employed by an experimentalist as expert as Bunsen himself, but as most difficult and even dangerous in less able hands. Again, all chemists use and appreciate the much simpler methods for the estimation of nitrogen and sulphur admirably worked out by his pupils—Maxwell Simpson and Russell."

"We all employ his beautiful general method of volumetric analysis. His well-known method of flame reactions is a standard example worked out by every student. Again, modern chemists can now scarcely carry on the simplest experiment without using the 'Bunsen gas-lamp'—a burner which is also now employed in every household, and in many manufacturing, and has become so necessary that it is difficult to conceive how we worked before its invention."

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

In Edinburgh a number of gentlemen warmly interested in the gas industry have again and again made efforts to get up an exhibition of apparatus, similar to that which was held in Glasgow in October of last year; but so far they have not secured that unity, or it may be that amount of funds, which enables practical effect to be given to the ideal. At a meeting of the Edinburgh Association of Science and Arts—a younger branch of the Royal Scottish Society of Arts—on Monday last, it was stated by Mr. D. W. Kemp that it was contemplated to hold an exhibition of gas machinery in a few months. He trusted that manufacturers and others who took a special interest in such exhibitions would send in machinery and apparatus, and otherwise give the promoters every assistance in their power. As soon as the ball has been set a-rolling the Committee will doubtless obtain all the assistance they desire; but meantime I would strongly counsel them to secure central premises for the purpose of the show. I am afraid it might as well not take place as be held in Fountainbridge, where I understand the Committee propose to open the exhibition. There are, nearer the centre of the town, plenty of places which could be made available; and if the Committee do not secure one of these, I am afraid they will commit a grave mistake.

With respect to the Aberdeen exhibition, I have to mention that at a meeting of the Town Council of that city this week a communication was read from Mr. A. D. Milne, Secretary to the proposed exhibition, in which he intimated that an important step towards the success of the undertaking had been made by the University kindly granting the use of the two large halls in Marischal College. He further mentioned that the Aberdeen Committee had taken these and other preliminary steps in the hope that the Town Council would do as had been done in Glasgow and other places—namely, give the gas and water supply and fittings free of expense. With true Aberdonian caution, the Council adopted the suggestion of the Lord Provost, that the application be granted; but at the same time coming under no obligation as to the fittings. Seeing that such an exhibition must ultimately benefit the city, by increasing the demand for gas, and seeing further that the expense of making connections, &c., must be a mere trifle to such a wealthy Corporation as that of Aberdeen, it would have been a very small matter to have handsomely granted the application in full. It is expected that the exhibition will be held about the end of September. I trust that the Secretaries of the two exhibitions will so arrange that they do not clash with each other.

The Jurors of the Glasgow exhibition have not yet seen their way out of the difficulty into which the premature publication of their awards threw them. Proposals have been made to recall the report and issue a fresh one, and also to amend the report which has already been given, in such a way as to make it consistent; but neither of these suggestions has met with unanimous favour, and the Jurors are therefore somewhat in a dead-lock. Last week, I believe, the Exhibition Committee had rather a lively meeting. Arrangements were being made with a view to winding up, and, prompted by a feeling of generosity, a desire was manifested by several committeemen to suitably reward certain of the gentlemen whose services had been to a greater or lesser extent at the command of the Committee. On this point a resolution was moved, and then it came out that the gentlemen in question had drawn pretty heavily on account. With more of vigour than politeness one member of the Committee demanded to know who had authorized the payments; but, his cholera having toned down, the Committee made arrangements which may be satisfactory to one set of the parties concerned. I do not know how the Philosophical Society of Glasgow ordinarily conduct their business; but if not inconsistent with their general practice, the publication of the accounts connected with the gas exhibition would afford satisfaction to a large section of the community who interested themselves in the matter, and would at the same time give some data upon which exhibition committees yet to be formed might calculate the probable income and expenditure of proposed undertakings.

Thomas Hean, inspector of lighting in Dundee, died about a month ago, after having served the Police and Gas Commissioners for a period of 33 years. At a meeting of the Dundee Gas Commissioners on Wednesday last, it was agreed to pay over to his widow £33 6s. 8d., which had been returned from the Tay Bridge Disaster Fund; and it was further intimated that the Lighting Committee of the Police Commission had recommended a payment of £30 to Mrs. Hean.

A few weeks ago I mentioned that a good deal of interest had been excited in St. Andrews in consequence of the Gas Company in that city having resolved to erect a store shed at the site of the old gasholder, which shed, it was alleged, would interfere with the view seawards from a certain point of the city. Local feeling ran pretty high on the subject. It was argued in the prints that the site in question had been obtained from the Council by the Gas Company solely for the purpose of a gasholder, and that the Company, therefore, had no right to put the ground to the use mentioned. Representations were made to the Directors of the Company on the subject, and at a meeting of the Town Council of St. Andrews on Wednesday last a letter was read from Mr. Hall, the Manager of the Company, intimating that his Directors had not seen their way to comply with the request of the Council to lower the roof of the building. A resolution was adopted, regretting that the Directors of the Company had not complied with the request of the Council.

From the fortnightly statement of the Water Trust as to the water supply of Edinburgh, it appears that the total quantity stored in the reservoirs of the Trust on the 3rd inst. amounted to 2,197,454,000 gallons, as compared with 2,269,720,000 gallons on the 19th of April. The delivery of water into the city has been 40·87 gallons per head per day to a population of 304,300.

About six months ago an application was made to the Sheriff to have the district of which the village of Whitehills is the centre, converted into a water supply district. The application was granted, and now a supply has been introduced at a cost of £400. This is a small sum, but it means an assessment of 1s. or 1s. 1d. per £10 on the inhabitants. Mr. A. Watson, Manager of the Banff Gas Company, was the Engineer.

The Manager of the water-works at Inverness has no sinecure at present. The report which he statedly lays before the Police Commissioners

contains accounts of the discovery of burst pipes which have for long baffled search. The water from these burst mains and services finds its way into the sewers, or sinks in the gravel. These have been repaired; but still, judging from the quantity of comparatively clear water running in the drains, it is concluded that there must still be a great waste of water through the town. A special account is being kept of the bursts through the recent severe weather.

The ceremony of introducing a new water supply to Dalbeattie was performed ten days ago. It is now about ten years since a proposal was made to obtain a water supply by gravitation, and within this period various schemes have been before the community; but finally it was resolved to bring in a supply from a glen above New Buittle farmhouse, about two miles from the town. Now that the scheme has been carried into practical effect, the cost has been ascertained to be £7220. To meet this outlay, £7200 has been borrowed from the Public Works Loan Commissioners. It may be mentioned that a further sum of £2800 has been obtained from the same source, to defray the cost of a drainage scheme which is now being prosecuted.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The leading event in the gas world in this part of Scotland during the past week has been the half-yearly meeting of the West of Scotland Association of Gas Managers, which was held in this city on Thursday, under the presidency of Mr. R. S. Carlow, late of Port-Glasgow, but now of Arbroath. There was an unusually large attendance, but the provision made by the Committee for the intellectual entertainment of the members was decidedly below the average; indeed, one of the papers included in the programme of business was not read, nor was any sufficiently satisfactory reason given to the meeting for the absence of the gentleman named in connection with it. However, as the new Secretary, Mr. Napier, of Crieff, seems to be a gentleman of considerable ability and force of character, there is room to hope that the next meeting, which is to be held in Dumbarton, will be one specially worthy of note as regards the bill of fare for the members to partake of. The President's address, though short, was possessed of much interest, and was listened to with very great attention. With such a large body of members, many of whom are gentlemen of ability and large and varied experience, the Association should never be at a loss for interesting and instructive papers, together with suggestive and well-sustained discussions upon the same. I may mention, in passing, that Mr. Dalziel, of Kilmarnock, who read a short paper of the kind referred to, is the President-Elect, and that the new Vice-President is Mr. Niven, of Dunoon.

Mr. McCubbin, the new Manager at the Port-Glasgow Corporation Gas-Works, was formally installed in office last Thursday. His predecessor, Mr. Carlow, was unable to be present on the occasion, owing to his duties in connection with the meeting just spoken of; but he put in an appearance in the evening, after the conclusion of his presidential labours in Glasgow. On the evening of Friday, the 29th ult., at a meeting of the Literary Association of Muirkirk, reference was made by the President to the loss which the Association were about to sustain in the departure from their midst of Mr. McCubbin, the Gas Manager, who had been one of the most active members, and had been appointed Gas Manager at Port-Glasgow. In recognition of his services to the Association he was elected and enrolled as one of its honorary members.

The annual general meeting of the Kilsyth Gaslight Company was held on Tuesday, the 3rd inst. From the financial statement which was submitted to the meeting it was shown that the works had been carried on very successfully during the past twelve months. A dividend of 10 per cent. was declared, and a pretty large balance was voted to be laid aside during the ensuing year, to provide for the depreciation of the Company's works.

Yesterday afternoon the Magistrates and Town Council of Paisley made their annual inspection of the gas-works under their charge. There was a large attendance of the Gas Commissioners and the Corporation officers. After the party had been conducted over the works by Mr. G. R. Hislop, the Manager, and Bailie McGown, the Convener of the Gas Committee, they met in one of the rooms of the new offices attached to the works, and partook of light refreshment—Provost MacKean presiding, and Bailie McGown discharging the duties of the vice-chair. The customary loyal toasts having been given, the Provost referred to the inspection which had been made, and congratulated the Council on the satisfactory condition of the works. Bailie McGown also complimented the Council on the results of the inspection, and remarked that the gas supply undertaking was the most valuable trust which the Corporation had. Since the gas-works were taken over by the Town Council in the year 1870, the annual income had increased more than £9000.

At Thursday's meeting of the Town Council of Glasgow there were submitted the minutes of the Corporation Gas Committee, in which it was stated that at a meeting on the 28th of April there was read a letter, dated the 14th inst., from the Magistrates, stating that, according to Dr. Wallace's reports, the illuminating power of the gas supply was, on the dates therein mentioned, below the statutory minimum. The Secretary was instructed to state, in reply thereto, that the Committee find that the illuminating power of the gas, as at the works, on the dates referred to, was considerably above the minimum standard required by the Act of Parliament. Referring to the matter, Mr. Richmond condemned the system of testing the gas for its illuminating power at the works, and said that the gas supplied to the citizens of Glasgow was the worst of any town in Scotland. Mr. Neil said that the report of the illuminating power of the gas was quite fallacious. The gas might be pure at the works, but what was supplied to the community was a mixture of gas and air. How the sapient Mr. Neil can have found out such a condition of things, and where the air was admitted into the gas, I am at a loss to know. Bailie Finlay remarked that during the year the gas had been, on an average, 1½ candles over the parliamentary standard. The minutes were eventually passed.

Extreme quietness has prevailed in the Glasgow pig iron warrant market during the week, and the amount of business done has been very restricted. Speculation has almost ceased to be an element of the market. Hitherto holders have held tenaciously to their iron, and the heavy selling has come mostly from "bears;" but during the last two or three days the feature has been a greater desire on the part of holders to realize. A feeling of hopelessness begins to prevail, which, at the low prices ruling, is disappointing. Business closed on Friday with sellers at 47s. 2d. cash and 47s. 3½d. one month, and buyers near.

The coal trade in general is not improving. In house coal the tendency of prices is downwards. Steam coal and shipping lobs are in fair request, and prices are unchanged.

BRIGHTON CORPORATION WATER SUPPLY.—It was stated at last Wednesday's meeting of the Brighton Town Council that the Water-Works Committee had been able, by good management, to pay out of last year's profits a sum of £4149 to the borough fund, as well as £139 to the contingent fund.

THE AWARDS AT THE MELBOURNE EXHIBITION.—In addition to the awards in the sections of "Mining and Metallurgy" and "Heating and Lighting," a list of which (so far as they concerned the gas industry) we published last week, we learn that Messrs. Tangye Bros. and Co., of Birmingham, have received at the Melbourne Exhibition 15 awards—"first order of merit"—for steam-engines, lathes, and hydraulic machinery. An award—"second order of merit"—has been granted to the Silicate Carbon Filter Company, for filters.

REDUCTION IN THE PRICE OF GAS AT BLACKBURN.—The Gas Committee of the Blackburn Town Council have resolved that the price of gas supplied by the Corporation be reduced from 4s. and 8s. 9d. per 1000 feet, as at present, to 3s. 9d. and 3s. 6d. per 1000 feet respectively, such reduction to apply only to gas consumed on and after the 1st of April last; and also that for the future a discount of 2½ per cent. be allowed on all gas accounts if paid on or before the 15th day of the second month in each quarter.

DERBY CORPORATION WATER SUPPLY.—Last Wednesday, a meeting of the Derby Town Council was held, at which the Water-Works Committee reported upon the position of the undertaking at the close of the first year from the transfer from the old Company. The deficit expected at the end of the first twelve months, ending December, 1880, was £2752. The actual deficit was £2204, or £500 less than was anticipated. Alderman Bemrose, who moved the adoption of the minutes, said it was the hope of the Committee that before the end of the fourth year the water-works would be bringing in a surplus, which would go to the formation of a reserve fund.

SALES OF GAS SHARES.—On Tuesday last, Messrs. J. and A. Bray sold by auction, at Hastings, some shares in the Hastings and St. Leonards Gas Company. Lot 1 consisted of two fully paid £25 shares, which were sold for £98 each, similar shares subsequently fetching 10s. each more. Two £20 shares in the Company were sold at a premium of £4 15s. each.

—Last Thursday Messrs. Tootell and Sons sold by auction, at Maidstone, £5000 worth of stock in the Maidstone Gas Company, being a portion of the new capital authorized to be raised under the Act obtained by the Company last year. The stock was sold in 25 lots of £100 each, 25 of £50, and 50 of £25. Of the first, 13 lots realized £160 each, 11 realized £159, and one £161. Each lot of £50 stock realized £79; while of the £25 lots, two of them realized £40 each, and the remainder £39 each.—Last Saturday 500 £10 shares in the Bishop Auckland District Gas Company were sold at prices ranging from £10 14s. to £11 3s. 6d. each.

HEYWOOD CORPORATION GAS SUPPLY.—At a special meeting of the Heywood Town Council on Wednesday, the 27th ult., the Town Clerk stated, in reference to an application which the late Local Board made to the Local Government Board for additional borrowing powers, on account of the gas-works, to the amount of £20,000, that an inquiry was held into the application by an Inspector from London, and it was then agreed that the amount applied for should be enlarged from £20,000 to £30,000; but in regard to this matter the Inspector thought it was better that nothing should be done until the Corporation had an opportunity to express an opinion on it. It was for the Council now to say if the amount to be borrowed should be £30,000, or whether the original application for £20,000 should be adhered to. Mr. Firth said the Council were aware why it was thought best that the new borrowing powers should go up to £30,000; for though £20,000 would be sufficient to carry out what was intended, in such a matter it was well not to tie themselves down to a given sum. They could not tell what might be required in order to increase the prosperity of the works. He moved that the Council sanction the application to borrow £30,000, as agreed upon at the inquiry. Alderman Hodgkinson seconded the motion, which was adopted.

UCKFIELD GAS COMPANY.—The twenty-third annual general meeting of this Company was held on Saturday, the 30th ult.—Mr. J. G. Langham in the chair. The Directors reported that the balance-sheet for the year showed the rental from private consumers to have been £802 8s. 6d., as against £882 3s. 3d. last year. The difference was fully accounted for by the reduction of price, to 5s. 10d. per 1000 feet, which took effect at Michaelmas, 1879, and had therefore been in operation more than a year. The coke and tar account showed a decided increase in the past year, the receipts having amounted to £177 4s. 9d., as against £139 4s. 9d. in the previous year. The assets and liabilities account showed a balance of £593 16s. 10½d. available for dividend and reserve. Of this sum the Directors proposed to appropriate £200 in payment of a dividend at the rate of 10 per cent., retaining the balance of £393 16s. 10½d. for working capital and reserve fund. The report was adopted, and the dividend recommended in the report declared. Immediately after the annual meeting, an extra-ordinary general meeting was held, at which it was unanimously agreed, subject to confirmation at a subsequent meeting, to increase the capital of the Company from £2000 to £4000. A vote of thanks to the Chairman terminated the proceedings.

THE NEWCASTLE-UNDER-LYME GAS-WORKS ARBITRATION.—At the meeting of the Newcastle Town Council last Thursday—the Mayor (Alderman Heath) in the chair—Mr. Briggs stated that the award of the Arbitrators in the matter of the gas-works purchase had been received. In the usual course it would have been better for the subject to have been first brought before the Committee, but he was anxious to have some fuller information from their Arbitrator (Mr. R. P. Spice) upon it before he called the Committee together, and he had only that morning received a long communication from Mr. Spice upon the subject. This he could not read to the Council before it had been submitted to the Committee, but as the amount of the award was now known in some quarters he would state that it was £65,000, both sides having to pay their own costs in the arbitration. The amount asked for in the first instance by the Company was £68,000, and the amount offered by the Council was equivalent to 25 years' purchase, or £57,875. The amount claimed at the arbitration was the average of the valuations of three witnesses—viz., £76,340. It was only right that the public should be in possession of the information and reports on which the Committee based their offer to the Company. Five professional witnesses examined and valued the works on behalf of the Corporation, three out of the five considering 25 years' purchase to be the full value of the undertaking, but the other two decided on a higher valuation. He did not think the Committee or the Council would have been justified in going beyond the offer of 25 years' purchase. The question might arise how it was the Arbitrators had settled the matter without referring to the Umpire. At the close of the arbitration it was arranged that the Umpire as well as the Arbitrators should come down to inspect the Stafford works, which were of a similar character, though better constructed than the Newcastle works, and that then they should visit the Newcastle works and estimate the value of the undertaking. He personally was under the impression that this arrangement would be carried out, and on the 1st of March received a communication from their Arbitrator stating that in a few days he would be able to name a time for his conference with the Umpire and the other Arbitrator (Mr. G. W. Stevenson). Further correspondence followed, and Mr. Spice, without visiting the works with the Umpire, had given his award, amounting to about 27 years' purchase, although on his first inspection

he had valued the undertaking at 25 years' purchase. He (Mr. Briggs) had written to Mr. Spice on the question, and had received a reply in which he said that whilst it was unusual to do so he had supplied the Council with his grounds for coming to the decision he had. This was the communication which he proposed to submit to the Committee before making it public. In reply to a further question, Mr. Briggs said he did not think the costs of the Corporation would much exceed £1000.

THE USE OF GAS FOR MOTIVE POWER.—Last month's number of *Van Nostrand's Engineering Magazine* (New York) contains an article on "Small Motive Power," in which the author, Mr. H. S. H. Shaw, C.E., speaks of gas as "a convenient source of power, and in towns where it is already supplied almost to every building for purposes of illumination, it is at once obtainable in any moderate quantity. Moreover, the principle of adopting a large centre of supply, which is employed in the case of gas, is, on scientific grounds, truly economical, for that substance is supplied in the state of fuel, and involves no more loss in its transmission than would occur in the transference of any other fuel. But in spite of many attempts to use it for small motors, it has only recently been much adopted." He then proceeds to describe the various gas-engines in general use at the present time; and winds up this part of his article with the statement that "the theory of gas-engines is yet imperfect; but some things are certain with regard to them, and one is that the absence of a boiler in connection with them gives a great advantage over the steam-engine. The absence of risk, either from explosion or conflagration, is another strong point; while the scientific application of production on a large scale, in the form of the gas used, is perhaps the strongest of all, in leading to the conclusion that their present popularity is likely to last, gas-engines being a step in the right direction."

A CORRESPONDENT kindly forwards the following paragraph from the monthly list of a well-known firm of stockbrokers in the City. It looks very much as though they would be glad of gas shares to meet forward sales made in anticipation of the expected fall in the value of gas property, consequent on the advent of the electric light in the streets of London early in April:—"For several months past we have been warning the public against being led into sacrificing their gas property at the greatly depressed prices that were occasioned by the first scares in connection with the new light. We cannot help inferring that the electric is the light of the future, and that science will before long invent methods by which its use will be vastly improved and extended, and the drawbacks now experienced obviated. Should this view be correct, it seems to follow that, although senseless panic and hasty selling are to be deprecated with as much reason as ever, those persons who have hitherto kept the bulk of their means locked up in gas investments may do well to consider the advisability of acting to a greater extent upon that cardinal principle which advises the spreading of money over many different fields, thus

bringing into play the sound doctrine of averages. They will better effect this suggested reconstruction of their plan of investment now than by waiting until the period when the most profitable portion of their business—we mean the lighting of private dwellings—is encroached upon by the new light. It is true that the means of thus applying it have not yet been provided, but who can say how long the discovery of such means will be delayed, in these days when the triumph of one laboratory becomes almost instantaneously the common property of the whole scientific world; each discovery thus forming a fresh step towards the bringing into subjection and utilization the deepest and most recondite secrets of Nature?"

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

1831.—LAKE, W. R., Southampton Buildings, London, "Improved apparatus for regulating the heat of carbonaceous substances used for enriching coal gas." A communication. April 27, 1881.

1894.—ABEL, C. D., Chancery Lane, London, "Improvements in the production of combustible gas, and in apparatus therefor, which latter are also applicable for calcining and carbonizing operations." A communication. May 2, 1881.

1897.—BARLOW, W. A., St. Paul's Churchyard, London, "New or improved means of or process and apparatus for obtaining, storing, and utilizing gas for lighting or illuminating, heating, motive power, and other purposes." May 2, 1881.

1940.—OTTO, N. A., Muelheim-on-the-Rhine, Germany, "Improvements in the manufacture of combustible gas and in apparatus therefor." May 4, 1881.

1966.—JONES, W., Manchester, "Improvements in meters for measuring water and other liquids." May 5, 1881.

PATENT WHICH HAS PASSED THE GREAT SEAL.

5456.—WALLER, G., Southwark, London, "Improvements in rotary pumps, specially applicable as gas exhausters." Dec. 28, 1880.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1355.—BILLING, C. E., "Improvements in gas-burners and reflectors for heating and warming purposes." April 5, 1878.

1391.—LAKE, W. R., "Improvements in apparatus for measuring water or other liquids." April 8, 1878.

1509.—GEDGE, W. E., "An improved water-meter." April 16, 1878.

1534.—COCKEY, H. and F. C., "Improvements in wooden grids for gas purifiers." April 17, 1878.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending May 4, 1881.

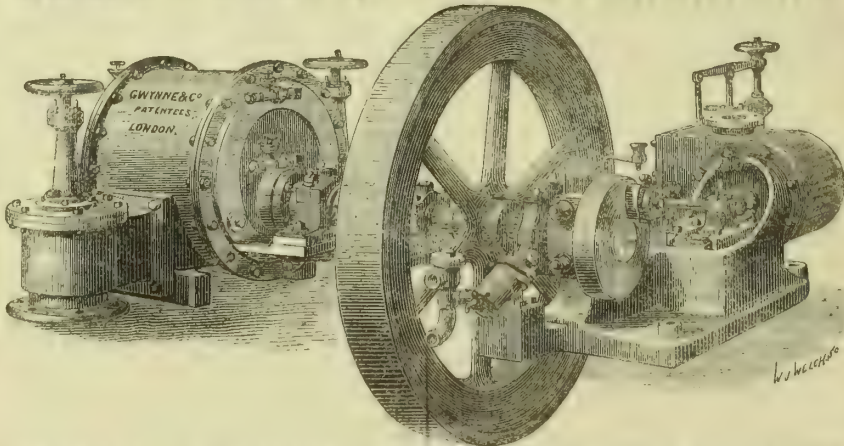
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.9	16.9	17.4	9.7	6.5	8.7	0.0	0.0	0.0	None.	In excess.
	Camden Town	17.4	16.9	17.2	15.8	11.7	13.3	0.0	0.0	0.0	"	"
	Dalston	17.6	16.7	17.2	13.9	10.0	11.0	0.2	0.0	0.0	"	"
	Bow	18.1	17.0	17.6	11.6	9.5	10.8	0.8	0.6	0.7	"	"
	Chelsea	17.0	16.6	16.8	13.2	11.5	12.3	0.4	0.0	0.1	"	"
	Kingsland Road	17.4	16.5	16.9	13.7	8.8	11.5	0.1	0.0	0.0	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas) . . .	21.6	21.0	21.3	8.7	6.5	7.7	0.0	0.0	0.0	"	"
	Peckham	16.8	16.6	16.7	11.3	10.2	10.7	0.4	0.0	0.2	"	"
Commercial Gas Company	Old Ford	17.7	16.8	17.2	11.5	8.8	10.7	0.3	0.2	0.3	"	"
	St. George-in-the-East	17.3	16.9	17.1	7.3	5.7	6.7	0.4	0.1	0.2	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 17, 1881.

THE HOUSE OF COMMONS AND THE NEW STANDING ORDER.

On Tuesday last the new Standing Order proposed by Mr. Stanhope, with reference to Gas and Water Companies' Money Bills, was, as will be seen from our "Parliamentary Intelligence," accepted by a large majority of the members present at a very full sitting of the House of Commons, and is therefore now in force. Henceforth the labours of the Court of Referees on Bills dealing with water or gas supply will be materially lightened, for Local Authorities will be able to claim as a right the *locus standi* in opposition to such measures which has, under some circumstances, been either denied or conceded as a favour. That the question at issue was not free from difficulty might, in default of other evidence, be inferred from the fact that the strong convictions on the one side which led the President of the Board of Trade to throw the great weight of his influence against Mr. Pemberton's amendment, were balanced by the equally

pronounced but less authoritative opinions formed against the original motion by the Chairman of Committees. When two prominent officials, such as Mr. Chamberlain and Dr. Lyon Playfair, are found to vote against each other on an apparently simple question, it is *prima facie* evidence that there is more than meets the eye in the subject at issue. That this is so in regard to the matter on which we have already commented at some length, no one interested, actually or potentially, in the higher branches of gas polity in this kingdom will be disposed to deny.

Although the wording of Mr. Stanhope's motion and Mr. Pemberton's amendment did not make any direct reference to the fact, the whole principle of modern gas legislation was involved in the simple proposition advocated by the supporters of the motion, and denied by the friends of the amendment, that local authorities should, in all cases, be heard against all the circumstances of a gas monopoly, whenever the undertakers apply to Parliament for power to raise additional capital to carry on their business. How this great consequence originates in such an apparently simple procedure as the introduction of a new Standing Order of the House of Commons, is made evident if it is remembered that, speaking broadly—and parliamentary rules are not made in view of exceptional cases—all the capital referred to is sliding-scale capital, sold in the open market to the highest bidder. By the well-known modern practice, all Gas Companies, upon applying to Parliament for extension of capital powers, have to accept the sliding scale and auction clauses, and if, at any time afterwards, a Company so regulated should require more money, it has to be raised in the same way. Now, contemporaneously with the general introduction of this principle, the Court of Referees decided that simple application on the part of a Gas Company for power to raise more capital did not offer sufficient ground for a Local Authority, however interested in the other circumstances of the Company's existence, to appear in opposition to the application. This decision was rather loose and informal; but, taken in conjunction with the new conditions—this qualification being of the first importance—it worked well. Mr. Pemberton's amendment would have consolidated the Referees' practice upon an intelligible basis, preserving its spirit, but removing its accidental and unintentional exclusiveness.

The essence of the decisions of the Referees, and their sole benefit, lay in the fact that by discouraging opposition to Money Bills, they narrowed the occasions still open to Local Authorities for attacking the initial prices upon which sliding-scale capital is based. Local Authorities and, as appears by last Tuesday's work, the majority of the members of the House of Commons also, do not understand how initial prices differ from standard prices, such as were universal less than ten years ago. As the late expression of opinion in the House is by no means irrevocable, it will not be too late to here enunciate the difference afresh. Reduced to the briefest terms, it is this: Whereas it was at one time to the interest of the public that standard prices should be frequently revised, it is now as beneficial to all parties concerned that initial prices should be maintained without alteration. It will be conceded that, under the sliding scale, no matter what may be the initial price, gas will be sold as cheaply as possible, in order that increased dividends may be the result. Suppose now that a Company, when coming under the new regulations, obtained such an initial price that by the time the capital then authorized had been nearly expended, the course of trade was so favourable that the Company could pay twelve per cent. dividends, the selling price having been reduced commensurately, say, from 3s. 6d. to 2s. 10d. per thousand cubic feet. The last portions of the authorized capital would, in general, be readily subscribed by investors to pay six per cent.; hence £20,000 nominal stock would realize to the Company just £40,000, of which half would bear no dividend while being sunk, like the rest, in the working of the undertaking. If now the Company, upon applying to Parliament for more capital, is met with opposition on the ground that the initial price is too high, and the Local Authority, with mistaken zeal, gets it reduced to the actual selling price for the time being, what is the result? Nothing short of robbery to the investors who may have bought the old stock, and great injury to the consumers, for there will no longer be the influence of premium capital to help in reducing the price. All the good of the sliding scale will be abolished at a blow, and the system of regulation of the unfortunate Company, and their still more unhappy customers will be reduced to the obsolete standard without its compensating security. We advocated Mr. Pemberton's amendment, which would have rendered it extremely difficult for

Local Authorities to attack an initial price after it had been once settled, for the reason that such bodies are generally ignorant of the mischief they might do in this respect, and it is as well to remove the ability of doing actions which cannot possibly have good results.

Mr. Chamberlain does not appreciate the position in which Local Authorities and Gas Companies under recent legislation stand to each other in reference to this matter of price, as concerning ratepayers and gas consumers. The duty of leading the opinion of the House in the brief discussion of Tuesday last was not performed by him in an unimpeachable manner. He strengthened his own imperfect arguments by quoting portions of a letter written, as we think with questionable policy, by Mr. W. Livesey, the main purport of which, as may be gathered from the full text published in another column, was evidently not intended to support the case against the Companies. However, the Order is now in operation, and it must be taken for what it is worth. It will soon take effect, and the question of the stability or otherwise of initial prices will be well threshed out in the coming contest between the South Metropolitan Gas Company and the Metropolitan Board of Works. This will be the first time that a Company under the sliding scale has had to meet opposition solely on the subject of price, and it is well that the Company is powerful enough to fight to the uttermost for the principle. A feeble Company might give way before determined opposition, and accept some compromising settlement which would make a bad precedent; but there will be no danger of this kind of weakness in the present case.

In the interest of the public, not less than in that of the Companies, it is most advisable that the whole spirit and meaning of modern gas policy should be carefully and thoroughly explained. It is, of course, difficult to define the truth in a way that shall be acceptable to those persons who, being members of local boards or corporate bodies which have always held to the cardinal principle of opposing everything Gas Companies do, fail to understand why this new-fangled idea of the sliding scale should upset the good old stubborn rule; but it must be done somehow, if only through the slow means of precedents made in parliamentary committee-rooms. The latter is an expensive class of instruction, and has the fault of being rather uncertain. It is, however, fortunate that so many of the members of Mr. Forster's Committee, which originally approved of the new regulations, including the Chairman himself, are available, if need be, to explain the meaning they attached to the conjunction of the sliding scale and the auction clauses; and it may be hoped that, after all, the most promising advance in the gas legislation of modern times will not be allowed to suffer inept disparagement.

THE ACCOUNTS OF THE METROPOLITAN GAS COMPANIES.

WE publish in the present number of the JOURNAL (p. 831) our usual annual abstract of the accounts of the Metropolitan Gas Companies, which it is impossible to examine, however slightly and superficially, without being struck at once with the growing magnitude of the operations represented by these figures, and the improvement that has taken place during the past year in most of the circumstances of the Metropolitan Gas Supply. To begin with, it will be noticed that the nominal capital of all classes employed by the Companies amounted in 1880 to £13,025,955, or £344,136 more than was paid up in the previous year. The total incomes of the Companies from all sources amounted last year to £3,993,298, or £66,530 more than in the previous year. The expenditures of the Companies on revenue account do not show such a large proportionate increase, so that, with the solitary and slight exception of the London Company, who have a very heavy repairs and renewals account, the profit realized per cent. on capital was higher last year than in the year before, notwithstanding the fact that last year the returns relating to the South Metropolitan Company were affected by the payment of large sums by way of compensation to retiring Directors and officers under amalgamation schemes. It will be observed that the capital of the London and the South Metropolitan Companies shows a nominal decrease as compared with last year, that of the former Company being caused by several minor conversions of bonds, &c., and the more striking diminution in the case of the latter Company being due to the conversion, under the provisions of the scheme of amalgamation, of £504,000 of the Phoenix seven and a half and five per cent. capitals into £342,000 of ordinary "B" stock of the South Metropolitan Company. This process caused a nominal reduction of £162,000 in the capital of the amalgamated Companies, which, by the actual increase of £78,802 (less bonds paid off)

in the amount of new capital called up during the year, leaves the apparent decrease shown in the table.

Coming to the working of the Companies, the smallest expenditure per ton of coal carbonized is that of the South Metropolitan Company, amounting to £1 7s. 0.73d., or a decrease of 4.69d. per ton as compared with the previous year's working, although the past year's account includes the working of the Phoenix district. The heaviest proportionate expenditure is that of the London Company, amounting to £1 11s. 6.87d. per ton, the reason for which has been already alluded to. The figures representing the gross profit realized per ton of coal carbonized do not exactly follow the capital employed; for although the Chartered, having the heaviest capital charge, also make the greatest profit, the next in order of profit is the Commercial Company, which is the lightest burdened, in respect of capital, of all the Companies. It would be impossible to give, within reasonable limits, all the considerations with respect to selling price, &c., which have combined to make the figures in these tables what they are; in fact, they form, when properly read, the epitome of all the Metropolitan gas history which appears in our pages from year to year.

Perhaps the most interesting part of these accounts, from an engineer's point of view, is the small table which follows:—

TABLE of the Residuals and Gas made, per Ton of Coals Carbonized, by the Metropolitan Gas Companies in the Year 1880.

Name of Company.	Coke per Ton of Coals, in Bushels.	Breeze per Ton of Coals, in Bushels.	Tar per Ton of Coals, in Gallons.	Ammoniacal Liquor per Ton of Coals, in Gallons.	Gas Made. Cub.Ft. per Ton
CHARTERED	42.36	4.21	11.05	33.15	10,346
COMMERCIAL. . . .	47.31	4.49	11.62	38.03	10,476
LONDON	35.20	4.34	10.15	24.92	10,036
SOUTH METROPOLITAN	48.46	3.11	9.84	28.47	9,803
Mean per ton . . .	43.41	4.02	10.77	31.91	10,220

Two distinct schools of retort-house management are here represented—the Commercial and the Chartered Companies adhering to the practice of large yields, and the South Metropolitan and the London being content with a comparatively small production of gas per ton of coal carbonized. The doctrines of each school appear to have been pushed farther during the past year than in 1879, the high yields having been increased, and the low rates having been still further diminished. We cannot here enter into a discussion of the points of this nice question. So many factors are involved in the problem of how much of absolute profit or loss there is in the extra 673 cubic feet per ton placed to the credit of the Commercial, as compared with the South Metropolitan Company, that we are unable to argue the matter upon these data alone. The South Metropolitan Company are ahead in the production of coke, but last in yield of tar. We closed our comments last year with the remark that the results of the working of all the Companies then catalogued for comparison were remarkably even. This cannot be said with regard to the working of 1880. Strongly marked differences undoubtedly exist; but the work of explaining them must be relegated to those responsible for them.

THE PROPOSED AMALGAMATION OF THE LONDON GASLIGHT COMPANY.

ALTHOUGH the subject is not ripe for full discussion, there is no secret made of the actual resumption, during the past few days, of negotiations for further amalgamation among the few existing Metropolitan Gas Companies. This time it is The Gaslight and Coke Company who have alone approached the still coy London Company with offers of an alliance, presumably for their mutual benefit. The South Metropolitan Company, who, at one time, appeared as a third member of a possible confederation for the absorption of one of the trio, have other work on hand, and, for the present, are out of the scheme, but will probably have something to say about it later. It cannot be asserted that absolute agreement yet prevails between the parties to the present negotiations, but if both are earnest in the lines long ago indicated as their respective policies—the one desirous of amalgamating in furtherance of preconceived duty, and the other passive, not unwilling to be won over for a suitable consideration—a coalition should be ultimately easy. The London Company stand to their northern neighbours in a very different relation to that in which they are regarded by the South Metropolitan Company, and it is intelligible that the former should be more disposed to push on the treaty for acquiring the district in question than the latter, whose interest in a possible partition is not so superficially plain.

Without, on the present occasion, entering upon the more abtruse points of contemporary Metropolitan gas policy, it is

evident, from a glance at the map of the several districts, that the London Company have a very compact area to themselves within the inner circle of the Chartered territory; while their works are across the river, and practically surrounded by the South Metropolitan district. The London Company, again, are easily able to sell gas at a much cheaper rate than the Chartered—and, what is more, actually do so now, and are prepared to go still lower; while every penny taken off by the larger Company is with much anxious consideration. In fact, in the matter of price, the London Company are at present precisely in the same commercial relation to their two great neighbours as they are geographically by the distribution of their district on each side of the river. They are the "link," not at present missing, but whose absence is rather desired. There is sufficient strength in their position to make them attractive to the Chartered Company, but the same fact unfortunately tends to endure them with no inconsiderable amount of self-esteem. This is manifested at the present crisis in the following way:—The Chartered Company, having a high initial price, are believed to be willing to allow the London shareholders to participate in the advantages which this confers, and to divide on the London ordinary capital the full sliding-scale dividends, or to take over the same capital as ten per cent. preference. It is difficult to see the unfairness of this offer, although the Directors of the London Company are said to regard it with scorn, and to demand all the benefits of the sliding scale with a guaranteed minimum dividend of ten per cent. In other words, they want all the sweets, but none of the risks of the sliding scale. This appears so unreasonable, if true, that—setting aside any possible objections to such a peculiar style of preference which might be entertained by the Board of Trade—we cannot help wondering whether the Company could expect to obtain anything like such terms if they were to go to Parliament on their own account. Not with the Metropolitan Board of Works in opposition, it may at once be decided. Unless the London Company can manage to get the course of recent gas legislation reversed, for their own especial benefit, the sliding scale and auction clauses, with 3s. per thousand cubic feet as a highest possible initial price, loom for them in the near future.

We have no desire to take the part of the Chartered Company in the present instance; but regard for the truth compels us to say that in preferring, if such should be their decision, to trust to the fortunes of the future, instead of agreeing with their neighbour while there is time, the Court of the London Company would incur a responsibility for which, if they should be in error, no amount of admiration that they may now entertain for their own glorious state will be held to serve as a sufficient excuse. Whatever may be the result of the current negotiations, we may take it that the consumers will not suffer. There will, in due time, be a levelling down of prices if the districts should be amalgamated, and, in the alternative, the history of the London Company's dealings with their customers speaks volumes on the subject of their future action if left to themselves.

LIMERICK CORPORATION GAS SUPPLY.

THE benefits of amalgamation of gas undertakings are not confined to large centres of population, as the Town Council and ratepayers of Limerick are fast learning. It is but a short time since the Limerick Gas Company, to which title the venerable United General Gas Company had shrunk at the last, gave up their undertaking to the Local Authority, and passed out of existence in so doing. Under the advice of Mr. T. Newbigging, arrangements were thereupon commenced for consolidating and improving the supply from the defunct Company's works, so as to gain the advantage of manufacturing gas at one station, and using the other old works, which had been in the hands of the Corporation since 1856, for storage only. The improvements are not yet completed, and the town does not therefore reap the full benefit from the recent changes. Even now, however, there has been recorded, in the recent report of the Gas Committee, such a marked progress in the united undertaking, that the Corporation might be excused for feeling intense remorse that a state of competition should have been allowed to exist in the gas supply of their town throughout so many years. We observe that the interest to bondholders and repayment of loan and interest absorbs the greater portion of the disposable profits; but, notwithstanding these charges, the balance has risen from £967, in the last account, to £2681 at the termination of the past year. This is so reassuring, that we may expect, perhaps, a speedy reduction in price, to make the ratepayers and consumers feel they share in the prosperity of the concern.

THE REMUNERATION OF GAS MANAGERS.

THE principle of part payment of a gas manager by results has acted remarkably well at St. Helen's, if we may judge from a recent report. When the present Manager, Mr. John Hall, took office under the above conditions, he was allowed a bonus of one penny per thousand cubic feet for all gas made over 8937 cubic feet per ton of coal carbonized, and a further commission of one halfpenny per thousand cubic feet in respect of all saving effected in unaccounted-for gas, over an average of 22·6 per cent.—these being the figures obtaining at the time. Mr. Hall has done so well for the undertaking upon these terms that it has been unanimously decided by the Town Council to raise his fixed salary by forty per cent., and to afford him a revised commission of fourpence per thousand cubic feet on all gas produced over 10,000 cubic feet (of 18-candle power) per ton, and an additional allowance of threepence per thousand cubic feet on all saving effected in unaccounted-for gas over a yearly average of 9·26 per cent.—this last being the figure to which Mr. Hall has succeeded in bringing down the loss. The difference between the earlier and later *minima* permitted to the Manager is eloquent enough in itself to discharge us from the necessity of making any comment upon it. Whatever may be said in regard to leakages, it must, however, be felt that, unless the Manager is allowed unlimited choice of coals, the highest point in respect of yield of gas has now been fixed, and the St. Helen's Committee must rest and be thankful, if the Manager's commission is to be of much benefit to him.

Water and Sanitary Affairs.

MR. EDWARD J. WATHERSTON and his friends indulge the expectation that the Government Water Bill will really be introduced immediately after the Irish Land Bill has passed its second reading in the House of Commons. The Vestry of St. Martin's-in-the-Fields have accordingly resolved to invite the various Vestries and District Boards of the Metropolis to re-appoint a body of delegates to consider the terms of the Bill, and to report to the respective Vestries and District Boards before taking any further action in the matter. Mr. Watherston is anxious that the delegates shall be all ready for their duties by the time the Bill is in the House, and hence the preparation which is going forward. That any real progress can be made with the London Water Question this year seems exceedingly unlikely. The only ground of Mr. Watherston's expectation appears to be the reply of Sir William Harcourt to Mr. Ritchie, that when the Bill relating to land in Ireland was passed, he (the Home Secretary) would be in a better position to say whether there was a likelihood of a measure being introduced dealing with the Metropolitan Water Supply. This amounts to a very vague kind of promise, simply showing that the subject is not abandoned. A Bill may possibly be brought in, even now, and it must be done quickly if at all. But its introduction at so late a period could do little more than excite discussion and elicit opinion, prior to a more serious effort next year. If Mr. Watherston were Home Secretary, perhaps matters would move a little faster.

The annual report of the Medical Officer of Health for Cardiff (Dr. Paine) enters at much length into the question of the water supply, concerning which it is shown that this rapidly growing town has but an inadequate provision. Taking in the whole of the population dependent on the local supply, it is shown that already only twenty-two gallons per head per day are available, whereas the proper minimum is twenty-five gallons, and the population of Cardiff and Penarth, which is now 90,000, is likely to become 100,000 in less than two years. Concerning an excess of infantile mortality from diarrhoea during July, August, and September last year, Dr. Paine gives reasons for his belief that it was due—not to the water supply, but to cows' milk. The disease was neither epidemic nor endemic, and it was limited to infants of one year old and under. Dr. Paine found that he could stop the disease by ordering the cows' milk to be discontinued, and condensed milk substituted. This is worth considering in London, where the Registrar-General in past years has laid down the rule that diarrhoea increases with the temperature of the Thames—thus associating the water supply with the prevalence of the disease. Perhaps we shall next be told that the milk is made bad by the water that is put into it; but this does not appear to be the view entertained by the Medical Officer of Cardiff. The sins of the milk supply are daily becoming more apparent, and if there is sometimes a mixture of the two liquids, it seems quite as likely for the milk to spoil the water as for the water to spoil the milk.

Moreover, in cases where the water is proved to be at fault, it is water that is taken from a well, and not from a Company's main.

The Lower Thames Valley Main Sewerage Board have made a call of £5000, in defiance of the protest of one of their members, who declares himself "ashamed to belong to the Board." If his memory served him rightly, this would make £15,000 which they had called up in about three years, and all they had to show for it was "some worthless plans and a few handsome chairs." "There was no approximation," so he declared, "to dealing with the sewage." At the same meeting at which the call was voted, one gentleman wished to know the position in which the Board stood in reference to the account of Lient.-Col. Haywood. A statement was then made in reply, by which it appeared that Mr. Haywood puts in a claim of nearly £8000 against the Board, but refuses, for the present, to go into any matters of detail, although a deputation was appointed to wait upon him for this purpose in January last. All his letters addressed to the deputation are marked "private and confidential," and for the present the deputation have nothing to report, but express a conviction that Mr. Haywood will not take proceedings against the Board without a preliminary conference. In addition to the troubles with Mr. Haywood, the Board are on the verge of a difficulty with another eminent Engineer—no less a personage than Mr. T. Hawksley. Some time ago, the Board desired this gentleman to advise them what to do towards the disposal of the sewage, but wished him, in the first instance, to state what his charges would be. After a long period of delay, Mr. Hawksley suddenly began to explore the district, and stated that "he should send in his charges when he sent in his report." The Board are apparently as anxious now to stop Mr. Hawksley as they were a short time back for him to go on, whereas Mr. Hawksley appears as determinedly active as before he was provokingly passive. Great apprehensions are expressed as to what will be the extent of Mr. Hawksley's claim, the only comfort which the Board have received on this point being Mr. Hawksley's own assurance that he is "notorious for his moderate charges." Not content with thus getting into war with the giants, the Board have had a little fray with a medical gentleman—Dr. Collum, who was one of their own witnesses at the Local Government Board inquiry held at Kingston last year. Dr. Collum claimed thirty guineas for preparing and giving evidence, and this amount the Board wished to cut down by one-half. On the case coming on the other day before Mr. Vernon Lushington, Q.C., at the Kingston County Court, Sir Thomas Nelson, who was subpoenaed for the plaintiff, and Mr. Bell, the Clerk to the Sewerage Board, offered such testimony in support of the claim, that the Judge gave his decision emphatically in favour of the plaintiff, expressing his regret that the case had been defended, and telling the Board that he thought they had been "very ill advised." On the whole, there seems some little warrant for the appeal made by the dissatisfied member who thumped the table at the last meeting of the Board, saying: "Let us abrogate our functions and retire ashamed of ourselves." The Chairman pronounced the suggestion "charming," but "utterly impracticable."

Helensburgh, situated several miles below Glasgow, resents the idea that the pollution of the Clyde is such as to affect the sanitary condition of this popular health resort. The unfavourable notion has been promulgated by Dr. Henderson, who quotes from a paper read by Dr. Angus Smith before the Glasgow Philosophical Society, entitled "The Mud of the Clyde." The Helensburgh authorities quote from the same document to show that by the time the water which has been polluted at Glasgow reaches the shores of this burgh, it is "very nearly free from sewage contamination." Water taken from the sea off Ailsa Craig contained nearly half as much oxidizable matter as the water off Helensburgh. Various analyses have been made, and the result of the whole appears to establish the fact that Helensburgh does not suffer any harm from the sewage of Glasgow. At the same time the authorities of this pleasant little town are advised that they had better carry their own sewage farther out to sea, so that the outlets should be considerably beyond low-water mark. The investigation is interesting as showing that the foulness of a river is by no means so persistent as some scientific purists assert.

The Dublin Corporation, having called upon the Irish Local Government Board to investigate the question as to the manner in which the sewer contract for that city has been carried out, are not very well pleased with the response which has been vouchsafed to them. The Board signify

that they have nothing to do with any dispute between the Corporation and the Contractor, but they will inquire into the matter so as to see whether there has been any departure from the original plans on which the Government loan was granted, "Mr. Bell, C.E., having stated that sufficient provision was not made for the supervision of the work." On the issue of this inquiry will apparently depend whether the Corporation will receive from the Board the final instalment of the loan. Thus the Corporation, rather than the Contractor, are to be put upon their trial, and the matters which they more particularly desired to have investigated will be passed by. The Corporation have accordingly resolved that a further communication be made to the Local Government Board, requesting that the inquiry should be of "the full and ample character sought by the Council in their previous communication."

An account of the work done by public analysts during 1880, under the Sale of Food and Drugs Acts, is given in the *Analyst* of the current month. Out of a total of nearly 18,000 samples analyzed, over 3000 were found to be adulterated. There were 1619 samples of water, of which 287 were condemned. Of 11 samples of water analyzed in Chelsea and 18 in Lambeth, none were condemned, but of 32 analyzed in Somersetshire, 24 were condemned. Of 69 in Cheshire, 36 were condemned; so also 16 in Canterbury, out of 26; 45 in the borough of Leicester, out of 137; none in Brighton, out of 12; 24 in Cork (city and county), out of 72; and of 31 in Norfolk, all were condemned. Throughout the country the proportion of water samples condemned was a little under 18 per cent. Of milk, the proportion adulterated was 22 per cent.; butter, 20 per cent.; and wines, spirits, and beer, over 21 per cent. The adulteration of butter is shown to be largely on the increase, as also bread and flour.

SOCIETY OF ENGINEERS.—We have pleasure in acknowledging the receipt of a copy of the Transactions of this Society during its last Session—from Feb. 2 to Dec. 6, 1880. The report is exceedingly well got up; and contains pretty full abstracts of the discussions that took place on the various papers read during the year, besides interesting accounts of the vacation visits paid by the members of the Society to engineering works of interest in and around London.

A LECTURE ON "Coal Gas, Photometry, Meters, Fittings, Burners, &c.," was delivered at Wandsworth, on Monday last week, by Mr. Alfred Lass. Numerous experiments were performed during the evening, and these were ably carried out by the lecturer, assisted by Mr. F. W. Hartley.

AMONG other exhibitions of gas apparatus, &c., announced, we notice there is to be one held at Oswestry. It will be open for three days, commencing on Tuesday, the 31st inst. Also one at Chelmsford, to take place early in June.

A NOTICE of motion was on the agenda paper for the meeting of the Warwick Town Council last Tuesday, in regard to the projected purchase of the gas-works by the Corporation. Owing, however, to the illness of the town councillor who intended proposing a resolution on the subject, the matter was deferred till the next meeting of the Council.

ITEMS of news (?) respecting gas and gas supply are constantly cropping up in most unaccountably strange places. Recently one of the London morning papers published a paragraph in large type, and following the "leaders," giving information in regard to the contemplated opposition to the South Metropolitan Gas Company's Bill, that was fully known and published months ago. This has evidently been seen and improved upon by one of the financial papers, which last week, under the heading of "Sayings and Doings," informed its readers that "the South Metropolitan Gas Company comes before the House of Commons this week for further powers. Opposition is to be offered on the very sensible ground that the Company charges 5s. 6d. per 1000 feet for gas, which others—The Gaslight and Coke for one—can supply at 3s. 2d." The utility of publishing such a totally erroneous statement is not apparent.

WOLVERHAMPTON CORPORATION WATER SUPPLY.—At the meeting of the Wolverhampton Town Council on Monday, the 9th inst.—the Mayor (Mr. J. Jones) in the chair—Mr. Wright, Chairman of the Water-Works Committee, presented a report recommending considerable extensions of the works at Cosford, in order to meet increased demands upon the Corporation for water. On the 5th of March last the Committee had, the report stated, received a report on the subject from Mr. H. J. Marten, and acting upon this gentleman's recommendations, they had, with the approval of their Engineer (Mr. L. Wright), determined to sink a well and erect the necessary engines and plant for obtaining the increased supply of water required, at an estimated cost of £8150. The report was approved.

LOCAL GOVERNMENT BOARD INQUIRY AT STAFFORD.—On Tuesday last, Mr. S. J. Smith, C.E., held an inquiry into an application by the Stafford Town Council to the Local Government Board for sanction to borrow £5000 in connection with the sanitary depot, £4000 for gas-works, and £1400 for works of river improvement. With reference to the item of £4000 for gas-works, the Town Clerk said the Corporation purchased the gas-works, as from July, 1878, for £70,000. By their Act of Parliament they were not bound to pay back anything for the first five years, but to the present time the sum of £2400 had been repaid. Of the purchase-money £55,000 had been borrowed, repayable in 30 years, although they were allowed 60 years under the Act. The loans were repayable in equal half-yearly instalments of principal and interest. They had also reduced the price of gas in October, 1879, from 4s. 2d. to 3s. 10d. per 1000 feet, and had given notice of a further reduction of 4d. in October next; and, in addition to the reduction of price, over £3000 had been voted from profits to the reduction of district rates. The present loan was for money which had been expended upon capital account; £2200 being for extension of works, and the remaining £1800 for laying mains and an extension of the retort-house and a new retort-bench.

ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1880.

	Chartered.		Commercial.		London.		South Metropolitan.		All the Companies.	
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Capital and borrowed money	9,469,943	16 6	745,845	10 0	858,675	15 0	1,951,490	0 0	13,025,955	1 6
Income—viz.:										
Sale of gas by meter	1,855,971	3 10	215,445	19 3	216,887	16 4	501,364	12 4	2,789,669	11 9
Public lights, including lighting and contracts	128,048	18 5	20,947	4 7	21,489	19 6	50,785	19 1	221,272	1 7
Meter-rents	37,893	10 11	4,277	7 2	4,503	6 0	11,411	4 9	57,995	8 10
Old materials	3,113	5 0	171	1 0	464	17 10	705	11 1	4,754	14 11
Residual products	585,480	5 1	75,385	9 11	69,109	18 7	178,553	13 1	908,529	7 8
Miscellaneous	5,262	14 5	212	18 5	2,581	0 6	3,020	19 5	11,077	12 9
Total income from all sources	2,615,979	17 8	316,440	0 4	315,036	18 9	745,842	0 9	3,993,298	17 6
Expenditure—viz.:										
Coals, including carriage and dues	907,036	16 5	111,125	7 2	112,173	17 11	259,129	0 11	1,389,465	2 5
Purifying materials, including labour	47,989	7 11	6,637	3 7	3,700	0 4	10,286	17 6	68,613	9 4
Salaries and wages—manufacture	179,694	5 11	30,205	16 7	27,828	11 7	65,410	16 10	303,139	10 11
Wear and tear—manufacture	245,974	18 1	22,185	13 8	45,376	11 8	62,430	15 9	375,967	19 4
Rents, rates, and taxes	78,067	11 10	7,541	13 2	9,984	1 4	18,353	1 1	113,976	7 5
Salaries—management	12,638	13 3	1,484	1 0	2,735	4 9	6,661	13 3	23,519	12 3
Collectors' commission	24,562	17 9	2,328	14 9	3,677	6 4	9,085	4 10	39,754	3 8
Stationery, printing, and general charges	10,562	9 10	2,121	7 2	1,981	1 8	4,790	4 4	19,455	3 0
Directors	7,500	0 0	2,500	0 0	2,500	0 0	21,424	17 8*	33,924	17 8
Auditors	500	0 0	150	0 0	150	0 0	830	0 0*	1,680	0 0
Salaries and wages, wear and tear—distribution	124,788	5 3	20,780	9 11	28,617	19 11	38,172	19 10	212,359	14 11
Repair and renewal of meters	37,463	14 8	3,760	13 10	3,251	14 0	9,609	4 2	54,085	6 8
Law and parliamentary charges	5,660	12 4	683	0 7	780	0 9	5,396	5 6	12,519	19 8
Bad debts and extraordinary expenses	33,530	11 3	2,711	1 6	2,665	6 5	12,295	12 4	51,202	11 6
Total expenditure on revenue account	1,716,070	4 6	214,215	2 11	245,421	16 10	523,906	14 0	2,699,613	18 3
Gross profit	899,909	13 2	102,224	17 5	69,615	1 11	221,935	6 9	1,293,684	19 3
Do. per cent. on capital and borrowed money	9 10 0		13 14 2		8 2 2		11 7 6		9 18 8	
Do. do. gas-rental	45 7 2		43 4 11		29 4 1		40 4 0		42 19 4	

* This item includes £17,244 7s. 1d. paid as compensation to Directors retired under amalgamation schemes.

† This is inclusive of £605 paid as compensation to Auditors whose services were dispensed with under amalgamation schemes.

TABLE showing the Capital, Income, Expenditure, and Profit per Ton of Coal carbonized in 1880.

	Chartered.		Commercial.		London.		South Metropolitan.		Mean of all the Companies.	
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Capital and borrowed money	7 17	0·23	4 19	8·65	5 10	5·57	5 0	9·60	6 17	2·71
Income—viz.:										
Total gas-rental	1 12	10·76	1 11	7·27	1 10	7·99	1 8	6·24	1 11	8·63
Meter-rents	7·52		6·87		6·95		7·08		7·33	
Old materials	0·68		0·27		0·72		0·44		0·60	
Residual products	9 8·49		10 0·95		8 10·69		9 2·67		9 6·86	
Miscellaneous	1·05		0·34		3·99		1·87		1·40	
Total income from all sources	2 3	4·50	2 2	3·70	2 0	6·34	1 18	6·30	2 2	0·82
Expenditure—viz.:										
Coals, including carriage and dues	15	0·47	14 10·30		14 5·17		13 4·62		14 7·65	
Purifying materials, including labour	9·55		10·65		5·71		6·38		8·67	
Salaries and wages—manufacture	2 11·76		4 0·47		3 6·96		3 4·55		3 2·32	
Wear and tear—manufacture	4 0·94		2 11·60		5 10·05		3 2·61		3 11·53	
Rents, rates, and taxes	1 3·53		1 0·11		1 3·41		11·40		1 2·41	
Salaries—management	2·51		4·22		4·22		4·13		2·97	
Collectors' commission	4·91		3·74		5·67		5·64		5·03	
Stationery, printing, and general charges	2·10		3·40		3·06		2·97		2·46	
Directors	1·49		4·02		3·86		1 1·28		4·28	
Auditors	0·10		0·25		0·23		0·52		0·21	
Salaries and wages, wear and tear—distribution	2 0·83		2 9·35		3 8·18		1 11·67		2 2·85	
Repair and renewal of meters	7·46		6·04		5·02		5·96		6·84	
Law and parliamentary charges	1·13		1·10		1·20		3·35		1·56	
Bad debts and extraordinary expenses	6·67		4·35		4·13		7·65		6·47	
Total expenditure on revenue account	1 8	5·45	1 8	7·69	1 11	6·87	1 7	0·73	1 8	5·27
Gross profit	14 11·05		13 8·01		8 11·47		11 5·57		13 7·55	

TABLE showing Increase or Decrease in each Item during 1880 compared with 1879.

	Chartered.		Commercial.		London.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
Capital and borrowed money	£ 373,173	£ ..	£ 55,845	£ ..	£ ..	£ 1,684	£ ..	£ 83,198†	£ 344,136	£ ..
Income—viz.:										
Sale of gas by meter . . . . .	..	49,772	3,065	..	849	..	2,590	..	..	48,448
Public lights, including lighting and contracts . . . . .	..	307	251	..	1,283	..	3,912	..	..	2,684
Meter-rents	1,318	..	55	..	112	..	184	..	1,301	..
Old materials . . . . .	..	1,243	..	1	..	163	..	1,137	..	2,544
Residual products	88,801	..	12,702	..	1,068	..	16,636	..	119,206	..
Miscellaneous . . . . .	..	152	..	92	..	121	..	65	..	301
Total income from all sources	38,645	..	15,980	..	3,028	..	8,878	..	66,530	..
Expenditure—viz.:										
Coals, including carriage and dues . . . . .	..	22,145	..	6,240	1,271	..	2,753	..	..	24,361
Purifying materials, including labour . . . . .	..	9,187	..	673	..	582	..	853	..	11,294
Salaries and wages—manufacture . . . . .	..	1,950	718	..	825	..	1,646	..	1,239	..
Wear and tear—manufacture . . . . .	..	40,146	2,438	..	1,865	..	..	10,257	..	46,101
Rents, rates, and taxes	566	..	..	160	634	..	..	1,064	..	24
Salaries—management	598	..	..	47	141	..	..	1,858	..	166
Collectors' commission	974	..	6	..	318	..	296	..	1,593	..
Stationery, printing, and general charges	971	..	263	..	..	46	..	629	..	560
Directors . . . . .	..	..	..	700	..	..	7,069*	..	6,369	..
Auditors . . . . .	..	..	..	..	..	..	373†	..	373	..
Salaries and wages, wear and tear—distribution . . . . .	..	13,462	..	591	2,439	..	..	3,877	..	15,491
Repair and renewal of meters	5,008	..	1,591	..	..	613	1,421	..	7,406	..
Law and parliamentary charges	2,393	..	..	239	..	68	3,759	..	5,846	..
Bad debts and extraordinary expenses	2,611	..	737	..	340	..	6,285	..	9,973	..
Total expenditure on revenue account . . . . .	..	73,769	..	2,897	6,524	..	6,064	..	..	61,078
Gross profit	112,414	..	18,877	..	3,496	..	2,814	..	130,608	..
Do. per cent. on capital and borrowed money	0 84	..	1·63	..	..	0·39	..	1·62	0·76	..
Do. do. gas-rental	6·65	..	7·50	..	..	1 74	..	0·62	4·98	..

* † See notes to Table of Receipts and Expenditure, *supra*.

† For explanation of this item, see p. 828.

THE ADVENT OF CHEAP OXYGEN.

We have already published a "Note" upon the establishment in Paris of an oxygen gas-works for the production of this gas on a large scale, and we then stated that there were no particulars available on the subject of the process adopted. We are now enabled to describe the arrangements, as invented by the Brothers Brin, and which formed the subject of a communication by M. Guitton to the Société des Ingénieurs Civils on the 22nd ult.

It is known that M. Boussingault first pointed out the remarkable property possessed by barytes of absorbing atmospheric oxygen at a certain temperature, and of giving it up again at a higher temperature. The experiment could be repeated about ten times with the same material, but after this it would lose its absorbent quality and become inert. In 1869, Gondollo repeated Boussingault's experiments, and in a patent taken out by him, which did not come into general application, he alleged that he was able to make a hundred successive operations with the same sample of barytes. M. Gondollo, however, did not state the quantity of oxygen absorbed, and whether this quantity diminished with use or otherwise; but he declared that after the above number of operations the material became inert and required to be revived, besides which the oxygen could never be obtained of above 65 per cent. purity. Messrs. Brin are said to have made of barytes a veritable sponge for oxygen, and they use the same material over and over again indefinitely, without diminishing the quantity absorbed. In the laboratory, 295 operations have been conducted with the same sample, without perceptible variation of the yield or alteration of the material. This test was considered so conclusive that the establishment of works on a large scale was the immediate consequence. The apparatus as now erected at the works in operation at Passy, and capable of producing about 18,000 cubic feet of oxygen per day, which might be doubled with few additions to the plant, may be divided under the following heads:—(1) The preparation of the air to render it easy of decomposition by the barytes. (2) The application of blowing pumps or fans to facilitate the peroxidation of the barytes. (3) The use of a vacuum or of aspirating pumps to extract the oxygen after peroxidation. (4) The use of special pyrometers permitting of the regulation of the temperature of the furnaces, and of maintaining it between two points which must never be exceeded. This is an absolutely indispensable condition, without which no uniform production is possible. (5) The preparation of the barytes.

At the Passy establishment there are, first, two Letestu blowing and exhausting pumps driven by a portable engine of about 9-horse power. A fan is also driven by the engine, but this machine has been placed last, since it has been found that the peroxidation takes place very rapidly, and it is not necessary to drive in the air at a pressure above 9 inches of mercury. The pumps have therefore been used exclusively for exhaustion. The air driven by the fan first passes through a quantity of quick lime contained in an apparatus called the decarbonizer. It is of use in preventing alteration of the barytes by the addition of the carbonic acid otherwise contained in the air. After this is a cylinder wherein the air rests, and beyond is the saturator. This is an apparatus which contains in its upper portion a kind of bird-fountain, which allows water to fall drop by drop into a lower basin, and upon a sieve which divides the liquid and facilitates its absorption by the air. When the air driven by the fan has passed the cylinder above mentioned, it can, by an arrangement of valves, be separated into two systems of pipes, one of which carries its portion of air through the saturator, and the other division passes by this apparatus, the two streams of air being afterwards reunited. A very sensitive hygrometer indicates the degree of humidity of the air, and shows when the valves are regulated to give the air a determined amount of moisture. The required degree has been found in the laboratory by trial, whence it appears that the maximum absorption of the barytes corresponds to a hygrometric state of the air equivalent to 65° of a hygrometer of which zero is the sign of absolute dryness, and 100° signifies saturation. The foregoing arrangements are of greater theoretical than practical importance, for it is evident that as, in reality, the hygrometric state of air constantly varies, the barytes will give so much more or less oxygen, and the mean will be about the best theoretic yield. In an experimental works, however, it is important to observe these particulars and niceties of procedure. From the saturator the air is sent through retorts containing crushed barytes. These retorts are made of iron tubes nearly 8 feet long and 6 inches in diameter. They are placed horizontally in two gas-generator furnaces of special design. An arrangement of dampers permits of the flame being alternated from one setting to the other. Highly ingeniously constructed pyrometers allow of the maintenance of absolute constancy in the heat, when it has once been regulated to the required average. The furnace, when it is in action for peroxidation, is kept at about 600° C. (1112° Fahr.). In this operation the oxygen of the air blown in by the fan is fixed in the barytic product, and the nitrogen escapes by a safety-valve weighted to 1½ atmospheres when working with the pumps, and to about 12 inches of mercury with the fan, so as to obtain such a pressure in the retorts as shall facilitate the absorption of oxygen by the barytic product. The period of saturation of the contents of the retorts is known by trying a piece of coal, &c., at a test-cock on the nitrogen receiver; if the coal continues to glow, it is a proof that the oxygen is no longer being fixed by the barytic compound. During this operation the temperature of the retorts is being raised—by the admission of air to the furnace, where it enters into combustion with the carbonic oxide—until it reaches about 800° C. (1470° Fahr.), at which temperature the air inlets are closed by the action of the pyrometers themselves. These pyrometers, upon which so much depends, are composed of a steel bar resting on the top retorts. One

end of the bar is fixed by a pin at the farther end of the furnace; the other extremity acting against a bent lever, fitted with a plate which is capable of sealing the air inlet. The bar and lever are so connected that by the dilatation of the former, corresponding with a temperature of 800° C., the plate descends by its own weight, and stops the supply of air. Thus it will be seen that when the furnace is heated, by carbonic oxide alone, to about 600° C., the process of peroxidation is begun, and as the work goes on air is admitted for the combustion of the carbonic oxide in the chambers of the setting, until, by the time that the peroxidation is complete, the furnace has almost reached the temperature of extraction. The vacuum is then made, and the oxygen given up by the barytic product is drawn off by the exhaustor, which forces it into the gasholder. The furnace is left in this state until the electric indicator shows about 22 inches of mercury. The supply of carbonic oxide is then turned off, and into the other oven (the settings being always worked in pairs), and the temperature gradually falls. The pyrometer bar regains its normal length, and opens the air-door, and the air again enters to still further help in the cooling action. The exhaustion of oxygen, which commences at a vacuum of about 19 inches of mercury, is continued until the vacuum rises to 26½ inches. The peroxidation is then recommenced as before. With two furnaces coupled as indicated, the peroxidizing process goes on in one of them during the extraction of oxygen from the other; and thus the work of the factory continues without intermission. At the Passy factory, during three months' constant work, the gas generators being charged with coke, 4 cubic metres of oxygen were obtained at every operation, per 100 kilos, of barytes treated. Usually 10 changes were made in 24 hours, therefore 40 cubic metres (1412 cubic feet) of oxygen were produced from 100 kilos. of material per day.

As nitrogen is at the same time produced in a pure state, experiments have been carried on with a view to fixing it as chlorhydrate, or as sulphate of ammonia. This has been effected on a laboratory scale, and it will shortly be carried out in a complete commercial manner. The oxygen should be chemically pure, and analyses show that the usual product is 95 per cent. of oxygen, the remainder being nitrogen, due, in all probability, to slight leakage of the joints of the apparatus. The cost price of the oxygen ready for delivery, including all capital charges, is under 15 centimes per cubic metre (about 3s. 2d. per 1000 cubic feet).

The object of M. Guitton's communication is to prove that the commercial manufacture of oxygen is possible on a large scale, and that the products may be sold at such a price as will necessarily open up uses for this gas which its former high cost rendered impracticable. Messrs. Brin's operations have been carried on so long, and on such a large scale, as compared with anything of the kind which has ever been done before, and they have been supervised by a technical Committee of such undoubted competence, that the success of the process appears to M. Guitton to be now beyond dispute. The operations are so simple that ordinary stokers are able to conduct them.

The influence of cheap oxygen upon lighting may well be infinite. It can be used for burning sticks of carbon without any other agent, or it may be mixed with the flame of a mineral spirit; or with special gas-burners, fitted with pencils of zircon or magnesia, a more brilliant light than the electric arc may be obtained, and at a much lower cost. Photometric tests with mineral spirit show that to obtain the light of a gas-burner consuming in air 127 litres (4·44 cubic feet) of gas per hour, there would be needed—oxygen, 10 litres; mineral spirit, 11 grms. Taking oxygen at 50 centimes per cubic metre (11s. per 1000 cubic feet), and the spirit at 75 centimes per kilogramme retail—compression, carriage, and profit included—the cost would be 0·01325 fr. per hour, while the cost of common gas in Paris would be 0·0381 fr. In an incandescent lamp, consisting of a rod or pencil of carbon burning in the pure oxygen, there has hitherto been much loss from the unconsumed gas, as much as two-thirds of the supply being wasted; more perfect lamps are being constructed which will materially reduce this loss. In spite of this waste, a light of 38-candle power has been obtained by the use of 120 litres of oxygen and 17 centimetres of carbon per hour, costing together about 7 centimes for this period. The cost of 500 litres of the Paris Company's gas to give an equal light would be 15 centimes, or more than double. It may, however, be expected that, if oxygen is to be largely used for purposes of lighting, it will be only in conjunction with coal gas, and not as sold in portable reservoirs for use with mineral spirit or sticks of carbon. With oxygen common gas may be made to give a steady, brilliant light, without the dirt of mineral spirit, or the flickering inseparable from the combustion of carbon pencils. It looks as though M. Guitton had overweighted oxygen in assuming it to cost 11s. per 1000 cubic feet as distributed. It should certainly be sold for much less, if his own figures relating to the cost of manufacture are to be relied upon. It appears that the oxygen from the works at Passy is being successfully used for illuminating purposes in several places in Paris.

It was stated at the last meeting of the Rochdale Town Council that a Sub-Committee of the Gas Committee had visited Cologne for the purpose of inspecting Dr. Grüneberg's apparatus for the distillation of ammonia from gas liquor, and had caused tests to be made by their Analyst (Mr. Collinge) to show the results of its working. They reported that the effluent water contains a much larger proportion of ammonia than the patentees promised for it (0·05 per cent.), the lowest of the tests showing 0·13 per cent. When the deputation got home they sent Mr. Collinge to test the results arrived at by the machine at work in Carlisle, and this apparatus showed that only 0·0874 per cent. of ammonia was left in the liquor. The difference in the amount of ammonia taken out in the two machines would represent, according to Mr. Collinge, a difference of between £200 and £300 in the receipts for the salt sold.

Notes.

THE THEORY OF HARDENING AND TEMPERING STEEL.

A Committee has been appointed by the Institution of Mechanical Engineers to examine into the question of the changes in the character of steel, known practically as hardening and tempering. Although both processes are so well understood and practised daily in every workshop, there has not yet been any thoroughly satisfactory reason given for the behaviour of steel under such common treatment, especially with regard to the changes in the colour of a bright steel surface when gradually heated. Several ingenious hypotheses have been advanced to account for these effects, depending principally upon the known presence of carbon in steel. It has been suggested that if the carbon is in a condition of solution in the metal the result is a hard and brittle state of the steel when suddenly cooled; but that slow cooling, or tempering, reduces the dissolved carbon in a separate form, and thereby leaves the metal soft and ductile. The Committee have, after due examination, rejected the carbon theory in every form, and propose another, based on some observations of Mr. Edison on platinum wire. Referring to the generally accepted fact that steel contains a certain proportion of occluded gases (consisting, according to Müller, of hydrogen, nitrogen, and carbonic oxide), they suggest that the application of heat causes these gases to be expelled through minute fissures which open in the steel, and that sudden cooling prevents the re-absorption of what has been expelled, and perhaps actually tends to expel the remainder. By the loss of these gases the metal becomes harder and denser than before. If the metal be now expanded by gentle heating, the fissures open, re-absorption begins, and the various changes undergone by the surface during this process are marked by the succession of colours characteristic of tempering. This is supposing the colours to be produced by diffraction and not by interference, to which they are sometimes assumed to be owing. The suggestions of the Committee are by no means proved, and it is now proposed to make a series of experiments to test the validity of their theory, which is calculated, if tenable, to exercise an important influence on the methods of tempering and hardening large steel tools as at present practised.

A SELENIUM PHOTOMETER.

At a recent meeting of the delegates of the departmental Scientific Societies, at the Sorbonne, Paris, M. Léon Vidal, of Marseilles, gave an account of his first trials with a selenium photometer. It is an apparatus designed to measure the intensity of natural or artificial light by a purely mechanical and physical action, in a manner analogous to the measurement of temperature or of atmospheric pressure by the thermometer or the barometer. The difference in conducting power which results in selenium by the action of light, causes very marked deviations in a galvanometer needle, and accordingly as these variations are more or less above the zero point, which corresponds to absolute darkness, the intensity of the light acting upon the selenium element is ascertained. M. Vidal first proposes to make a photometer capable of determining the chemical power of daylight. He admits the possibility of making selenium elements strictly comparable in susceptibility one to another, and therefore capable of being substituted in the series when, after observations more or less prolonged, the plates in use have become inactive, or fatigued. These exhausted cells can always be restored to their pristine state of activity by subjecting them, for some minutes, to the heat of boiling water. M. Vidal's receptor cells are somewhat similar to the pattern introduced by Professor Graham Bell in the photophone, but in some respects simplified in accordance with the earlier designs of Dr. W. Siemens, and consist of brass spirals closely coiled, without touching, enamelled with selenium covered with two plates of mica. An astatic galvanometer, graduated from 0° to 50°, gives the indications of the power of the source of light which it is desired to measure. The electric current required for this apparatus is furnished by one, or at most two Daniell's elements. The apparatus of the pattern for use in meteorological observatories is in course of construction, and will be accompanied by tables compiled by the inventor after five months' observations, to give all necessary instructions, and corrections of the instrument for temperature, &c.

OFFENSIVE RESERVOIR WATER.

At a meeting of the Philadelphia Engineers' Club, Mr. Charles G. Darrach communicated some notes by chemical experts on the present condition of the water supplied to the inhabitants of Baltimore. The source of supply is a lake, and the water is distributed through pipes in the usual way, but when drawn from the taps has such a disagreeable taste and odour as to be quite unsuited for domestic and culinary purposes. One analyst stated that he had found traces of a volatile nitrogenous compound, unknown to chemists, which he believed to be the cause of the offensive smell and taste of the water. The analyst could not give an opinion respecting the noxiousness or otherwise of this strange compound. Another chemist thought that as the reservoir was 25 to 30 feet deep, and the water was drawn from the bottom, it was the lack of air which caused the annoyance in question. This opinion was supported by Mr. Darrach, who instanced another reservoir which had come under his notice, wherein the surface water was good, but that drawn from near the bottom was very offensive to smell and taste. He also stated that the water taken from the Fairmount Pool in winter, when the ice has remained for a considerable time, is very disagreeable. The whole circumstances go to show that water which is liable to this obnoxious change must be originally charged with putrescible substances, since pure water cannot be affected by being kept in any possible bulk, although the ventilation of reservoirs is of the first importance.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

VOTING BY PROXY.

SIR,—Permit me to offer your Correspondent "Rus in Urbe" the following reply to his inquiries.

The appointment of a proxy, being a purely voluntary act, made for no valuable consideration, and conveying no beneficial interest to the appointee, is revocable at will by the appointer.

In the event of more than one form of proxy being signed by a shareholder, effect should be given to that which bears the latest date; the more recent appointment indicating, presumably, the final desire of the appointer. As to the hypothesis of a false date being inserted, the date which the instrument bears is *prima facie* evidence of its having been executed on that date, and must be accepted as true in the absence of evidence to prove it to be false.

In the case of two proxies bearing the same date, both should be declared void for uncertainty.

May 12, 1881.

H. D. E.

SIR,—I beg to inform your Correspondent that a shareholder can give his proxy to two or more persons; and either of them (provided they are both shareholders) can act. When two or more names are given, they are generally put upon one proxy. It cannot, however, matter how many proxies are given, so long as the secretary of the company sees that only one is used at the meeting; or, if the names are all on one proxy, that the vote of one only be taken—who can vote for the director and for the auditor (for either or neither) as he pleases; the first one named, or claiming to vote, having priority.

A proxy can be withdrawn by the proprietor. He exercises his right to give it, and he can withdraw it if he sees fit to do so; and should he attend the meeting when a vote is taken, the proxy cannot be used.

Lower Sydenham, May 12, 1881.

MAGNUS OHREN.

THE MEETINGS OF THE BRITISH, FRENCH, AND GERMAN GAS ASSOCIATIONS.

SIR,—Can you not, through your columns, inaugurate a movement that may result in an arrangement by which the meetings of the great leading Gas Managers' Associations in Europe shall not take place at the same time; or, at any rate, that they should not occur on the same day? As one who has crossed the Atlantic—and there are others who do the same thing—I am much disappointed to find that the meetings of the British Association of Gas Managers and of the Société Technique de l'Industrie du Gaz en France are on the very same day.

Three years ago there was established a beginning of good feeling, which should be continued; and, at the expense of a few postage stamps, it does seem that the Committees of the two societies might arrange beforehand, so that it would be possible to attend the meetings of both, if one desired it.

London, May 13, 1881.

GEO. WARREN DRESSER.

WASHERS AND SCRUBBERS.

SIR,—I was amused, when reading Mr. H. Woodall's letter in your last issue, to find that he has inadvertently fallen into the very blunder of which he accused Messrs. R. Dempster and Sons in the circular issued by them.

We introduce into our scrubbers here 25 gallons of pure water per ton of coal carbonized, and it issues forth at fully 10-oz. strength—i.e., a total of 250 oz. Our total make of liquor is not less than 36 gallons per ton of 10-oz. liquor, which is considerably in excess of the quantity obtained at Leeds, according to Mr. Woodall's statement.

Wigan, May 13, 1881.

J. G. HAWKINS.

SIR,—In the last number of the JOURNAL, your Correspondent, Mr. Henry Woodall, writes in reference to a circular issued by Messrs. R. Dempster and Sons relative to the working of their "tower" scrubber.

Kindly permit me space to state that the 28 gallons of liquor of 10-oz. strength (= 280 oz.) produced at Elland simply represents the quantity of pure water introduced into the scrubber. The total quantity produced for sale, say, for the year 1879—the year following the erection of the scrubbers—was 40 gallons of 10-oz. liquor (= 400 oz.) per ton of coal carbonized.

Elland, May 13, 1881.

W. A. WALKER.

SIR,—We very much deprecate any attempt to make your columns the advertising medium for the claims of rival makers of apparatus having similar objects; but in your last issue we are charged by Mr. Woodall, of Leeds, with distributing a circular "calculated to do injustice to an admirable invention, as well as to discredit the good sense of all those who have adopted it." We trust, therefore, that you will permit us to answer these charges.

A more careful perusal of the circular issued by us will show that the returns given relating to our improved scrubbers are "the results obtained from our scrubbers alone"—i.e., do not include the liquor derived from the rest of the apparatus at the works named. The 28 and 25 gallons of liquor, of 10-oz. strength, at Elland and Wigan respectively, are obtained by the introduction of that quantity of pure water to our scrubbers per ton of coal. At Elland, the Gas Company sell 40 gallons of 10-oz. liquor per ton of coal, and we congratulate them upon obtaining results so much superior—viz., 80-oz. strength per ton of coal—to those realized at the much larger works at Leeds.

We do not think Mr. Woodall would have stated that we had made a "too palpable blunder," if he had not misread our circular; and we assure your readers that his explanation is not only unnecessary, but wrong, and that the misconception which he imputes to us never existed. As we have taken only those figures relating to the "standard" which have been published and remain uncontradicted, and have compared results from our own apparatus on strictly the same footing, we fail to see how our circular is calculated to do any "injustice." We have no intention of reflecting upon the good sense of those who have adopted

the "standard," and may surely draw comparisons between independent sets of figures without doing so.

Mr. Veevers's letter, upon the same subject, displays a misconception which could only arise from a careless perusal of our circular. This was not intended to suggest a procession of a washer, a scrubber, and a "standard," but to indicate the best position for our scrubber in relation to either of the others, where either of them is used; and also the manner in which the liquid purifying agent should be applied in both cases.

We may also point out that this same letter is at variance with a statement in the paper read by him last year at Halifax, and published in the JOURNAL for Sept. 14 (p. 419). He therein stated: "Previously to the adoption of this apparatus we had no means of arresting the ammonia, and commercially it was all lost to us." He now writes: "Here a quantity is removed by another apparatus placed before it, and all the remainder is abstracted by the 'standard.'" If the former statement is correct, probably the "standard" continues to do the same amount of work as before—i.e. (according to the figures given in the paper), to realize 1446-oz. strength of liquor out of a total quantity of 34391-oz. strength per ton of coal carbonized. The scrubbers at Elland produce 280-oz. strength out of a total quantity of 400-oz. strength. If the test of comparison is to be, which abstracts the largest proportion, the question stands thus: The "standard" abstracts 42 per cent. of the total quantity; our scrubbers, 70 per cent. If the statements in the paper and letter are both correct, the only inference is that another apparatus has been added, since the paper was read, to relieve the work thrown upon the "standard;" and at Dukinfield this appears to do more work than any of the others of which the results are known.

In conclusion, we are of opinion, that to judge of the real value of a washer or scrubber by the length of time within which the apparatus will pay for its first cost is likely to lead to much misconception. It will chiefly depend upon the results obtained before the adoption of the apparatus; to a large extent upon the value of the liquor; upon the relative size of the apparatus to the quantity of coal carbonized when first erected; upon the cost of power to work it, along with the cost of repairs and renewals; as well as upon several other points which bear upon the question more or less directly. We could cite a gas-works in Staffordshire where we erected an excellent form of washer last year, and the increased results paid for its first cost in less than three months; but this fact would not determine the efficiency of the washer. Where existing apparatus in the form of washers or scrubbers secures a very fair return, it may be commercially advisable to improve or supplement it, so as to enhance the value of the results. We believe this is possible at many works, and the additional capital required for the plant would earn a large revenue, besides conducing greatly to more extensive purification in closed vessels.

Elland, May 13, 1881.

ROBT. DEMPSTER AND SONS.

THE GAS APPARATUS EXHIBITION AT GLASGOW.

SIR,—I thank you for the insertion of my letter, dated April 27, in the pages of the JOURNAL.

I would again crave space to make known that on representing my case before a meeting of the Executive Committee of the Glasgow Philosophical Society, held on the 6th inst., it was, under the circumstances, resolved to test my meter, and to acknowledge the results.

Musselburgh, May 14, 1881.

A. G. HENDERSON.

LANCASTER CORPORATION WATER SUPPLY.—The ceremony of opening the works which have recently been constructed, under the direction of Mr. J. Mansergh, C.E., and Mr. A. C. Watson, the Resident Engineer, for extending the water supply of the Lancaster Corporation, took place on Thursday, the 5th inst. The Mayor and Corporation, with a number of guests, first visited the several reservoirs, the capacities of which were described by Mr. Mansergh. The water was then turned on with the usual formalities by the Mayor (Mr. E. Clark), and the company afterwards partook of luncheon, when "Success to the New Water-Works," and other appropriate toasts were proposed and duly honoured.

STAFFORD CORPORATION GAS SUPPLY.—At the meeting of the Stafford Town Council on Tuesday, the 3rd inst.—the Mayor (Alderman Evans) in the chair—the report of the Gas Committee for the year ending the 25th of March last was presented. The Committee stated that the gross profit on the year's working amounted to £5694 16s. 2d., to which should be added £1398 19s. 1d., the balance of the previous year, making a total of £7093 15s. 3d. Out of this had been paid for interest on borrowed capital £3219 10s. 5d.; income-tax, £139 8s. 2d.; and £2408 18s., the amount of the half yearly instalments repaid to the insurance company to March 14; leaving a balance of £1325 18s. 8d. at the credit of the profit and loss account. The No. 2 retort-house had been taken down and rebuilt at a cost of £1865 8s. 4d., which had been charged to the depreciation fund. There had been an increase in the rates and taxes during the year of £221 13s. 4d. The increase in the quantity of gas manufactured was only 3.5 per cent., and the increase in the amount of the gas-rental 1.5 per cent. The sum of £1500 had been paid to the general district fund towards the reduction of the rates during the year, making a total of £3700 paid since the Corporation took possession of the gas-works. The Committee intimated that in addition to £1000 to be appropriated for the balance towards the district rate, they recommended that on and after Oct. 1 next the price of gas be further reduced to 3s. 6d. per 1000 feet, which would make a reduction of 8d. per 1000 feet since the works were transferred to the Corporation. Alderman Cox, in moving the adoption of the report, said that in addition to the items mentioned in the report, during the last winter season they had burnt gas in the streets for 100 hours longer than usual without increased charge. With reference to a notice of motion by Mr. Holder to discontinue charging gas-meter rents on the 25th of June next, the Committee had known nothing of the proposal when making out their report, or they could not have recommended what they had, nor could the price of gas be lowered if the motion were carried. Alderman Averill seconded the motion. Mr. Holder moved that the meter-rent be discontinued, on the ground that it was unjust, when the Corporation charged the consumer with gas, to charge him with the means of measuring it. The price of gas in Stafford also was high as compared with other towns. Mr. Fellows moved as an amendment that the proposal to lower the price of gas be referred to the Committee. Mr. Ash seconded the amendment, which was negatived, and Mr. Holder not finding a seconder, the report was adopted *nem. con.*

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, MAY 5.

(Before the MASTER of the ROLLS.)

APPLETON v. THE CORPORATION OF BOLTON.

This case, which occupied the Court nearly two days, involved the question whether the Bolton Corporation were bound to supply the plaintiffs, who are bleachers occupying works on the Bradshaw Brook, in the neighbourhood of Bolton, with pure water for use as "washing water" in their works. In 1864 the Corporation obtained an Act of Parliament enabling them to take the Entwistle reservoir, which had been constructed for the benefit of the millowners on the Bradshaw Brook about the year 1833, for the purpose of supplying the town of Bolton with water. The Act provided that the Corporation should, in order to compensate the millowners, construct a reservoir, called the Wayoh, lower down the Bradshaw Brook; and that the millowners should be entitled to a fixed quantity of water out of such reservoir, part of which was to be sent down the brook, and the remainder was to be delivered to them by pipes as "washing water." The present action was brought by Mr. William Appleton and Mr. Thomas Hardcastle, two of the millowners, in consequence of the muddy state of the water delivered to them down the pipes. The defendants' contention was that the Act did not impose on them any obligation to supply the plaintiffs with other water than such as might for the time being be stored in the Wayoh reservoir, and that they had no power under their Act to filter the water in times of flood. They also argued that the term "washing water" did not necessarily mean pure water, but only water which could be used for washing purposes after it had undergone a process of filtration. A number of witnesses were called to prove the meaning of the term in the trade.

Mr. INCE, Q.C., and Mr. ROMER, Q.C., appeared for the plaintiffs; Mr. CHITTY, Q.C., Mr. B. T. WILLIAMS, Q.C., M.P., and Mr. ARMISTEAD for the defendants.

The MASTER of the ROLLS, in giving judgment to-day, said in treating actions of this class he always looked at the substance of the statement. In this instance it was that the plaintiffs were manufacturers, and could not get the water they required for their business, which was washing water, and with which the Corporation agreed to supply them. The way in which the complaint should be framed was another matter. If they obtained a sufficient quantity of water for washing purposes, this was all they required. They said they were entitled to have it in some shape or other from the Bolton Corporation, and he thought they were so entitled, whether they received it by taking the water in the brook or from pipes. The substantial complaint was that they wanted sufficiently clear water for washing purposes. This was all they ever required, and this was all their complaint, although no doubt the draftsman had put in the statement of claim that they required clear water everywhere. If the defendants gave them pure washing water they could not claim a shilling as damages; and in substance, it appeared to him, the plaintiffs had succeeded in proving their case. The Corporation denied any liability to do more than they had done; but in his view of the Act of Parliament the Corporation were bound to supply pure water for washing purposes, and had failed in the performance of their contract. This being so, the plaintiffs ought to have the costs in the action generally. With regard to what he should do in the action, he should give 40s. as damages as to what had been done, and if the Corporation did not take measures to make the water clear, the plaintiffs would get from him very handsome damages if they came to the Court again. As regarded the power of the Corporation to make the works, he had already said there was no provision in the Act of Parliament to prevent them. They had the land, the work was feasible, and he was glad to say that the professional men were quite agreed, not only as to the desirability, but very nearly as to the cost, the only difference being 50 per cent., which was very small considering the kind of estimates. There was no ground for the Corporation saying they had not power to execute the works. They had, and he should give costs to the plaintiffs.

Mr. CHITTY said that the Corporation would have to go to Parliament for borrowing powers.

The MASTER of the ROLLS said the plaintiffs would not immediately bring an action for damages, but would no doubt give the Corporation sufficient time to obtain the money to make the works.

Mr. INCE said that this was so.

FRIDAY, MAY 13.

(Before Vice-Chancellor HALL.)

Re THE MAURITIUS GAS COMPANY, LIMITED.

This was a petition asking the sanction of the Court to a resolution which had been passed authorizing the reduction of the capital of the Company. The certificate of the Chief Clerk found that the only interested classes of creditors had been satisfied. As the Company carried on business abroad, it was asked that the word "reduced" after the name of the Company should be used for a fortnight only.

His LORDSHIP made the order as asked.

REDUCTION IN THE PRICE OF GAS AT RUNCORN.—An intimation has been made that, as from the commencement of the current quarter, the price of gas supplied by the Runcorn Gas Company has been reduced 6d. per 1000 cubic feet. The price, therefore, will now be 3s. 2d. per 1000 feet to consumers of 50,000 cubic feet per quarter and upwards, and 3s. 3d. per 1000 feet to consumers of less than that quantity. A discount of 5 per cent. will also be allowed on all accounts paid within one month of date of invoice.

ROCHDALE CORPORATION GAS SUPPLY.—At the meeting of the Rochdale Town Council on the 5th inst., the abstract of the accounts of the borough, for the twelve months ending March 25, was under consideration; also the estimate of the proposed expenditure during the current municipal year. The total Corporation rates will this year be 4s. 4d. in the pound, as against 4s. 7d. last year. The main reason of the reduction is the increased gas profits, which, though made last year, only come into this year's account to lessen the rates. The accounts of the work of the gas department for the year are very satisfactory. Notwithstanding the reduction in price, of 8d. per 1000 feet, during the last quarter of the year—a reduction equal to about £1000—the general account shows that the receipts from the sale of gas were £42,607, against £41,137 in the previous year. The residual products produced £6091 as compared with £5292. The coal and cannel used cost £15,078 as against £14,783. The net profits were £11,331 as against £886; and there has been set aside for depreciation a sum of £1735. The present value of the works is set down as £162,244, a sum of £464 having been expended on capital account since the last balance-sheet. It appears from the estimates that for the current year the Gas Committee intend to reduce the charge made on the general purposes fund for supplying gas to the street lamps from £2 10s. each to £1 3s. This is merely a matter of account, but it will have the effect of reducing the apparent profits on the works by a sum of more than £2000.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION 1881.

PROGRESS MADE TO SATURDAY, MAY 14.

[illegible]

HOUSE OF LORDS.

MONDAY, MAY 9.

The Bray Township Bill (Lords) was referred to a Select Committee, consisting of Earl Beauchamp (Chairman), Lord Clifford of Chudleigh, Lord Hilton, Lord Sandhurst, and Lord Lamington; to meet on Thursday, May 12.

The Dudley Gas Bill was referred to a Select Committee, consisting of Earl Belmore (Chairman), Earl Amherst, Lord Clanbrassil, Lord Clements, and Lord Kintore; to meet on Friday, May 13.

THURSDAY, MAY 12.

A petition against the Cleator Moor Local Board Bill was presented from Lord Leconfield.

FRIDAY, MAY 13.

The Beverley Water Bill and the Egremont Local Board Bill were referred to a Select Committee, consisting of Lord Ashford (Chairman), Lord Carysfort, Lord Monteagle of Brandon, Lord De Freyne, and Lord Grey de Radcliffe; to meet on Tuesday, May 17.

HOUSE OF COMMONS.

MONDAY, MAY 9.

MONDAY, MAY 9.
LOCAL GOVERNMENT GAS PROVISIONAL ORDER BILL.—This Bill was read a second time, and committed.

TUESDAY, MAY 10.

TUESDAY, MAY 10.

The Standing Orders Committee reported—"That in the case of the Caterham Spring Water petition, the Standing Orders ought to be dispensed with; that the parties be permitted to proceed with their Bill." The report was agreed to, and the Bill, which is "to authorize a lease of the Kenley Water-Works to the Caterham Spring Water Company; to increase the number of Directors of the Company; and to enable them to raise further money; and for other purposes," ordered to be brought in by Mr. Grantham and Mr. Watney.

GAS PROVISIONAL ORDERS BILL, WATER PROVISIONAL ORDERS BILL.—
These Bills were read a second time, and committed.

MUNICIPAL AUTHORITIES AND GAS AND WATER COMPANIES' BILLS.

A NEW STANDING ORDER.

Mr. E. STANHOPE, in moving the following new Standing Order:—"The municipal or other local authority of any town or district alleging in their

petition that such town or district may be injuriously affected by the provisions of any Bill relating to the lighting or water supply thereof, or the raising of capital for any such purpose, shall be entitled to be heard against such Bill"—said: The House will recollect that when any particular practice is established by a series of precedents in the Court of Referees, the only way in which the House can reconsider that practice, and take into consideration whether the circumstances require revision, is by moving a resolution on the floor of this House. The notice I bring before the House has no reference to any particular case or any particular thing. I desire only to put before the House the general principle that covers the case of local authorities in relation to the gas and water companies in their particular districts. As it stands, the rule is practically laid down that when a gas or water company comes to this House for the purpose of asking for a Bill, leave to oppose the proposal is not given by the Court of Referees to the local authorities who are affected by such gas or water company. The object of the rule I propose is that when a gas or water company comes to this House with a Bill, the local authority of the district shall be entitled to appear. To the resolution that I have proposed, notice of opposition has been given by the honourable member for East Kent, who is himself a member of the Court of Referees. He appears, therefore, to admit that some change in the practice of the Court is desirable. I hope to be able to show to the House that it would be highly advantageous to make the change I propose; but I may, in the first place, tell the House this, that the practice I desire to establish in this House is exactly the same practice as now exists at the Board of Trade, and the same practice that now exists in the House of Lords. Why is it suggested that the local authority ought to have power to appear against gas or water companies' Bills? For this reason, that the gas or water company has a monopoly limited only by the fact of the amount of its capital. The effect of the Standing Order I propose is this, that when a gas or water company desires to extend its power and come to Parliament to ask for such extension, the House shall have power to review any fresh conditions that may have arisen, and to act as the circumstances of the case may require. It would appear that in the first place this must have been the original intention of Parliament. If not, why did not Parliament allow gas or water companies to obtain additional capital by a simple Provisional Order or by other means? Parliament decided that it would grant capital to a limited extent only, and that subsequent applications for increase of capital should be made to Parliament itself, in order that it might have an opportunity of reviewing altogether the terms on which it was granted. If this was the case, it follows as a logical sequence that Parliament intended local authorities, who best represent the consumers in a district, to have *locus standi* before Committees of the House, for the purpose of calling the attention of this House to the manner in which the monopoly has been exercised, and to state the reasons why further extension should not be granted, or to suggest terms under which it should be exercised. If this was necessary originally, it becomes much more necessary since it has been the constant practice of local authorities to purchase these undertakings. Thus it is really more necessary to entrust local authorities with further powers for carefully guarding against increase of capital. There are many other points, which are developed by our experience year after year, which it is perfectly fair that those who represent particular districts should have power to urge before Committees of the House. Then we may be told it would lead to an increase of litigation. Why should it? It has not led to increased litigation under the Provisional Orders of the Board of Trade, and the Committees of the House of Lords. More than this, there are two or three safeguards. First of all, the House will remember that it is in the power of Committees of the House to refuse to allow costs when they think opposition frivolous and vexatious. The power has been exercised on one or two occasions, and I say that the power thus exercised will prevent needless opposition. Under the Borough Funds Act it is necessary, before a local authority can oppose any gas or water Bill, that it should obtain the sanction of a majority of the ratepayers at a meeting specially called for the purpose. I do not think at this moment it is necessary for me to add anything to what I have just stated. I believe that this is the best means of protecting the interests of the ratepayers. I believe also that this popular House of Parliament will not refuse to the local authorities the power I ask, which day after day, without any prejudice to the public interest, is given by the House of Lords. I beg to move the new Standing Order which appears on the paper.

Mr. PEMBERTON moved as an amendment, to insert after the word "against," the words "any matter contained in or proposed to be enacted by." He said: In rising to propose this amendment, I wish to state what the Court of Referees is. The Standing Order under which that Court at present acts states that it shall be competent for the Referees on Private Bills to admit petitioners, being municipal or other authorities having the local management of the Metropolis or any town, alleged to be injuriously affected by any Bill, if they think fit. Under this Order a discretionary power is given to the Referees; and I may say in every case that has been before the Court, whenever alteration is sought to be made either in the quality or quantity of the gas or water supply in any district, or any extension of the limits of the company, or in the powers relating to the gas or water supply, the petitioners in every such case have been admitted before the Court of Referees. We have gone farther than this. We even admit them in cases where the means of testing the gas are simply altered. When the works are proposed to be moved from one place to another, we admit petitioners against the Bill. The only cases in which they have ever been refused *locus standi* are cases where additional capital is merely sought to be raised; and upon this point I must differ from my honourable friend who moved the proposed Standing Order. When additional capital is sought to be raised it does not extend the monopoly. It simply gives facilities for carrying out those purposes which legislation has previously sanctioned and authorized. Of course, the Court of Referees only tries to carry out existing Orders, and it will relieve them of laborious duties if this Standing Order is carried. My amendment does not in any way oppose the principle of the proposed Standing Order. My honourable friend wishes that, in cases where additional capital is to be raised, as a matter of course the local authorities shall be admitted to oppose. My amendment does not interfere with this in any way; though I think a great deal may be said against the proposition, for I think it will give rise to a great deal of increased expense for unnecessary litigation. With regard to the statement of my honourable friend, that the local authorities are checked by the operation of the Borough Funds Act, I think this is not so in practice, for although the Local Government Board do not allow a charge on the rates without the previous consent of the ratepayers, this does not always have the effect of checking litigation. I put it thus: A question of opposition will be raised, in many cases most unnecessarily, and I think this will be a great disadvantage and discouragement to people who have invested their money in undertakings already sanctioned by this House. From neither the House of Lords nor the Board of Trade can the honourable member draw a single argument in favour of his resolution. The practices are entirely different, and cannot in any way be compared with the practice of this House. The House of Lords' Committees hear the merits of all Bills, and hear also the question whether a petitioner has a right to be heard or not. Petitioners are therefore entitled to be heard in every

case, because the Committee decide on the merits of the case, and decide also questions of *locus standi*. As to the Board of Trade, an officer is sent from the Board into the country, and that officer allows anybody to appear before him as a matter of course. What I propose to do is to carry out what I believe to be already the Orders of both Houses. The object of my amendment is simply to restrict the petitioners to those points which are raised in the petition and in the Bill. There is already a Standing Order, which I am convinced had this object in view. It sets forth that no petition against a Private Bill to confirm a Provisional Order shall be taken into consideration by the Committee on such Bill which shall not distinctly specify the grounds on which objection is taken, and that the petitioners shall only be heard on the grounds so stated. As I read this Order, the reason must be that it is intended that in no case at all of a Private Bill should the petitioners be entitled to be heard except on the grounds of objection to the Bill stated in their petition. In practice it has been held that these words do not go far enough. Although so far as any objection taken to the provisions of a Bill may have been distinctly stated in the petition, yet the Order does not in terms state that when something is raised in the petition which is not raised in the Bill the petitioners should not be heard on any such statement. All that my amendment does is to give an opportunity for a joint petition, and of course as this new Standing Order applies only to gas and water Bills, it will at present apply only to gas and water Bills which require that joint petition, and would so carry out the existing Order. It will not in any way interfere with my honourable friend's proposal. It will in no way prevent a petitioner from stating any objection; and it will not prevent him from being heard on an application for increase of capital. It will only prevent him from raising for the first time by his petition something which is in no way contemplated in the Bill, and which is not one of the issues between the parties. I may give an illustration of procedure which is very objectionable, and which this amendment will meet. During this session the South-Eastern Railway Company brought in a Bill to purchase about two miles of railway belonging to a private company. In many of the petitions against this Bill there were many allegations that the fares charged by the Railway Company on another and different part of their system were too high. Petitioners asked the Committee appointed to inquire into the question whether one railway company should sell to another railway company their existing undertaking, and to inquire into the rates of the purchasing company in an entirely different district. The House is aware that there is a Committee sitting on the question of the rates charged by railway companies, but it was not put to them. What I do object to is that on a petition of this sort petitioners should be allowed to spring a mine on a practice which the Legislature has very carefully considered and sanctioned. I beg to move my amendment.

Colonel MAKINS: I rise to second the amendment. It might appear that to a certain extent the resolution must be considered to cast some reflection on the Court of Referees; but even if the House considers that the new Standing Order is to some extent necessary, it would be only fair that it should be dealt with in the manner proposed in the amendment. The honourable member has stated that both gas and water companies have a monopoly, but he forgot to state that the monopoly is restricted, and that it is coupled with compulsion on the companies to supply the public with gas or water, which they have undertaken to manufacture or supply. Under these circumstances, it is clear that there would be no desire on the part of the companies to come to Parliament for fresh capital, for since the auction clauses were adopted some few years ago there is absolutely no advantage to these companies from increasing their capital. If the Standing Order were adopted in the words my honourable friend proposes, it would be competent for any one to come in with a roving commission in any case where any company whatever sought for new capital. It would also have another effect, which it would be imprudent to overlook; it would enable municipal authorities who have the intention or desire to acquire the business of a company, first of all to attack them in Parliament when they came for more capital. The companies are bound by their Acts to supply gas or water. For this purpose they are bound from time to time, as their district increases, to come to Parliament for more capital and other powers, and it would certainly be in accordance with my own ideas that gentlemen carrying out the responsibilities forced on them by Parliament should not be subject to detriment by reason of this new Standing Order.

An HONOURABLE MEMBER, whose name did not reach the reporters' gallery, said: I hope the House will agree to the proposal of the honourable member for Mid-Lincolnshire (Mr. Stanhope). Surely the large towns have difficulties placed in their way by being unable to appear against Bills brought before Parliament. We had a case in reference to a large town with which I am connected, in which a company has appeared before Parliament this year solely for the purpose of obtaining increased capital, and the local authorities have been unable to appear in opposition in consequence of the Standing Orders. There are great differences at this time between local authorities and water companies, as to which large sums of money have been spent in law proceedings. The company I refer to were asked to state those differences on the application to Parliament for a Bill this year; but they declined to do so. I do trust the proposal made by the right honourable gentleman will be agreed to.

Mr. STAVELEY HILL, amid general conversation prevailing in the House, was understood to say that it would be better to leave the question to the judgment of the Referees.

Mr. CHAMBERLAIN: The question that has been raised by the honourable member for Mid-Lincolnshire is one affecting a large number of persons, directors and shareholders of the great gas and water undertakings of the United Kingdom. On the other hand, it also affects directly the local authorities throughout the kingdom, who think that our present practice—by which they consider they are prevented from opposing these companies when they come before Parliament for further capital—should be amended. I have given the matter careful consideration, and have come to the conclusion that the proposal of the honourable member for Mid-Lincolnshire is one that the House would do well to accept. I do not concede that I am in any way passing slight on the Referees in connection with the discretion reserved to them; but I may point out that in recent years they have exercised this discretion more strongly than they formerly did. I have received a letter on this subject from Mr. William Livesey, the Secretary of the Gas and Water Companies' Association for more than 12 years. [Mr. Chamberlain then quoted from the letter, which we print, *in extenso*, in another column, and which consequently need not be repeated here.] I agree with the honourable member for Mid-Lincolnshire that there is no reason why the practice of this House should differ from the practice of the House of Lords in regard to these cases. The honourable member (Mr. Pemberton) says the cases are not entirely analogous, and I assent to this statement. At the same time local authorities should have the opportunity of opposition, which is denied them here. I confess I cannot see my way to accept the amendment of the honourable member for East Kent. It would have the effect of limiting the operation of the proposal of the honourable member for Mid-Lincolnshire, and practically render it of no effect at all. Mr. Livesey makes the matter very clear when he says that when a gas or

water company comes to Parliament for the purpose of effecting changes, it could never be intended that the public were not entitled to appear against them.

Mr. PEMBERTON: The result of my amendment will allow authorities to appear on all that relates to proceedings for additional capital.

Mr. CHAMBERLAIN: But the petitioners would not be able to raise any question dealing with water or dealing with gas, or with the prices charged. At the present time the great majority of gas companies are not under the slightest control. The first thing they have to do is to fix their prices, and this is a matter in which the local authorities have the greatest possible interest, and yet the local authorities, as the matter at present stands, would not be entitled to appear, although they must be seriously affected. The only objection I have heard taken to the proposed new Standing Order is, that it will have the effect of seriously increasing the cost of Private Bill Legislation. I do not deny that there is some force in this objection. But if legislation is too expensive, that is a reason for cheapening the course of procedure; but it is no reason for shutting the door of a Court of Justice or of a Legislature, if these companies and local authorities desire to enter.

Dr. LYON PLAYFAIR: I am sorry that, whilst I agree in principle with the resolution which has been proposed, I shall feel it my duty on this occasion to vote for the amendment of the honourable member for East Kent. I entirely agree with the principle that local authorities should have *locus standi* upon any Bill relating to their interests that comes before the House; but the whole principle of modern legislation with regard to Private Bills has been to decrease the expenditure of Private Bill Legislation, because the ultimate cost of the legislation is borne by the gas or water consumers. I believe that one effect of the Standing Order would be that the cost of Private Bills would be enormously increased. Let me give an instance of how injuriously this might affect the consumer. Suppose a gas or water company desired to take a supply of water or gas near a town, that gas or water company may be afraid to come to Parliament on account of the enormous expense, and they will refuse to come for the capital. I think, therefore, that we should give municipalities *locus standi* in what relates to any Bill; but when companies come up to ask for additional land or a small increase of capital, it would be very hard to put them to any increase of expense.

Mr. RODWELL: I wish to offer a few words derived from personal experience in these cases. I agree with the principle of the resolution of the honourable member for Mid-Lincolnshire, but I quite agree also as to the great danger of opening the door too wide to allow municipal authorities to oppose gas and water companies. The present state of the law with regard to gas companies and municipal authorities is much altered from what it formerly was. The relations are such now that it is necessary companies should be opposed whenever they come before Committees for the purpose of raising capital, because it involves a great many other things which should be taken into consideration. Yet I do think the amendment will embrace everything that is desired, and I shall certainly vote for it.

Sir JOHN MOWBRAY: I shall support the motion of my honourable friend the member for Mid-Lincolnshire (Mr. Stanhope) on the grounds which have been so well put by the President of the Board of Trade. It is a motion in the interests of the public, and does not cast any blame on the Court of Referees. I think that all the arguments are in favour of it.

Mr. WHITLEY: Occupying as I do a position in one of the most important municipal councils of the kingdom, I must say that there is a very strong feeling in favour of the proposition of the honourable member for Mid-Lincolnshire. I am quite satisfied that the municipalities of this country will feel grateful to the right honourable gentleman, the President of the Board of Trade, for giving his support to this resolution. It is quite true that a local authority may appeal to the Referees in the case of a Bill promoted by a gas or water company; but I am expressing the sentiments of every one connected with municipal government, when I say that we have always felt great difficulty indeed in opposing any proposition of a gas or water company before the Referees. Bearing in mind the importance of the private and public interests involved, I maintain that we, who are chiefly affected by the Bills of these companies, ought to have the opportunity of coming before Parliament whenever such Bills are introduced.

The House then divided, when there appeared—

For the amendment	56
Against	311

Majority against. 255

The motion was afterwards carried without further opposition, and was ordered to be added to the Standing Orders.

WEDNESDAY, MAY 11.

Requisitions to withdraw their petitions against the following Bills were presented:—

London Sea Water Supply Bill, from the West London Extension Railway Company.
Woking Water and Gas Bill, from the Earl of Onslow.

Miscellaneous News.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Thirteenth Quarterly Meeting of this Association was held at the Grand Hotel, Birmingham, on Thursday, April 28. There were present the President (Mr. R. O. Paterson, of Cheltenham), the Ex-President (Mr. P. Simpson, of Rugby), Messrs. C. Hunt (Birmingham), J. Tindall (Walsall), H. Peaty (Burslem), C. E. Jones (Chesterfield), J. M. Darwin (Longton), J. R. Frith (Runcorn), J. H. Parsons (Oswestry), T. Collett (Dudley), D. W. Lees (Willenhall), G. E. Stevenson (Peterborough), A. Dougall (Kidderminster), R. Morland (Gloucester), W. Littlewood (West Bromwich), W. R. Cooper (Banbury), T. Layton (Redditch), W. Winstanley (Newcastle-under-Lyme), W. T. Tew (Warwick), and W. North (Stourbridge), Hon. Sec.

Mr. NORTH read the minutes of the last meeting, which were passed and signed.

Mr. H. PEATY then read the following paper:—

ON CONDENSATION.

The subject of condensation has been so frequently discussed in this and kindred Associations, that it seems presumptuous for any one to re-introduce the subject unless he has evolved some new theory, or can throw light on some debatable point. This short paper does not pretend to effect either of these desirable ends, and was only written in the hope that opinions and information may be educed from the members of this Association, which will add to our imperfect knowledge of the subject.

Condensation may be defined as the process of taking out the tar from the gas, and reducing the temperature of the gas to that point where the after-processes of washing and purifying may take place with the greatest

effect. Among the methods employed to effect this end we have—contact with liquids; contact with surfaces promoting cooling, and lowering the vapours below the point of vapour tension; friction with rough surfaces; separation under the action of gravity; and, lastly, compression with friction.

The first important portion of the condensing arrangement is the hydraulic main, and the action of the water materially assists the gas to throw down the tar. From 40 to 50 per cent. of the whole bulk of tar is here deposited. From the hydraulic main the condensers are usually arrangements of tubes, either placed in a horizontal or a vertical position, and the principle involved in their action is that of cooling the gas by radiation and conduction; consequently the amount of surface is of primary importance, and condensers are considered efficacious in proportion as they present ample area for the cooling influence of the surrounding air, or of water artificially applied.

Six feet for every 1000 feet of gas produced per day appears to be the amount of surface generally allowed for condensers, but it must be evident that this is by no means a safe rule. If we had a pure gas to deal with, and had simply to reduce its temperature from, say, 100° Fahr. to 50° Fahr., the problem would not present any difficulty. But we have aqueous and tarry vapour to condense, and coals vary very much in the quantities of aqueous and tarry vapours they produce; and to condense these from a make of 500,000 feet of gas per day may require twice the condensing power which will suffice if another kind of coal be used. There may be great variation also in the capacity of condensers of the same superficial area. A horizontal condenser of a given area, composed of 24-inch pipes, will have twice the cubical capacity of one with 12-inch pipes having the same surface, and four times that of one with 6-inch pipes. The rapidity of the flow of gas would be 16 times greater in 6-inch than in 24-inch pipes, and though the smaller pipes would be efficient as far as cooling was concerned, the tar and vapour would not be deposited on account of the speed of the current.

The presence of tarry particles in the gas on leaving the ordinary condensers led to the adoption of large vessels filled with coke, which, breaking up the current and presenting innumerable points of contact, effectually took out the tar. The necessity, however, of frequent cleansing soon led to their disuse, and large empty settling-vessels were employed instead, the current of gas through them being exceedingly slow, allowing the particles to settle by their own specific gravity. In a vessel of this kind constructed by Mr. Malam, the rate of speed was about 1½ feet per minute; in a settling chamber used in Manchester the rate would be 18 feet per minute. To give an extreme instance, gasholders have been proposed as receptacles for the crude gas, and there is no doubt they would form excellent precipitating chambers. The battery condenser is another form, acting upon the same principle, but with greater cooling power afforded by the addition of cross-pipes, which assist in breaking up the current of the gas.

A great stride forward was taken, and another principle acted upon, when MM. Pelouze and Audouin invented their mechanical condenser—an arrangement whereby the particles of tar were forced together and formed into small drops, and the gas freed from its tarry vapours. The passing of gas through small apertures has been employed with complete success to effect the same result, by Mr. G. Livesey in his wash-vessel.

Up to the present we have only considered the mechanical means of cooling gas and ridding it of its tar. Chemical actions have, however, to be considered. At every step of the progress of the gas through the pipes, this same tar has been exercising an important influence upon its character and composition. In the hydraulic main, tar consists principally of pitch and heavy oils, and contact with it, whether cold or hot, cannot possibly improve the gas. Further on a mixture of heavy and light tars are found, which have been thought beneficial, inasmuch as they absorb naphthalene. In the last stages a thin light oil is deposited, having no injurious, but rather a good effect.

It has often been debated as to whether we should keep the tar and gas together as long as we can, or separate them as soon as possible. Whichever plan is adopted, it is evident that as long as the present apparatus is employed, much will depend upon the heat at which the coal is distilled. With high heats a greater proportion of the light oils will be made into permanent gas, and under these conditions the sooner the gas is taken out the better; with low heats tars are produced, the contact of which may be beneficial. The chief reason why tar is kept in the condensers is that it has an affinity for naphthalene, and prevents the deposition of this troublesome material farther on in the apparatus. This is certainly the case, and if it did not at the same time absorb the light oils, no objection would be made to the practice. It, however, takes up the light oils, and robs the gas of its chief light-giving properties. While dreading to be troubled with naphthalene, gas engineers do not wish to lose the naphthas, and a compromise has been attempted by keeping gas in contact with tar so long as it was not reduced below 100° Fahr., and at that point leading the tar away by a separate pipe.

The difficulty experienced is that of separating the tar which does injury from that which does not, and to apply the latter, if it be found expedient, to the enriching of the gas. This difficulty is not overcome by the use of any ordinary apparatus, and we are indebted to the ingenuity of Messrs. Aitken and Young for an apparatus that deals with the tar by a system of hot condensation, taking out those light hydrocarbons which increase the illuminating power of the gas, and sending the rest to the tar-well. The St. John apparatus is another means of separating the tar while hot, and is so effective as a condenser that only 8 grains of tar per 100 feet are left in the gas after passing through. There is a marked similarity between the hydraulic main and the St. John apparatus; the latter being a series of dip-pipes so arranged that the gas has to be repeatedly plunged into hot ammonia water and tar, the action of the water separating the particles of tar from the gas, while the heat effects a partial distillation of the lighter tars, causing light oils to float on the top, and the naphthas to be permanently absorbed by the gas passing through them. In France, a system of hot condensation has been advocated, not unlike that of Messrs. Aitken and Young. Large condensing chambers are kept hot, and the heavy tars allowed to settle by gravitation. The valuable portions of the light tars are distilled; and, as a consequence, there is a speedy deposition of all tarry matters; an increase in the illuminating power of the gas being the result.

On a review of the whole subject, it seems that there are three methods which may be used with great effect to take out tar—(1) Separation by gravitation (large vessels). (2) Washing in water. (3) Passing gas through a series of fine apertures, such as there are in the Pelouze and Audouin condenser. The Pelouze and Audouin condenser has been tried with hot gas, and found to be comparatively inefficient. An extra pressure of 6 inches was required to force 500,000 cubic feet in 24 hours through a condenser of this kind, which was constructed to pass at ordinary temperatures 1,000,000 feet in the same time. Also it was observed that the light naphthas were driven forward, but as the means of condensation beyond were of the ordinary kind, we have no evidence that the naphthas were utilized. The removal of the crude gas into large holders, artificially warmed to prevent too sudden a cooling of the gas, would effect good results. If only time were allowed, the tar would inevitably precipitate

by gravitation, and the water in the tank of the holder would protect the gas from the action of the heavy tars. The very light particles remaining in the gas would be dealt with in the after-washing process.

The remaining process, that of washing at a high temperature, is the one on which I should place most reliance, and which is now proposed for your consideration. The method I should adopt would be to take the gas as speedily as possible into a receiving-main over the retort-benches, and by means of a steam-jet exhauster force the gas into a suitable washer—Livesey's washer would serve the purpose admirably. The heavy tars would at once be precipitated, and the light ones acted upon as in the St. John apparatus—more effectually, in fact, by reason of the minute subdivision which the gas would undergo. There would be no greater liability of naphthalene causing trouble, for the benzol vapours would be powerful in their action to carry it forward. Ordinary care would have to be exercised that the subsequent cooling took place gradually. The tar would be conveyed from the washer as soon as produced, and would not be found to differ much in fluidity from what is usually deposited in the tar-well.

Discussion.

The CHAIRMAN: We have been listening to an interesting paper, and I shall now be glad to hear any remarks the members may have to make upon it.

Mr. JONES said that he should very much like to ask Mr. Peaty, if he was going to take his gas into an ordinary gasholder, and allow it to condense, how he would get rid of the difficulty of removing the tar without some special appliance. The gas and the heavy tar would, no doubt, be effectually separated, as gasholders were usually constructed somewhat deeply in the ground. He would also like to know how Mr. Peaty proposed to dispose of the tar which would be necessarily deposited in the pipes forming the inlet and outlet of the gasholder.

A MEMBER remarked that he did not understand that Mr. Peaty had made any experiments himself. His proposal, he said, seemed to him to be that the vessel was to act in the way of a large washer or scrubber, and it was a question whether it would be best to condense the gas in this way, or cool it in the ordinary way. It was just possible they might get more of the light oils in the gas in that way than by the present mode of condensation.

Mr. JONES said his question had reference to the economy of pumping.

Mr. STEVENSON said he did not quite understand whether Mr. Peaty meant to use pure water, or water impregnated with ammoniacal liquor. He did not see much advantage himself in using warm water, but was not sufficiently acquainted with the matter to form a definite opinion.

Mr. HUNT had very little indeed to say except to express the pleasure he had felt during the reading of the paper. It seemed to him to be an excellent *résumé* of all that was known, and of much that could be conjectured with regard to the subject. There was no doubt that their aim should be to separate the heavy tar as speedily as possible. Whether the proposal to wash at the outlet of the hydraulic main with hot or with cold water was a feasible one or not, he was not prepared to say; he was rather inclined to think that it would increase the amount of aqueous vapour in the gas, and this, according to some—although he had not any experience upon the point himself—led to an increased deposition of naphthalene. It was, however, certain that nothing could be more efficacious than washing for the removal of tar. The same object might be effectually attained by the employment of a gasholder, but it seemed to him to be an expensive remedy, and he could not help thinking an unnecessarily expensive one. In some German works the plan had been proposed, if not adopted, of passing the gas from the hydraulic main upwards through what might almost be described as a small scrubber. At intervals in the height there would be plates having large perforations, so as to offer as little obstruction as possible to the gas, and yet to cleanse it from the tar. This seemed to him to be a very good method, dealing as it did with the gas when it was at its hottest.

Mr. MORLAND said he should be rather afraid that if Mr. Peaty's plan were adopted there would be an increase of heat, which would cause the deposition of naphthalene in places from which it could be removed only with great difficulty. This was found to be the case in the Gloucester works, where there was a steam-jet exhauster. The light oils were converted temporarily into gas, only to be again transformed into naphthalene, and deposited in the condenser and scrubber.

Mr. PEATY, in reply to Mr. Jones's question, said he simply mentioned gravitation as an effectual mode of ridding the gas of the tar, but no doubt there were very many mechanical difficulties in connection with the subject. These he had not considered. With regard to the washer itself, its action was based on the fact that hot water, while in contact with tar, partially distilled it, and this at not a very high temperature. He had tried experiments with heats of from 140° to 160° Fahr. There would have to be a good depth of liquid, so that the tar would be allowed to proceed itself, and be taken out of the sphere of the action of the gas, while those oils lighter than water would remain on the surface till dealt with. He tried an experiment with an artificial hydraulic, with the bottom of the dip covered with fine perforated tin, and at one immersion through this dip he was able to get seven-tenths of the tar. If with a rude apparatus he had obtained this result, he thought it was a fair conclusion that with an elaborate and good apparatus, such as Livesey's washer, all the tar would be taken out.

The PRESIDENT inquired whether the experiment alluded to referred to the amount of tar the gas carried away in its passage through.

Mr. PEATY said it did not; it was an incomplete experiment, made to ascertain what work the hydraulic main did in the way of taking out the tar at one process. It was not a copy of the hydraulic main, as gauze was put at the bottom of the dip-pipe, and made the action greater. The perforated plate was at the bottom, and formed part of the dip-pipe. The vapours in the crude gas, in addition to the steam-jet, would keep it sufficiently heated. He should only use steam to force it through, and use ordinary exhausters to draw it on the other side. His experiment registered 140° Fahr. after it left the water.

Mr. JONES: If the temperature is 140°, what becomes of the benzene?

Mr. STEVENSON: If you get the full proportion of benzene, the gas will maintain in vapour—that is all you can do. The surplus would be condensed again.

Mr. PEATY observed that a French engineer said the gas tar would not furnish the amount of benzene vapour the gas would take up. They could carburet the gas after it had taken all the benzol it could get from the tar. Mr. Morland had asked whether the naphthalene which it was desired to take out would not be carried farther on; but this washer would have to be supplemented by all the apparatus they had at present. The distinction he (Mr. Peaty) tried to make in dealing with the subject was that the gas they were treating was not simply a gas. There was the tar to take out, and the sooner it was taken out the better.

Mr. LAYTON read the following paper:—

DIFFERENTIAL CHARGES FOR GAS.

In introducing for your consideration and able discussion the subject of differential charges for gas, I beg to say that it is with a full conscious-

ness that many present will not endorse my views, but at the same time I do not anticipate that I shall stand alone. I could have wished the subject brought before you by some member who would have dealt with it more efficiently than myself; but it will find its way there just now, and I trust that it will be well and fairly considered by you in all its bearings. I shall then be amply repaid for my trouble, in having the assurance that if I have not done much myself I have set a number to work who will do something, and do it thoroughly.

While it is quite true that gas ought to be manufactured upon the most correct scientific principles, that the best machinery should be used in its production, and the strictest economy observed in every part of its manufacture, it is equally true that when produced it should be sold upon the best commercial principles, fairness and equity being strictly observed towards every class of consumers. The system of differential charges for gas seems to me to have crept in somewhat unawares. The sale of gas is looked upon by some people in the same light as Birmingham, Manchester, or Sheffield goods, and this, I think, is where the error arises. I cannot myself but regard the sale of gas as very different from that of hardware, and articles of a similar description, and I do so for several reasons. First, gas is a monopoly, and the manufacturers of it are secure from the competition to which nearly every other class of manufacturers are subjected, and which compels them to resort to that which is perhaps more expedient than just and equitable. But the gas manufacturer can soar above the reach of these things, and, standing in a good position for selling his gas in the fairest and most equitable manner, he should exercise his rights. In the second place, I look upon coal gas as the artificial light of the age, and I consider that artificial light is man's necessity and not his choice, for it is as indispensable to his comfort as bread is to his support. It is on this account that I think he ought to be supplied at the lowest possible cost, and upon terms as favourable to him as possible, whether he be a small consumer or a manufacturer or extensive tradesman. Why should the manufacturer, using a large quantity of gas in the manufacture of goods from which he is deriving a considerable income, if not accumulating a large fortune, have his gas supplied to him at 9s. per 1000 feet, while the workman, wielding the hammer at his smithy, is called upon to pay 8s. 3d. per 1000 feet for gas consumed for the comfort of his humble home?

The Deputy-Governor of The Gaslight and Coke Company, speaking, at the last meeting of this Company, on the subject of discounts to large consumers, said: "It has been my lot to have this matter brought before me in other places, and to my mind it is a most abominable shame to grant this indulgence to the very people who, of all others, can afford to pay." These remarks I thoroughly endorse. I know it is argued that reducing the price where large quantities are consumed tends to increase the sale still further. This argument may have possessed some force in the past, when gas was sold at more than double the price charged for it at the present time; but now, for the purposes for which gas is used in the manufacturing industries, a more economical substitute cannot be found. As to the contention that, as an illuminant, the reduction of price will increase the consumption, I am of opinion that this argument had also more power in the past than it has now, for I have found on more than one occasion that my hopes on this score have been disappointed; and now that gas is sold throughout England so reasonably as to make it the cheapest light obtainable, who is there among us who does not find the sale increase where no reduction is made in any form?

In favour of the lower charge to the greater consumer it is urged that there is no more, and perhaps less trouble in collecting an amount for 50,000 cubic feet of gas, than there is in collecting the amount for 5000 cubic feet. This is perhaps the strongest argument in its favour; but something may be placed against it; for instance, there are greater risks to run as regards bad debts, which, although they may be less numerous among the large consumers, are more telling in amount. Then there is another thing to be considered by companies supplying small, and even moderate-sized towns, and that is the great number of small consumers as compared with large ones. In some towns there would be twenty small consumers to one large one, and it is in these cases that discontent arises in consequence of the differential charges. Although the abuse of a thing may not be any argument against its use, still I should like to remark that the system of differential charges is sometimes abused. A case came under my notice recently of a man adding to his own consumption of gas that of a son-in-law, in order to make himself eligible for the lower rate of charge per 1000 feet.

The only argument that a gas company can urge in favour of the system is that it promotes the sale of gas. This may not be true in all cases, if it is in some; but even supposing it to be correct, such a view of the question would seem a little selfish. These differential charges must cause an extra amount of trouble in book-keeping, thus adding to the expense of clerks and book-keepers; and I think economy should be exercised there as well as in the other departments of the business.

I am fully aware of the difficulty of any company who has adopted the system abandoning it now; but to those who have not yet adopted it, the discussion may be of service. I have always been opposed to the system of differential charges myself, and ever shall be, until some more potent argument is advanced in its favour. I look upon it as savouring a little of giving to the rich because he is rich, and taking from the poor because he is poor.

I shall now leave the subject in your hands, feeling assured that your discussion thereon will be advantageous to all concerned.

Discussion.

The PRESIDENT said the paper just read afforded plenty of scope for discussion. They had had Mr. Layton's view of the case, and he thought this gentleman had said rightly that there were many in the room who would not share his opinions, and some one following the practice he so strongly condemned might lead the way, and give the meeting his view of the question.

Mr. MORLAND remarked that Mr. Layton had said gas companies had a monopoly. Such was undoubtedly the case; but the monopoly was restricted within certain limits—viz., the exclusive right to lay mains in the streets, sell gas, &c., but they could not prevent consumers manufacturing gas for their own use. For this reason it would, he believed, be a wise policy on the part of gas companies to supply large consumers at a reduced price. If a large consumer thought he could make gas for himself at a less cost than that for which he could procure it from a company, he would do so. Besides, they would only be following out the well-known commercial rule, that there was always a reduction on taking a large quantity. He could not see why gas, which was an article of commerce, should be an exception to the general rule. With the large consumer one supply-pipe and one visit of the collector and inspector was nearly always sufficient. The loss to the company by leakage was also very much less in proportion to the gas consumed. Companies should not bind themselves to a hard-and-fast line, but should be guided by circumstances.

Mr. STEVENSON observed that a reduction of price, it was said, did not increase consumption. This seemed to him to give one of the key-notes to the subject under discussion. Was this false, or was it true? He would not say increase of consumption always followed reduction of price, but

no doubt most of those present found that reduction of price did tend to increased consumption. He was not, he said, one of those who thought it was desirable, through thick and thin, to get a great consumption, and he believed very often this end had been kept in view, and striven after to an extent hardly warranted or desirable. They might go on pushing and pushing, and trying to get their consumption so enormous that they would hardly know what to do with it. Provided the capital was in fair proportion to the make and consumption, and there was provision for a uniform extension, he did not think a gas manager was called upon to spend his energies so much for obtaining an increase of consumption; but to his mind increase of consumption and reduction of price acted and reacted on one another. If the consumption of gas could be increased sufficiently, it opened up a way for a further reduction of price; but after consumption had so far increased that a further extension of capital was necessary, then there was a falling back. If the works were extended again after a time, there would be a heavy capital account in proportion to the consumption. What he had been talking of was certainly not the main point of the question, but was a by-point. He had always had the idea that companies reduced the price to large consumers because of their great consumption, and with the view to induce them to still further increase their consumption. It seemed from Mr. Layton's point of view that there was no reason why they should do so; but from other points of view there was great reason. Gas was far more a necessity to the manufacturer and large consumer generally than to the small consumer. The item of cheap gas to a manufacturer might be a point materially affecting the cost of the article he manufactured, and the lighting of large manufactories or mills was no doubt a considerable expense. It had been said that there was a great deal more leakage and a great many more bad debts with small consumers, all tending to raise the cost of the gas to the supplier, and necessitating an increased charge to maintain a proper amount of profit. Mr. Layton said he thought differential charges increased the expense of book-keeping. He (Mr. Stevenson) did not see this. In Peterborough there were three prices. The Corporation received gas at the lowest price, and the Railway Companies had it at the same figure. There was considerable leakage from the public lamps, and he should be inclined to call every lamp a small consumer; but the Act of Parliament provided, as usual, that the public lamps should be supplied at the lowest price charged to private consumers. With the railway supply there was no leakage, for there was one large meter at the entrance to the works. There were not many manufactories in Peterborough, but there were a few, who were large consumers; and they also had their gas at a reduced price. The ordinary consumers paid the third price—the highest of all. The Company's officials did not find any difficulty in making up the accounts. He did not find any trouble with the small consumers on account of the price; but the large consumers were continually writing to know when the Company were going to make a reduction. They had to consider what was the right thing in the interests of the public and of the manufacturer. There should be a fair profit on the business, whether done wholesale with the large consumers, or retail, as they might call the business done with the small consumers.

Mr. TINDALL said as the Corporation of Walsall adopted a system of differential charges, he should like to remark that he thought Mr. Layton had put it rather too strongly in saying this was taking from the poor, and giving to the rich. What was done at Walsall in the way of differential charges was done on purely commercial principles.

Mr. JONES said Mr. Layton's paper was highly useful and suggestive in itself, but the writer had, he thought, put a great deal of sentiment into it. It was part of our social machinery—particularly with regard to the supply of water, for instance—that the rich paid high rates to assist the poor, who thereby obtained this necessary of life cheaper; and if in the matter of gas, as they had heard, the reverse was the case, they had the happy medium which brought everything to its level. He could assure Mr. Layton that as to the broad principle of differential charges, if he took a commercial view of the gas undertakings under their charge, he would modify his opinion materially. They were frequently called upon to exercise their judgment on matters of commercial policy and principle. What Mr. Layton advocated he (Mr. Jones) understood to be this: Whereas one man took £1000 worth of gas in the year, he was to have no concession over the man who took only 9d. worth. In his district, the Company had three charges for gas and three for water, and in the first instance the water charges were fixed at so much on the rental within half a mile of a definite centre. Beyond this radius, the increase in the rates was 25 per cent.; and if they went still farther from the source of supply, the increase amounted to 33 per cent. These charges had not only been sanctioned, but actually fixed by Parliament; therefore if the system of differential charges was a wrong one, Mr. Layton must find fault with Parliament. He was certainly justified in saying, as in his (Mr. Jones's) particular case, that while they were bound to construct and provide water-works in some definite place, in the case of gas-works they could take them to the centre of the supply. But Parliament had sanctioned differential rates in many instances in the case of gas companies as well as water companies. He thought it was fair to reduce the price of gas to a man consuming a thousandfold what another did. In his district he had a consumer who even paid more for meter-rent than for gas, and surely such a one was not entitled to privilege. He was strongly of opinion that if Mr. Layton reconsidered the question, he would discover his views required a considerable amount of modification. As to collection, he did not find that it cost more to make out a bill on the first, second, or third scale. Mr. Layton must also remember that the use of gas tended to develop the trade of a district, and if local trades were encouraged by manufacturers being enabled to have cheap light, a benefit was conferred on the district at large. It followed that a district did benefit by a gas company supplying large consumers on a differential rate. It had been said that the man was a benefactor to his country who made two blades of grass grow where one grew before; and if, by selling cheap gas, gas companies enabled a man to employ 100 instead of 10 men, they conferred a public as well as a private benefit. The question opened up avenues of considerable ramifications. Decrease of price, it was said, would lead to increase of consumption. He knew a case, where a reduction of 20 per cent. was made in the price of gas, where there was a diminished consumption, and was to this day; so that reduction in price did not bring about greater consumption in that case. He did not think it necessarily followed as a sequence at all. It was a question of commercial supply, and if people could obtain oil or electricity much cheaper, they would discard gas, and use the other illuminants. As a matter of pounds, shillings, and pence, gas-works were profitable according to the consumption per mile of main. He thought the system of differential charges encouraged the consumption per mile of main, and if they could deliver more gas in proportion to the length of main, and by a differential charge induce manufacturers to take more, this was a feature which certainly commended itself to consideration. Then there was the policy of the matter, which they all had to attend to. They were monopolists to this extent, that Parliament required them to make and to sell, but the public were not obliged to buy. The companies had legal obligations of an onerous character, though they had a *quasi* monopoly. In the case of

a bank, the manager would charge a man more *pro rata* for a small sum than for a large one; and so with other like matters. He thought, on the whole, the system of differential charges for gas was commercially sound, and one which, in the present state of affairs, gas companies could not possibly afford to do without.

Mr. HUNT said that all the speakers had been upon one side of the question, and he thought something ought now to be said upon the other side. He sympathized very much with the views advanced by Mr. Layton, but what surprised him was that they were those of an officer of a company, and not of a corporation; for certainly, if any sentiment upon such a subject was at all permissible, it would be so when held by the representative of a corporation, whose sole object was supposed to be the public good. He had never heard of a company undertaking trading transactions for the love of mankind; and he thought that it was an American who had said that gas-making was not a missionary enterprise. Certainly it would not do to sacrifice commercial principles to a feeling of philanthropy; but he was not sure as to whether Mr. Layton was not, unintentionally perhaps, in the right. Gas-works were established for the supply of consumers, from whom a profit could be obtained, and these were presumably the larger ones; but if, when companies had established their system of mains, and settled all the details of management, it was found that smaller customers could be supplied without any derangement of their plans, and at a comparatively small additional outlay, surely it was sound policy, in the interest both of the large consumers and of the gas undertaking, to supply them at the same rate. By so doing, the consumption might be considerably increased, with benefit to all concerned. This was a view of the matter which ought not to be overlooked; although, at the same time, he admitted that there was much to be said in favour of differential charges.

Mr. DARWIN said he represented a Corporation who at present charged an equal rate alike to large and small consumers, and he did not think they had received any complaints from the large consumers, nor had they asked for any abatement on this account. Most of the towns in the Potteries charged 3s. 6d. per 1000 cubic feet, and he believed they made no abatement to large consumers, and when Parliament granted to his Corporation their Act, they were to charge a price not exceeding 3s. 6d. per 1000 feet, and this price they had kept charging all alike within one mile radius of the works. So far as his own opinion went, he thought that putting the manufacturer and the cottager on the same basis was equitable as regarded the supply of gas, and was an arrangement which, in his case, had worked satisfactorily.

Mr. NORTH said he had all through the discussion failed to find the line of demarcation where gas-works were separated from ordinary commercial undertakings. He did not know where the line was, and had not seen it yet. As to differential charges, he presumed gas managers carried the principle into their purchases. They expected to buy coal at a less rate than the man who bought a small quantity, and so also with other articles they used; and if they admitted this principle they could not fairly deal with their customers on a principle which they objected to have applied to their own purchases. He thought that a customer consuming, say, 1 million cubic feet of gas per quarter should have some advantage over one consuming only 1000 feet. It was acknowledged that, as a rule, the larger the make of gas the more cheaply it could be produced. This being so, if they could encourage the manufacturers to use gas for other than lighting purposes, they ensured a day consumption, and thus made their plant more profitable. But he must admit that there were one or two objections that might be raised against differential charges. One was that the large consumer was anxious to bring in at the lower rate the gas consumed by his partner, and some of his relations, however scattered might be their residences; and they could not tell exactly where they were going to stop. The other was that when the authorities began to agitate for a reduction in price, they invariably quoted in their arguments against the company the highest price charged, and took care not to mention that the company had a lower rate. On the whole he thought the system of differential charges best.

Mr. STEVENSON: I do not think I said there was a disadvantage in the increase of consumption. What I meant to say was that it was not always an end worth struggling for.

Mr. PEART said it was rather too late in the day to turn back the principles of political economy; they had obtained too long for this. All things sold in bulk were sold at a lower price than people could get them for in small quantities. Large consumers would bring pressure to bear if there were not differential charges. In these times, with the electric light or some other light before them, all sentiment would vanish if they had a light which threatened to take away large consumers. The companies should be glad to keep them at any price.

Mr. COLLETT regretted that Wolverhampton was not represented at the meeting, as they would like to have had Mr. Annan's views, coming from the second largest town in the district, and where one price only was charged. He rather leant to Mr. Layton's views, and was against differential charges. When he first went to Dudley they had, he thought, six prices; but now there were but two, and they intended having one uniform rate some day. He thought his Directors shared this view. As regarded public lights, he agreed with Mr. Stevenson that every public lamp was a small consumer. Each lamp required a separate supply, and there was a minimum consumption per service-pipe, and yet the lowest price was paid. He quite agreed with having one uniform charge, and a company would always stand best with one charge. In regard to discounts, again, he would always prefer a net price, and this price as low as consistent with remunerative profit.

Mr. SIMPSON said that if they had five or six different charges they would find it more difficult than with two. When a customer received his bill and found that if he had consumed say 4000 or 5000 feet more gas he would have had to pay less for the greater quantity than he was then paying for the lesser quantity, this would make him dissatisfied with his account. He did not go with Mr. Layton in his views, and could not think the same price should be charged to a customer who paid from £40 to £100 as to the customer who only paid from 40s. to 100s.

Mr. MORLAND said, with regard to the public lamps, he thought the argument was not all on one side. The public lamps were using gas when the mains would otherwise be comparatively idle all night. This was a point that should be borne in mind.

Mr. FARRIN said he did not at all agree with Mr. Hunt in his view concerning differential charges, and believed it was policy for a gas company to favourably consider their large consumers. He was not an alarmist, or a believer in the electric light, but in these days of electric lighting, gas companies had to reflect whether they would let their large consumers have recourse to the electric light, even for a time, because of the companies refusing to allow differential rates. Where they had large consumers they ought to deal generously with them. They gave but little trouble, either in regard to work or in the payment of their accounts. In the town where he resided nearly half the gas produced was used by large consumers; therefore he thought they ought to have a strong claim on gas companies, and it was a question whether there should not be several rates of discount, dependent on the amount of gas consumed.

Mr. JONES remarked that this would apply differently in different locali-

ties. In the case of a watering-place and a manufacturing town, the argument would, he said, hold good in one case and not in the other. Nearly, if not all water companies charged differential rates, and why not gas companies?

Mr. LAYTON, in reply, said Mr. Morland had remarked that he did not see that gas companies were monopolies. It seemed to him (Mr. Layton) that it would not be very convenient for consumers to make their own gas; therefore he considered gas supply was a monopoly. Mr. Stevenson made a remark which did not apply in his (Mr. Layton's) experience. Mr. Stevenson said bad debts were principally among the small consumers. He did not find this to be so at Redditch. As to book-keeping, if he had four or five charges in one column of his books, he did not think he could take out the amounts so quickly as if there were but one price. The electric light had been referred to, and it was said there should be some concession made on this account to large consumers. Who would, he asked, be the first to desert the gas companies? It would be these large and highly-favoured consumers, who had had the benefit of a differential rate. He had put the question to large consumers thus: "You have many workpeople burning a few thousand feet of gas, and why should they be called upon to help you to pay for your supply?" Discount for prompt payment he thought reasonable.

The PRESIDENT said the principle of differential charges was certainly one which came distinctly and clearly under the line of commercial transactions, and he did not see that Mr. Layton could justify a tithe of his arguments against them. It was, perhaps, more a question of degree. Differential charges had been carried to an extraordinary degree of absurdity in some cases. It would not be wise to instance particular towns, but there were places with scales of differential charges ranging from comparatively low to comparatively high rates, and in such cases an injustice was apt to be done to the consumer paying the high rate—namely, the small consumer, a class which generally composed the largest part of the business of a gas undertaking.

Mr. TINDALL read the following paper:—

ON DISTRIBUTION.

The subject I am about to introduce to you is perhaps not such an attractive one as that of the Anti-Dip or the more interesting one of Condensation, still I think it of sufficient importance to claim our attention for a short time at this meeting.

In introducing the subject, I may say I am placed in rather an unfavourable position, inasmuch as I have nothing new or novel to bring before you; but although such is the case, I am of opinion that our distribution services are by no means perfect. However, my remarks on the subject, and the discussion which I hope will follow, will, I trust, bring out some hint or idea which may prove to be of some advantage to us. If such be the case, our labour and time will not have been thrown away.

I purpose, in the first place, to ask you to consider whether the system of distribution now generally adopted is or is not the best; and, in the latter alternative, whether it does not admit of considerable improvement. Secondly, to submit some observations on the formation of naphthaline, and the best method of removing and obviating the same. Before, however, I commence this part of my subject, I wish to make a few remarks which I trust you will not think out of place.

Gas managers have during the past few years devoted much time and labour to instructing consumers how to burn their gas in the most economical way. They have also carefully selected the best kind of burners for their respective qualities of gas; have had exhibitions of burners, showing the disadvantage of bad ones and the advantage gained by using good ones; in fact, they have done all they could, or nearly so, in this direction, for the benefit of consumers. Regulator makers have also come to our assistance in vying with each other in trying to produce a new and effective burner regulator, and to some extent they have been successful in preventing waste and developing more of the light contained in the gas; but in my opinion there remains something more to be done, which can only be accomplished by a more effective system of distribution in street mains, and a proper regulation of the pressure by the governors at the works.

I do not, however, intend taking up your time with an historical review of the subject, or in offering any opinion as to which kind of pipe is the best; nor shall I refer to the relaying of mains, or to the method of ascertaining the quantity of gas to be supplied, as is necessary when we are about to light a town for the first time. All these matters must have had prior consideration, seeing that our districts are already lighted. My object, therefore, is to discuss two systems of distribution, and give you my opinion upon them.

I do not think I can better deal with these two systems than by referring to my own experience at Walsall. The plan adopted there, and in other towns where I have had experience, is to lay a large main, or number of mains, as may be required, from the works, then branch off in all directions, until the whole town or district is supplied with main power. They are then connected together in convenient places, forming one entire system of mains. This plan is, I believe, recommended in "Clegg's Treatise on Coal Gas." At page 283, referring to this subject, he says: "The cross pipes, whatever their diameters, should be connected together in every available place to form a system of mains; on no other plan can a certain regular pressure be ensured. Deficiencies in the quantity of gas in one place will then be made up by a supply from another point in which there may be an excess, and thus cause a constant circulation. The pressure in the mains will vary directly as the rise above, or the fall below, the datum line at the constant rate of 1-10th of an inch for 10 feet. Thus at those points which rise 10 feet above the datum, the pressure will be increased 1-10th, and will be decreased 1-10th at a point 10 feet below the datum. If, therefore, these points are connected together, the discharge will, in a measure, be regulated, and so at every intermediate elevation." Now we will see how this system will apply at Walsall, where it is to some extent adopted. The difference between the lowest and the highest level is 150 feet. It is evident that if I should put on at the works an initial pressure that would give a pressure of 15-10ths at the lowest level, I should have, providing the mains were sufficient, 30-10ths at the highest level. The result of this would be not only an excessive leakage, but an extravagant pressure at the consumers' meters, which I should consider to be unjust to the consumers. The 15-10ths pressure at the low level may be said or thought to be excessive; but as we have now gas-engines, stoves, &c., to supply, I consider it is not so.

In the year 1877 the Walsall Corporation took over from the Birmingham Corporation a large district, the greater portion of which was on the highest level, and contained nearly 700 meters. At that time our initial pressure was about 24-10ths, and the district was about 120 feet above the level of the works. I may also mention that there was a surplus of main power in the new district. The pressure, as I have before stated, being increased 1-10th in every 10 feet rise, we should have had 12-10ths added to the initial pressure, bringing the same up to 36-10ths. You will therefore see that this would have been a very excessive pressure, which would have resulted in increased leakage and an injustice to the consumers. I, however, ascertained the pressure that

this high-level district had been worked at, which was only about 22-10ths. I therefore disconnected one of the gasholders, put in a separate governor, and laid an independent main, which I connected to the new system of mains, and worked it at the same pressure as that at which it had been worked prior to our taking to the district. The result of this was that we did not have any complaints from the consumers, nor any addition to our leakage. Since then we have brought our new works into operation, and I have had occasion to connect the two systems of mains; but although our initial pressure has been somewhat reduced, I find that our leakage has greatly increased, and that this return to the former system of connecting all the mains together has otherwise been injurious. It may be said that a street governor would have obviated these difficulties. I have, however, recently put in a 10-inch street governor, and although it works very well, and does all that may be expected of it, it is far from accomplishing all that I want it to do.

The question may be asked—What is a street governor? It is, in my opinion, simply a self-acting valve, working within certain limits. If it be set to give the desired pressure when all the draft is on at night, it will regulate that pressure to a certain extent, and then its action ceases, and the pressure increases and becomes excessive, remaining so all through the day. In my opinion, the only proper way of governing a district is by having a station governor at the works, and this properly attended to in lighting hours by a man in charge. I beg to submit that the only system of properly distributing gas through mains is to divide the district or town into two or three separate levels as the case may require, and to supply each of those levels separately, and also govern them separately from the works. It may be said, had the district been level, or nearly so, I should not have experienced the difficulties I have met with; but my opinion is that providing the locality is level, or nearly so, the distribution would be better effected by dividing the district into given areas, and having a better control maintained over the pressure.

In concluding this part of my subject, I beg to say that we shall better compete with other systems of illumination—such as the electric light, and the enemy (the oil lamp) in our rear, which was referred to by our esteemed President in his Inaugural Address before the British Association—if we adopt the system suggested of dividing the town into districts, and governing the pressure at the works. Again, by so doing, we shall be able to equalize the pressure as nearly as possible at all the consumers' meters, and also reduce the leakage to a minimum—two objects we ought to attain as nearly as possible by our distribution services.

I purpose now to make a few observations on the formation of naphthaline, and of the methods adopted for its removal and obviation. These observations are submitted with a view to a discussion, rather than on account of any special information I can give on the subject.

In the first place, previous to my appointment at Walsall, I am not sure that I knew what naphthaline really was. I was not there long, however, before my troubles commenced. My first intimation of it was a heavy back pressure on the apparatus, which blew out the seal from the purifiers, and otherwise caused me considerable trouble. I found out that the stoppage was at the inlet of the gasholders, and also that steam-pipes were connected to the mains between the purifiers and the meter, and that the men were in the habit of turning steam into these pipes every two or three weeks to remove the obstruction. I continued to have considerable trouble from time to time, and removed the naphthaline in the same way that it had been done before. I, however, connected the steam-pipes direct to the inlets, and by turning in high-pressure steam I effected a clearance more quickly. I also tried crude naphtha, by putting at intervals large quantities into the bottoms of the syphon-boxes. This I found of some advantage; still I had to continue using steam. I have also had some trouble with naphthaline in the street mains; but I always found that it deposited most outside the district, in mains that did not do much work. My method of removing it from these mains was to take the pressure at night, when all was lighted up, to find as nearly as possible where the stoppage was. I then sent men to cut the main in two, and put in lengths of tubing, and we fixed a plunger in one end, and pulled it right through a long length of main. This method is rather expensive, but I always found it to be the readiest and most effective. I have also had trouble with service-pipes; but as my paper refers only to mains, I will leave this for a future time.

With reference to the formation of this deposit, I will give you a rather interesting summary of a correspondence which took place between the Town Clerk of Preston (Mr. H. Hamer) and the Secretary and Engineer to the Preston Gas Company (Mr. H. Green), which appeared in the JOURNAL OF GAS LIGHTING for Sept. 17, 1878, p. 427. In reply to a circular issued by the former gentleman to managers of a number of gas-works, the returns were as follows:—Seven attributed it to excessive heats; seven to the quality of coal used, or no canal being used in the manufacture of gas; one to the condensation being too small; one to the condensation being too great; one to the condensation being too rapid; one to the mode of purifying; three to cold and damp weather; five to taps and pipes being too small; one said it was not naphthaline, but ammonia; four said there was no remedy—that is, they did not know of any.

I am sorry to say, gentlemen, that I have not come before you with a solution of the problem as to the formation of naphthaline, but I trust before our discussion is ended on this most interesting subject it will be solved by some member of the Association. I am glad to inform you that during the past few years I have had very little trouble with naphthaline. I have used the same kind of coal, or nearly so, and I have had the same or greater heats. I therefore do not think it is due to the coal or to the heats employed at the works that to a great extent it has been obviated. I may say, however, that the condensation has been improved by its being done gradually with pipes round the retort-house; I have also increased the washing power; but whether it is to one of these causes only, or to both combined, or to something else, I am not prepared to say.

It was agreed that the discussion on the preceding paper should be deferred till the next meeting.

DATE OF NEXT MEETING.

After a short discussion with regard to the time of holding the next meeting, it was agreed that it should be in October, on a day to be fixed by the Committee.

VOTES OF THANKS.

Mr. STEVENSON proposed a vote of thanks to the President for his conduct in the chair.

Mr. DARWIN seconded the motion, and it was carried.

The PRESIDENT, in acknowledging the compliment, said it gave him great pleasure to find that any little efforts he might make met with approval. Their thanks were more due on this occasion to the gentlemen who had given them so much subject for consideration, and they could not allow the meeting to conclude without thanking Mr. Peaty, Mr. Layton, and Mr. Tindall for their papers.

Mr. HUNT seconded the motion, and it was carried and briefly acknowledged.

The proceedings then closed.

SAN PAULO GAS COMPANY, LIMITED.

The Eleventh Annual General Meeting of this Company was held at the London Offices, Pinners' Hall, Great Winchester Street, on the 12th inst.—Mr. F. DELMAR in the chair.

The SECRETARY (Mr. W. Southall) read the notice convening the meeting, and the following report was presented:—

The Directors have the pleasure to submit to the Shareholders the annexed statements of accounts for the six months ending Dec. 31, 1880, duly audited, which show that the total receipts for public and private lighting, rental of meters, &c., and sale of residual products, amount to £12,205 16s. 2d., as against £11,534 12s. in the corresponding six months of 1879.

The net amount of revenue carried to profit and loss account for the half year is £4380 16s. 5d., which, added to the amount brought forward, £1723 9s. 4d. (after payment of the last dividend in October, £3941 10s., and deduction of £126 9s. 8d. written off Mauá and Co.'s debt), makes a total of £6104 5s. 9d. available for dividends and contingencies, out of which the Directors recommend a dividend to be paid for the six months at the rate of 10 per cent. per annum, free of income-tax, amounting to £3941 10s., and a further 20 per cent. (£101) to be taken off the balance of Mauá and Co.'s debt, carrying forward at the credit of profit and loss £2061 15s. 9d. to the present half year.

During the year 1880 the number of public lamps was increased by 55, and the meters fixed by 121. Additional lamps are now ordered, and the private lighting is likely to be still further extended.

The Gas Engineer's report as to the efficiency of the works continues to be very satisfactory.

It is with great regret the Directors have to announce the death of Richard Clay, Esq., who has been for some time an honorary member of the Board. The election of E. D. Edgell, Esq., is subject to the approval of the Shareholders. F. Delmar, Esq., and E. Batt, Esq., M.D., retire by rotation, and, being eligible for re-election, offer themselves accordingly. The Auditor, Wm. Cash, Esq., also retires, and, being eligible, offers himself for re-election.

The CHAIRMAN, in moving the adoption of the report, said with regard to the gas manufacture, the cost of coal carbonized was £2782 in the December half of 1879, while in the corresponding period of 1880—the half year under consideration—the cost was about £200 more; but on the other side of the account the Shareholders could see what the additional revenue was against the increase in the expenditure. The repairs, &c., in the half year had cost them £642, against £702 in the December half of 1879. The general charges in San Paulo and the London charges were pretty much the same. The balance carried to profit and loss account, being the net revenue for the six months, was £4468, against £3763 in December, 1879. Passing to the general balance-sheet, he observed that there was cash at the Union Bank, at the London office, bills receivable, and cash at San Paulo, amounting together to £2657; the stock of materials—consisting of coal, gas-meters on hire, fittings on hire, fitting stock, &c.—amounted to £13,192; the sundry accounts owing to the Company for gas-rental, meter and fitting hire, and coke and fittings sold, &c., amounted to £2727; while Mauá's account was reduced to £506.

Colonel ROBINSON, *à propos* of Mauá's debt, inquired the meaning of the item, "Balance of bad debts."

The CHAIRMAN explained that it represented the balance of the bad debts from the commencement. They amounted altogether to £550, which appeared a large amount, although it was not, he said, above 1-16th per cent. from the commencement of the Company up to the present date. This was exclusive of Mauá's account, which would make the bad debts about 3-16ths per cent.; but he believed that $\frac{1}{2}$ per cent. was considered a small amount of bad debts in a company, and therefore as regarded this matter there was nothing to complain of. The coal carbonized in 1880 amounted to 1047 tons, against 891 tons in 1879; and the cost of the coals, including carbonizing, was £3817, against £3672 in 1879. In the past half year more than 13 million cubic feet of gas were made, as compared with 11,176,000 cubic feet in 1879. The illuminating power under the concession was 9 candles, but it had been kept up to 15-8 candles, and therefore the Company gave a very good proportion of lighting. The average quantity of gas made per ton of coal was 12,700 cubic feet in the past half year, against 12,500 cubic feet in the corresponding period in 1879. The loss of gas was 7 or 8 per cent., which seemed much less than that of the majority of foreign companies. He believed the usual loss of gas was 14 per cent., and in some cases it was 17 per cent., and this, so far, showed that the Company's works were in a very favourable condition. The Company received for gas sold £11,031 in the December half of 1880, as compared with £10,138 in the corresponding period of 1879, and for coke they received £968 as compared with £756. People began to find out that the value of coke was greater than they thought, and this was, of course, a very favourable feature for the Company. They had now 829 public lamps, having commenced with 500, and they expected a very large increase this year—in fact, the Provincial Assembly had authorized the President to order the erection of 200 new lamps. The President had only just been appointed, and had not yet issued the order. Still, the Company were anticipating a very large increase in the public lights, which he looked upon as most favourable, as it would cause but little additional expense. The private lighting had largely increased, it being 25 per cent. more in February, 1881, than in February, 1880. This was a very large increase in such a short period, and he supposed that it arose probably from the increase of population. The increase of population since the Company commenced, which they estimated at 15,000, had been about 30,000; and not only had the population increased, but the buildings also. The income derived from private consumption now exceeded that of public lighting by 32 per cent., whereas in 1878 the public lighting was equal to the private. If the consumption continued to develop as it did last year, when the increase was 2,189,000 cubic feet, the Company would no doubt require an extra gas-holder—probably next year or the year following—and the estimate of the cost of a gasholder, to hold about 40,000 feet, was £1000. He merely mentioned this to give the Shareholders an idea of the cost. Their affairs were progressing in a regular and satisfactory manner. The gross receipts for the half year to December last amounted to £12,205, as compared with £11,534 in the same period of 1879, being an increase of about £700, and the expenditure was £6236 against £6202, being an increase of only £34. The balance of profit and loss account was £6104. The dividend would take £3941; 20 per cent. off Mauá and Co.'s debt would absorb £101; and there would then be a balance to carry forward of £2061, against £1395 carried forward in May, 1880. The last report from San Paulo, from their Gas Engineer, said: "As usual, what with our services, meters, lamps, and works, we keep well employed in a general way; all of which I am pleased to report in excellent condition, and I look forward to this season being the heaviest for gas consumption that San Paulo has yet known." This expectation seemed amply justified by the additional public lamps mentioned.

Dr. E. BATT seconded the motion.

Mr. BLEWS thought a larger dividend might be recommended, particularly having regard to what the Chairman had said. An increase of only 100 lamps would give them sufficient to pay another $\frac{1}{4}$ per cent. dividend. He sincerely hoped that next time, with the prospects before them, they would receive $1\frac{1}{2}$ per cent. at least, and it would, of course, be much more gratifying if it were $1\frac{3}{4}$ per cent.

Mr. SAMUEL thought that $1\frac{1}{2}$ per cent. was the right figure. They would carry forward practically half the amount they distributed, and they could, therefore, positively pay 15 per cent. He would not, however, urge the division of everything; still, in a company like theirs, with

everything in order, he did not think it was necessary for them to keep much in hand. He thought another £1000 might be distributed, which would give an additional $\frac{1}{4}$ per cent. dividend for the half year.

The CHAIRMAN said that, so far as he was concerned, he acquiesced in the views of Mr. Samuel in this respect. The Shareholders in San Paulo, however, were strongly opposed to an increased dividend; and therefore the Directors thought that they had better carry forward £2000. Should circumstances again favour them, they would consider whether they would not be justified in giving an increased dividend, or a bonus, next time.

The SOLICITOR (Mr. Batten) urged any addition to be paid *quâ* dividend, and not as bonus, as in a case which came before the Master of the Rolls recently, he said his lordship ruled that money paid as bonus decreased the shares to this extent.

Mr. SAMUEL asked on what ground the San Paulo shareholders objected to receive more than 10 per cent. dividend.

The CHAIRMAN said because they thought the Government would take advantage of the favourable position of the Company, when they asked for a renewal of the concession, to place some restrictions on them. If on the next occasion of their meeting there was an opportunity of paying an increased dividend, the Directors would take the matter into consideration.

The motion was carried unanimously.

On the motion of the CHAIRMAN, seconded by Dr. BATT, a dividend for the half year at the rate of 10 per cent. was declared.

Mr. SAMUEL next moved, and Mr. BLEWS seconded, the election as a Director of Mr. E. D. Edgell, and the motion was carried unanimously.

On the motion of Colonel ROBINSON, seconded by General STRATTON, the retiring Directors were re-elected.

The CHAIRMAN having briefly acknowledged the resolution, Mr. Cash was re-appointed the Auditor of the Company.

A vote of thanks was then passed to the Chairman and Directors, and the proceedings terminated.

THE PROPOSED PURCHASE OF THE IPSWICH GAS AND WATER WORKS BY THE CORPORATION.

ABANDONMENT OF THE PROJECT.

At the Quarterly Meeting of the Ipswich Town Council last Wednesday—the MAYOR (Mr. A. Wrinch) in the chair—the Committee appointed to inquire as to the advisability of purchasing the undertakings of the Ipswich Gas and Water Companies presented the following report:—

In pursuance of a resolution passed by the Council on Feb. 4, 1880, your Committee have gone into the question of the purchase by the Council of the gas and water works.

As to the Gas-Works.

Your Committee applied to the Gas Company to know whether the Company were willing to sell their works, &c., to the Corporation, and, if so, upon what terms. The Directors of the Company, in reply, stated that they could not entertain the question until they were furnished with some definite proposal from the Council to lay before the Shareholders. Looking to the present and probable development of electric lighting, your Committee cannot recommend the Council to make any definite proposal for the purchase of these works.

As to the Water-Works.

Your Committee also applied to the Water-Works Company as to the sale of their works to the Council. The Directors of the Company replied that they were willing to recommend the Shareholders to sell their works for £106,868, in £100 debentures, bearing interest at 4 per cent. per annum, payable half yearly, to be secured on the water-works and the borough rate, the holders of the debentures not to be entitled to claim payment of the principal moneys secured thereby until after the 29th of September, 1900, the Corporation taking over the existing debenture debt of the Company of £28,001. The purchase price asked by the Company therefore amounts to £134,872.

To enable the Corporation to carry through a purchase, it will be necessary to apply to Parliament for the necessary powers, and for borrowing and other powers. Your Committee are informed that Parliament will require that the amount borrowed be repaid within a period not exceeding 60 years.

The net revenue of the Company is about sufficient to pay 4 per cent. interest on the purchase-money; but this will leave the annual instalments—about £2200—for repayment of the purchase-money to be provided for out of the borough rate at starting. The probable increase of the revenue of the works may reduce this call on the rates to some extent, but not materially for some years.

Your Committee being of opinion that it is not desirable to further increase the rates of the town, recommend the Council to decline the offer of the Company, and to abandon the idea of purchasing the works.

Mr. NICHOLSON, in moving the adoption of the report, said he fully concurred in that part of the report which had reference to the purchase of the gas-works, believing, as he did, that at no very distant date the electric light would be available, and would save the necessity of burning gas. In regard to the purchase of the water-works, when he asked for a Special Committee to take this matter into consideration, he believed it to be the feeling of many members of the Council, and of many of the inhabitants of the town, that it was desirable to acquire the property, and he had hoped the Corporation would be able to purchase it on reasonable terms. He believed that some few years since the property might have been acquired for something like £100,000, but the proposition was rejected by the Council at the time. When they had Mr. Stevenson's exhaustive report on the subject, the works were offered for £120,000, and the Council were strongly advised to purchase at £110,000, but the Committee could not see their way clear to recommend the purchase. Then came the withdrawal of the offer, and the price had now gone up to £134,000. The Committee could not see anything in the increased revenue of the Company to warrant such an increase in the price, and were compelled to say they could not recommend the purchase.

Mr. GRIMSEY seconded the motion.

Mr. W. B. JEFFRIES said he could not allow the opportunity to pass without explaining that he was more than ever of opinion that the supply of such absolute necessities as light and water should not be permitted to remain private monopolies. He regretted that he was unable to persuade the Committee to recommend the Council to apply for an Act of Parliament to give the Corporation power at any time within three years after the passing of the Act to require the Ipswich Gas and Water Companies to sell their undertakings to the Corporation for such consideration, and on such terms, as the Companies and the Corporation might agree, or in default of agreement as might be settled by arbitration under the Lands Clauses Consolidation Act. If such an Act were obtained, he did not doubt but that equitable terms could be arranged. There were 240 municipal corporations; and 196 of these were owners of gas or water works, and many possessed both. In every instance, so far as he could ascertain, large profits were made for the benefit of the ratepayers, even as much as £50,000 or £60,000 a year from gas alone. Water was one of the necessities of life, the Corporation were large consumers of it for sanitary purposes, and its supply should be under the control of the local authority. Doubtless as favourable results could be obtained at Ipswich as in other towns. He would call attention to the present market value of the shares of water-works in a few towns which had come under his notice. In Cambridge the £100 shares were worth £248; Boston, £196; Bridlington, £160; Whitby, £200; Clay Cross, £200; Folkestone, £185; Cardiff, £280; Canterbury, £160; Chatham, £180; Grantham, £230; Keswick, £182; Luton, £240; Newport, £216; Newark, £200; Sunderland, £215; York, £207; and Birmingham, £220. He was sorry the Corporation did not purchase these two undertakings years ago; if they had done so they would not only be having the public light and watering free of charge; but large profits would have

accrued, and would have gone a long way towards paying the cost of the sewerage of the town. When this question was again revived, as it assuredly would be in a few years, it would be an admitted mistake that the present Committee did not recommend the Council to purchase. The steady increase in the population of the town in the past was a proof of this, and they might anticipate that this increase would continue at the same or even a greater rate, and would therefore enhance the value of the undertaking. Timid people, no doubt, feared to embark in gas-works property because of what they called the advance in the electric light. He did not entertain such fears, believing that if some few electric lights took the place of gas the loss would be amply compensated by the extra consumption in other directions.

The motion for the adoption of the report was then put and carried by 14 votes to 3.

CARDIFF CORPORATION WATER SUPPLY.

At the Meeting of the Cardiff Town Council on Monday, the 9th inst.—the Mayor (Mr. Rees Jones) in the chair—the results of the purchase of the water undertaking were under consideration.

Alderman JONES said the Council had spent much time and labour upon the purchase of the water-works, and the Water Committee had had to work hard, for the undertaking was a very heavy one. The Council had spent £320,000 in the purchase of the works; and it was said at the time, by some, that this would involve a great loss. The purchase up to the present had not cost one penny, and there was a profit on the working of £916. The Council must not suppose that this was going to be their profit always. The first repayment—which was spread over eight years—would come on at the end of the present year, but he thought the surplus profits would be more than sufficient to meet it.

Alderman WINSTONE said if Mr. Jones's statement were correct, he should be greatly pleased; but he thought it would be necessary to have a statistical account of receipts and expenditure which would show at once who received the money, and how much the Corporation obtained by the sale of water. The Water Company were in the habit of having a statement of the kind he indicated issued every six months. The last statement issued by the Company showed that their receipts from all sources were £17,000 per annum, and the working expenses £5000. They had mortgaged the estate for £20,000, which meant another £1000 on the expenses. They had £11,000 left. The Corporation had purchased the water-works for £300,000; they had the mortgage for £20,000; and he thought, if the matter were properly investigated, that the purchase, including all law expenses, &c., would cost £350,000, which, borrowed at 4 per cent., meant a loss of £2000 or £3000 per annum.

The Mayor read the statement, which was as follows:—Maintenance, £844 9s. 8d.; pumping, £729 13s. 10d.; turncocks, &c., £876 15s. 6d.; printing, stationery, &c., £139 6s. 2d.; office expenses, £157 3s. 1d.; incidentals, £67 12s. 11d.; salaries, £847 6s. 10d.; rates and taxes, £1398 8s. 3d.; rent, £50; interest on loan, £13,331 16s. 8d.; total, £18,443 1s. 1d.; balance, £916 11s. 7d.; total, £19,359 12s. 8d. On the other side appeared the following items:—Water and meter-rent, after deducting irrecoverables, £19,269 12s. 8d.; rent of Ely and Llanishen mills, £90; total, £19,359 12s. 8d.; balance profit on working, £916 11s. 7d. During the year there was expended on pipes, £1204 19s. 6d.; meters, £52 8s. 4d.; sewage-pipes, £519 16s. 8d.; total, £1877 14s. 6d.

Alderman WINSTONE asked how they were to get £14,000 out of £11,000, the sum made by the old Company. He moved, and it was agreed, that an account should be presented every six months.

CORK GAS CONSUMERS' COMPANY.

There has just been printed and issued, by order of the Cork Town Council, a report by their Auditor (Mr. M. P. Buckley) on the accounts of the above-named Company for the half year ended Dec. 31, 1880. As we were not able to find space for the report of the Company's meeting at the time it was held, some particulars of their working may now be given.

Capital account shows £140,477 paid up on shares, and £16,700 of loans; the balance in hand being £4685. The expenditure during the six months was £998. The amount remaining to be paid up and issued is £30,323—viz., £9523 of shares, and £20,800 of loans.

The surplus assets of the Company consist of the depreciation fund of £2280, the insurance fund of £1800, and the reserve fund of £13,556.

The weekly comparison of coal carbonized and gas made, during the period from July to December last, gives the following figures as totals. There were 86 tons of cannel, at an average price of 24s. per ton, used; 9665 tons 7 cwt. of Newcastle coal, at 13s. 1½d.; and 825 tons 13 cwt. of Welsh small, at 10s. 10d.—in all, 10,577 tons, at an average price of 13s. 0½d. per ton. From this there were made 100,623,000 cubic feet of gas, or a production of 9513 feet per ton. The unaccounted-for gas is said to have been 15·52 per cent.; so that the sale of gas per ton was 8027 feet. The capital employed works out to £14 17s. 2½d. per ton of coal carbonized, and £1 17s. 0½d. per 1000 feet of gas sold.

In regard to the analysis of the revenue account, we may extract the following:—

		Per 1000 Feet of Gas sold.	Per Ton of Coal carbonized.
Coal cost	£6,893 6 3	19 48	13 0·41
Residuals realized	5,443 11 8	15 38	10 3·51
Net for coal	£1,449 14 7	4 10	2 8·90
Working expenses	9,542 5 8	26 91	18 0·27
Gas sold	£10,992 0 3	31 01	20 9·17
	17,910 3 8	50 62	33 10·39
Profit	£6,918 3 5	19 61	13 1·22
Add sundry receipts . . .	243 3 8	0 68	0 5·51
Dividends, &c.	£7,161 7 1	20 29	13 6·73
	5,958 1 6	16 84	11 3·19
Surplus profit	£1,203 5 7	3 45	2 3·54

The surplus profit was appropriated—£200 to parliamentary expenses, £400 to the depreciation fund, and £603 5s. 7d. to the reserve fund.

The gross receipts for the half year amounted to £23,596 19s., as compared with £24,681 10s. 2d. for the corresponding period of 1879; being a decrease of £1084 11s. 2d.; arising from a reduction, since Midsummer, of 4d. per 1000 cubic feet in the price of gas. The gross expenses, including coal, amounted to £16,435 11s. 11d., as compared with £16,357 8s. 9d.; being an increase of £78 3s. 2d. An additional sum of £132 17s. 1d. was expended on depreciation, as compared with £362 7s. 6d. for the corresponding period. The net result was a profit balance of £7161 7s. 1d., as compared with a balance of £8324 1s. 5d. for the corresponding period of 1879.

Mr. Buckley, on a review of the figures, comes to the conclusion that the Company could afford to sell gas at 8s. 11d. per 1000 cubic feet, but are not bound to do so until the reserve fund has reached the prescribed limit of £18,750. Although in his previous reports he advocated a reduction in

the price of gas, now, on more mature deliberation, he says he is of opinion that it would be more advantageous to the Corporation and the general consumers to wait until the Company have completed their reserve fund, which at the present rate of profits must be very soon. Then the consumers will be legally entitled to all the surplus profits, combined with the interest accruing on the reserve fund.

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

April 25, 1881.

For the first time in the history of the street lighting of New York City, an Electric Light Company has entered into competition with the Gas Companies to obtain a share of this work. The bids for lighting the city for the ensuing year commencing May 1, were opened by the Gas Commission on the 30th ult. The proposals put in by the Manhattan, New York, and Mutual Gas Companies were 18 dols. (£3 12s.) per lamp per annum; the Metropolitan Company's figure was 18·25 dols. (£3 13s.), the Municipal Company's 20 dols. (£4), while the figures of the suburban companies ranged from 19·50 dols. (£3 18s.) to 38 dols. (£7 12s.). The Brush Electric Lighting Company put in two bids—one for the lighting of a considerable portion of the city for 32,000 dols. (£6400); the other for a smaller district for 7400 dols. (£1480). The price asked by the Gas Companies is—for the large Companies supplying gas in the most densely populated portion of the city, 3 dols. (12s.) more than that of last year. This was not a surprise, the Companies having previously intimated that they could not continue to do the lighting at last year's figure—namely, 15 dols. (£3)—as there had been an advance in almost all the items of gas manufacturing account. Even at this figure the price is very reasonable, as it includes lighting, extinguishing, and cleaning lamps. The number of lighting hours in the year is 4000, the burners passing 4 feet of gas per hour. Thus, allowing that it costs the Companies 4 dols. (16s.) per lamp per year for supervision, it is clear that for the gas supplied to the city the Companies only receive about 88 cents (3s. 5½d.) per 1000 feet. When it is borne in mind that the retail price is 2·25 dols. (9s.) per 1000 feet, the lowness of the charge must be at once conceded. These figures refer to those Companies which propose to do the lighting for 18 dols. (£3 12s.) a year. The contracts have not yet been awarded. Turning to the offers of the Brush Company, one point attracts attention at once—viz., that the price at which they propose to light the large district is relatively greater than that for the smaller section. The former bid covers the lighting of Broadway from the lower end—"The Battery"—to Forty-fifth Street, part of Fifth Avenue, and adjacent streets and avenues; in all, a district now lighted by 1700 gas-lamps, which, if this offer were accepted, would be superseded by 340 electric lights of 2000-candle power, so called.

The relative cost of the gas and electric lighting of this district would be: Electricity, 32,000 dols. (£6400); gas—1700 lamps, at 18 dols. each—30,600 dols. (£6120). The price of each electric light would be 94·12 dols. (£18 16s. 6d.). The smaller proposal was for a section of the district covered by the larger bid. The acceptance of this would result in the displacement of 500 gas-lamps by about 100 electric lights. The relative cost of gas and electricity in this section would be: Electricity, 7400 dols. (£1480); gas—500 lamps, at 18 dols. each—9000 dols. (£1800). The price of each electric lamp in this case would be 74 dols. (£14 16s.). Thus for the large district electric lighting would cost more than gas; while for the smaller section the conditions would be reversed. But the apparent discrepancy between the two bids from the one Company is hardly noticed, the price in either case is so much below what the electric light is supposed to cost the Company producing it. Taking the case of the larger bid, it figures out to 2·4 cents (1¼d.) per lamp per hour, or for the 340 lamps, 8·16 dols. (£1 12s. 8d.), being about 90 dols. (£18) per night for the entire number. It is not too bold a statement to say that an electric light company cannot afford to supply light at such a figure—that they will not get their money back if they do so. Moreover the price is not one-half of that charged by the Company supplying the same lights in London, where, as fuel and labour are much cheaper, the difference would naturally be in the other direction.

The *American Gaslight Journal*, commenting on this subject, remarks that in a pamphlet on the "Electric Light for Industrial Uses," by Mr. Crompton, the cost of the carbons for the arc light is given as ranging from 11 cents (5½d.) to 4 cents (2d.) per hour, the average being 6·4 cents (3¼d.). The article continues: "Now, taking the lowest estimate for cost of carbons at 4 cents per hour, and applying it to the New York proposal, we have 4000 x 4 = 160 dols. as the annual cost for carbons for each lamp, or the above cost of the carbons for 340 electric lights per annum is 54,400 dols." Thus it is apparent why the proposal is regarded as extraordinary, for the carbon is but one of the items which go to make up the total cost of an electric lamp. Many of the New York daily journals take a similar view of the question, remarking that the price is low, but further contending that the relative cheapness of electricity and gas for lighting purposes is not proved until it is practically demonstrated that the electric light companies can light the streets at this figure, and at the same time make a profit on it. On the other hand, some papers consider that the use of gas for street lighting is as good as superseded, and in support of their views go into a labyrinth of figures, taking as a basis that each Brush lamp gives a light of 2000 candles; hence, as the cost of gas and electricity is about the same in these bids, the light obtained by the expenditure of a given sum of money would be about 280 times more in the use of electricity than in that of gas. But this we know to be all "bosh," and I greatly doubt if the light reaching the pavement at a distance of 15 feet from the foot of the post—the most favourable point—would equal 500 candles.

In this connection Professor Morton, in the course of some "Notes on the Electric Light," published in the *Sanitary Engineer* of April 15, called attention to this discrepancy. He remarked that the lamps are said to be 2000-candle power, "French measurement." On inquiry, he learned that the meaning of this term is that the actual light is multiplied by four—that is, an electric light of 500-candle power emits this amount of light in four directions; hence its total power is 2000 candles. If this be the correct definition of the term, gas engineers had better commence at once to reckon the power of their gas by French measurement; for by this means, having a light of given power, we can increase its power *ad libitum* by dividing a circle into 360°, then by divisions into minutes and seconds, and subdividing the latter, we can obtain a light of a power limited only by our mathematical ability; for certainly, if it be correct to figure the light as the total being given out in four directions, the principle can be extended to any limit. But let the candle powers of the electric and gas lights be what they may, let them bear any proportions to each other they may, it comes back to this question: Is electricity better suited for street lighting than gas? And it is to be borne in mind that gas is the present occupant of the field. If gas is to be superseded by electricity or any other illuminant for the lighting of thoroughfares, it must be demonstrated that the new illuminator, be it what it may, is superior to gas. In the present case it must be shown that electricity is not only equal to gas,

but better for the purpose designated; otherwise it would be unreasonable to make a change.

Regarding the experiment being tried on Broadway, New York, where a mile of the street is lighted by 23 Brush lamps, as a fair example of an electric-lighted street, I am not willing to accept the foregoing proposition as proved. That the corners where the posts are set are well lighted cannot be disputed, and, on the other hand, it is equally true that the parts of the street midway between the lamps are comparatively dark. It is the rapid transition from a brilliantly lighted spot to one of semi-darkness which renders an electric-lighted street a pleasing spectacle to view from a distance, but an unpleasant one to traverse. In fact, there are three variations in these Broadway lights—first, that occasioned by the impurity in the carbon rods; second, that simultaneous depression of all the lights, caused apparently by fluctuations in the electric circuit; third, the variation before mentioned—the want of sufficient diffusive power. In regard to the first, it must be admitted that there is but little variation from this cause in comparison with other electric lamps I have seen. The second one noted is of a more serious character, as there are frequently depressions of the lights, both of considerable extent and of comparatively long duration; sometimes lasting for several minutes, when they will again start up and for a while emit a brilliant light. Thirdly, passing alternately from a brilliantly lighted portion of the street to one of semi-darkness is exceedingly trying. This variation is hardly perceptible in the early evening, when all the shop windows are aglow with gas-lights, and each storekeeper tries to outdo his neighbour in illumination; but later in the night, when the stores are closed, the dark spots become unpleasantly noticeable. Thus, while admitting that electricity is a brilliant illuminator, I contend that its superiority to gas for street lighting is not by any means proved. As has been remarked so often, illumination is one thing, lighting is another. Doubtless the most agreeable exhibition of electric lighting to be seen in New York City is that at Hazard and Co.'s Apothecary, under the Fifth Avenue Hotel. This is a spacious store, and is illuminated by means of a large number of Maxim's lamps. The light emitted by these is soft and mellow, and the effect very pleasing. I have heard vague rumours, however, that their maintenance is attended with heavy expenses, not only for motive power, but also on account of the short life of the lamp.

The Edison Company is now settled in its new quarters, No. 65, Fifth Avenue, where the spacious building is lighted by the lamps invented by the head of the Company; but the effect of these lights is hardly equal to that obtained by the Maxim lamps. During the latter part of March, the Board of Aldermen of New York City passed a resolution granting permission to the Edison Company to lay wires, tubes, and conductors, and to erect posts in the streets and avenues of the city, for the purpose of conveying electricity for illumination. The conditions of the grant were that the streets should be restored to their former condition after laying such wires, and that the Company should pay to the City, in consideration of the privilege granted, the sum of 1 cent per lineal foot for all wires or tubes laid under the authority of the said grant. This resolution of the Board was vetoed by the Mayor, who gave as his reason for so doing that the amount named—1 cent per lineal foot to be paid to the City—was too small; also that there was no provision made for collecting even this small amount. So the case stands for the present, the Company promising that as soon as permission is given to use the streets of the city for the purpose asked, a station will be immediately established, and the superiority of electricity over gas be practically demonstrated.

At present the advocates of the "artificial daylight" scheme are devoting their attention to Ottawa, Canada, trying to get their system adopted there. The proposition is to erect a circuit of ten towers in the city, surmounting each with a number of large electric lights; the power of the grand total being equal to 700,000 gas-burners. It is claimed that this will illuminate both the streets and houses. I have noticed schemes of this kind before, so it is unnecessary to particularize more at present. If the plan be carried out I will refer to it again. The *Scientific American* is the authority for the statement that a part of Akron, Ohio, is lighted by two groups of electric lights—one on top of a tower 208 feet above the street, the other on a wooden mast from the top of the Observatory tower, about 40 feet higher than the tower group. Each group consists of four lamps of 4000-candle power each.

EXTENSION OF THE READING GAS-WORKS.

As briefly noticed in last week's JOURNAL, the first portion of some important extensions of the Reading Gas-Works—amounting almost to an entire re-construction—was commenced on Tuesday, the 3rd inst., with the laying of the foundation brick of a large gasholder-tank.

In May be remembered that last year the Company obtained an Act of Parliament by which they were authorized to raise further capital and construct additional works, and shortly after acquired possession of 13 or 14 acres of land, having almost unequalled advantages for the erection of new gas-works. It will have a junction with three railways, and touches two rivers, while it is in a part of the town where any nuisance that might occasionally arise would be least felt. The railways will be the inlet for the coal; and the rivers the outlet for the residual products. The site of the new works, being naturally subject to flood, is now being raised about 3 ft. 6 in. by ballast dredged from the Thames and Kennet, by a large steam dredger and a fleet of hand-dredging boats. It is approached by a road 35 feet wide, passing through the present works, and crossing the Kennet by what will be, when finished, a handsome iron girder-bridge, in one span, the piers of which at each end will be decorated with the borough arms (also the arms of the Company), surrounded by the words "Reading Gas Company" on a scroll. The holder to be erected is designed to contain about 760,000 cubic feet of gas, and will be telescopic, with three lifts. The columns, 18 in number, will be about 70 feet high, and 3 feet in diameter, with wrought-iron lattice girders between, and each standing on an entablature base 4 feet square and 7 ft. 6 in. high. On the panel of each of the entablatures at the base of the columns will be the letters "R. G. C." in monogram. The tank for the holder will be 135 feet in diameter, and 20 feet deep; the holder itself rising 66 ft. 5 in. The gas will be conveyed from the holder, crossing the river by the bridge, by two mains 24 inches in diameter, to the town, and the pipes will be connected with the entire system of mains. The whole of these important works have been designed by Mr. Edward Baker, the Engineer to the Company, and are being carried out under his supervision by Messrs. John Aird and Sons. The work is under contract to be finished by the 15th of October. A line of railway has been laid direct on to the site from all three of the Railway Companies' systems. It has been found necessary to go so deep below the level of the river bed to get the foundations—in fact, right into the Thames springs—that pumping to an extraordinary extent has been involved; and there are now employed six powerful steam-pumps, two of which are 24 inches in diameter, driven by various engines up to 25-horse power, and which are pumping at the rate of over 4 million gallons every 24 hours.

There were a considerable number of gentlemen present at the inaugural ceremony, among them being J. O. Taylor, Esq., J.P. (Chairman of the Company), the Directors, and other officials.

The ceremony of laying the first brick having been performed, with

the customary formalities, by Mr. TAYLOR, he briefly addressed the company. Some six or seven weeks ago, he said, the whole area of land on which the new gasholder and the other works were to be erected was covered with water; and he wished to say that the progress that had been made was mainly owing to the staff of Messrs. Aird and Sons, who had taken the greatest pains with the work. The Directors of the Company greatly appreciated the attention the contractors had given to the work, and the exertions they had made in carrying it out. The new holder was particularly interesting to the inhabitants of Reading, because, when coupled with the other evidence they had, it testified to the rapid growth of the town. The recent census had shown that the population had increased to the extent of 10,000 in ten years; and ten years ago—about the same period of the year—the Gas Company laid the first brick of a new tank and holder. They then thought that in constructing a holder capable of containing some 350,000 cubic feet of gas, they were undertaking a work which would meet all demands for at least more than ten years; but so rapid had been the growth of the town, and even so much more rapid the increase in the consumption of gas, that the necessity had now arisen for erecting a holder capable of containing something like 750,000 cubic feet. Singularly enough, 20 years ago the Company found themselves erecting a holder of one-half the capacity of that built in 1871. It would be seen from the fact that they were undertaking these new works, that they were not afraid of competition in the shape of the electric or any other light interfering with the progress the Company had made in the last 20 years. Some ten years ago they were supplying to the town about 80 million cubic feet of gas yearly; now they were supplying something like 170 millions; and calculations had been made that, unless the electric light interfered with them very materially, the Company would in ten years' time have to supply double the latter amount, or 340 million cubic feet. It was somewhat singular that the increase in the consumption of gas had been very nearly in the same ratio ever since 1860, and that the experience of the present Directors had been such as to guide them in providing extra works and extra power from time to time, so as exactly to meet the growing demand. Not only had the consumption increased, but the price had greatly diminished. Twenty years ago the Company charged 5s. per 1000 cubic feet for their gas. At the present time they were supplying it at 3s. 3d. per 1000 feet; and without making any promises or holding out any very strong hope at present, he thought the Directors might fairly entertain the idea that before very long they would see their way to some further reduction even from the present price. There was no doubt that the electric light would to some extent come into use; but he might remind those interested in gas manufacture that whilst this light might be more employed for illumination, gas had been brought into use during the last ten years for heating and other purposes, which greatly increased the quantity consumed. They might fairly say that some 40 or 50 million cubic feet of gas were used yearly in Reading for heating purposes, and this branch of the business of the Company was growing, so that even supposing the electric light did supersede gas for some purposes, there was no doubt that what was lost in the one direction would be recouped in the other. The contractors had, under inauspicious circumstances, made very considerable progress with the work up to the present time; and he hoped this progress would be continued in a manner satisfactory both to them and the Directors, and that the new works would, for many years, provide gas for the inhabitants of Reading. It was a great pleasure to him to be surrounded by several old colleagues who were present at a similar ceremony ten years ago; and he trusted the further experience they had gained during the past decade might be used for a long time to come in the interest of the Company and of the town of Reading. No one could appreciate more than he did the ability, the application, and the long-continued exertions of Mr. Baker, the able Engineer of the Company. Mr. Baker had been an excellent Engineer in the ordinary way, but in the extraordinary work which had been carried out during the 15 years he had been connected with the Company, the Directors had with perfect confidence felt themselves safe in his hands, and had entirely relied on him to supervise and direct in every respect these works. He wished to express his sincere feeling that Mr. Baker had in all respects done his duty both to the Company and also in the interests of the town of Reading.

Mr. COOPER (the Vice-Chairman) added his testimony to the services rendered to the Company by their Engineer; as did also Mr. JOHN ARD.

Mr. BAKER having briefly expressed his thanks for the kind expressions used towards himself,

The TOWN CLERK (Mr. H. Day) said he should not like to leave without saying how much the town was indebted to the Directors of the Company for the great work they were embarking upon. Mr. Taylor's remarks had naturally been chiefly directed to the interests of the Company, but he (Mr. Day) wished to add that not only had the gas supply of Reading been admirably attended to by the Company, but that with regard to gas legislation in general the borough had, ever since 1862, taken the lead, especially with reference to the protection of the public. The town might well feel, as to the Company's original Act of 1862, to their Act of ten years ago, and to their recent Act, that it was perfectly safe in the hands of the Company, watched as they were with deep interest—as it was their duty to do—by the Corporation, who were the guardians of the public welfare.

The proceedings then terminated.

EXTENSIONS AT DUNEDIN (NEW ZEALAND) GAS-WORKS.

Considerable alterations have recently been made at the Dunedin Corporation Gas-Works, under the control of Mr. E. Genever, who has personally superintended the arrangements for carrying out the plans he prepared for the purpose.

Among the extensions carried out is the erection of a single-lift holder of 200,000 cubic feet capacity, supplied by the Horseley Company, Limited, of Tipton, at a cost £4450; the total outlay for the holder and tank being between £7000 and £8000. The dimensions are 102 feet diameter and 25 feet deep; and the storage capacity at the works will thus be just doubled. The new retort-house is to have a three-span roof, one span of 66 feet being devoted to the special work of the house, and two spans of 33 feet each being used as coal-sheds. The retorts for this house are to be through retorts, 20 feet in length, set six in a bed, and fitted throughout with White's patent valves. Lines of rails run through the coal-sheds on either side of the retorts, so that the coal-trucks may be brought direct from the ships to the fronts of the retorts. The existing retort-house is full of retorts—68 altogether—and it is expected that they will be sufficient to meet the demand during the ensuing winter. The new retort-house is so designed that ample room will be left for extension; and if necessary 2 million cubic feet of gas can eventually be made daily. Among the new plant is a set of Walker's patent annular condensers, consisting of five columns, each of them being 30 feet high and 3 ft. 6 in. in outer diameter. These provide for condensation to the extent of nearly 600,000 cubic feet of gas per day, and they can be extended column after column according to the requirements of the works. The screens can be regulated, according to the manufacture of the gas, up to the rate of 600,000 cubic feet daily. The engine-house is a room about 40 feet square, well lighted

and thoroughly ventilated. It contains two 6-horse beam engines; a Pelouze and Audouin's condenser; and two exhausters, working respectively at the rates of 30,000 and 20,000 cubic feet per hour. Each exhauster has its patent compensator for regulating the suction on the hydraulic main. Every part of the machinery here is in duplicate, so that if any accident happen to one set, Mr. Genever can put on the other machinery in a few moments. The new purifying-house is 120 feet by 35 feet, providing accommodation for four purifiers, each 20 feet square by 5 feet in depth, and giving purifying power for 500,000 cubic feet of gas daily. Including carriage to Dunedin, the purifiers will cost about £2400. The new station-meter has been supplied by Messrs. J. and J. Braddock, of Oldham. Its capacity is over 30,000 cubic feet per hour, while the meter now used registers not more than 10,000 cubic feet per hour. The station-meter connections are 18 inches in diameter. The station-meter cost about £600, and the new building to contain it will probably cost £350. The present station-meter house will be converted into a meter and gas-fitting store—a room greatly needed.

The present consumption of gas in Dunedin is about 150,000 cubic feet nightly; and during the ensuing winter it will probably reach 300,000 cubic feet. The gas now supplied is 18-candle. Greymouth coal is principally used, the average consumption being 100 tons per week. During a recent fortnight only 22 cwt. of Newcastle coal were consumed at the works. "With all the new appliances, Mr. Genever expects," a local paper says, "to use New Zealand coal exclusively next year, and this means the keeping of £15,000 a year in the colony."

LOCAL AUTHORITIES' OPPOSITION TO GAS AND WATER COMPANIES' BILLS.

The following is a copy of a letter addressed by Mr. William Livesey to Mr. H. G. Calcraft, Assistant Secretary of the Railway Department of the Board of Trade, and referred to by Mr. Chamberlain in the course of the debate in the House of Commons last Tuesday, on Mr. Stanhope's proposal for a new Standing Order:—

Gas Companies' Association,
6, Victoria Street, Westminster, S.W.

"New Standing Order to be moved by Mr. Stanhope, on Tuesday, May 10."

Sir,—As it seems to me that the bearing of this question is but imperfectly understood, I take the liberty of sending you a few observations respecting it before it comes on for discussion.

In the first instance it was pressed forward because there was a *locus standi* case waiting the decision of the Referees, and they were unwilling to decide it until the House had expressed an opinion upon the proposed new Order; but to save any trouble on that head, the promoters (the South Metropolitan Gas Company) have withdrawn their objections, so that the necessity for an immediate settlement does not now exist.

I have been engaged in parliamentary matters more than 30 years, and as Secretary to this Association more than 12 years, and, so far as my knowledge extends, the rule has always been that when a company applies for power to raise additional capital, the local authority is entitled to inquire into all its powers; but in other cases only into the matters referred to in the Bill, although this latter part has not always been strictly adhered to. I believe, notwithstanding the recent decisions as to the *locus standi* of local authorities, this is the general understanding of the provincial companies at the present time, and that there is no desire on their part to alter it. If, however, the decisions are upheld, the companies will, of course, take every opportunity of turning them to account.

When application is to be made for additional capital, the first proceeding is for both promoters and opponents to retain the services of several scientific witnesses to go into the whole matter, and both parties make every possible arrangement for having a long parliamentary fight. These contests are always very expensive, but, as they are charged to capital, the amount with companies having large capitals is inappreciable, but with companies having only small capitals they are at times very oppressive, and a serious addition to the capital—as much, in some cases, as 5 per cent., or even more; and the fear of these contests deters many small companies from applying for Provisional Orders. Nevertheless the companies fully recognize the principle that if they are to be secured a monopoly on certain conditions, they must be prepared on certain occasions to satisfy the public that these conditions have all been duly complied with. Hitherto this has been done (as stated before) when a company applied for further capital. But the decisions before referred to would, in effect, prevent this ever being done at all, whilst the proposed new Standing Order would authorize its being done on every occasion; and as the expense on both sides must, in the end, come out of the pockets of the public, the Order would be as much against the public, in one way, as the decisions are in the other.

The amendment for which notice has been given to limit the objections to the provisions of the Bill might suit the companies; but it is impossible to overlook the fact that it would make the case for the public worse than the decisions. As for instance: If a company exhausts its capital or uses all its land, it is obliged to come to Parliament for further powers; but it is hardly possible to conceive a case in which a company would of necessity be obliged to come to Parliament for an alteration of the price they are charging, or the illuminating power of the gas they are supplying, and under the proposed amendment, so long as these points were carefully excluded from the Bill, the public would not be entitled to inquire into them.

The proper remedy for this (if you will pardon me for saying so) would be not to allow local authorities to be heard in Parliament against Provisional Orders, but to confine their opposition to the Board of Trade; to give them *locus standi* without question against all Bills, but to provide that when the application is for further capital they shall be entitled to go fully into all the company's powers, and, if necessary, impose fresh conditions, but when it is only for other objects that they shall only be allowed to go into those objects.

On the first introduction of gas, the companies were allowed to erect works wherever they could find a proper site; then they were prohibited from erecting works within 300 yards of any dwelling-house, without the consent in writing of the owners, lessees, and occupiers thereof; and now they are prohibited from erecting works except on sites authorized by their special Acts. Consequently they are now obliged to come to Parliament more frequently than they formerly were; and to authorize these expensive contests on every occasion, as the Order proposes, would be as injurious to the public as to the companies, and especially in small places.

With regard to the Metropolis, there were formerly thirteen gas companies under the Metropolis Gas Act, 1860, all charging different prices, and hence the local authorities of each district were allowed to oppose as well as the Metropolitan Board of Works; but now there are only four companies, and even this number may be reduced very shortly, and two of these supply very nearly the whole Metropolis—one on the north and one on the south. The one on the north has twenty local authorities within its district, besides the Corporation and Metropolitan Board of Works, and the other has eight local authorities and the Metropolitan Board; and, according to the terms of the Order, all these would be

entitled to oppose separately every application, and to go into all a company's powers. There might be one or two local authorities in one company's district that were desirous of opposing, while all the others were not so; but still these two would have the power, under this proposed Order, to oppose separately, and might take one view of the case, while the Metropolitan Board took another. As the price, illuminating power, purity, and all other matters affecting the supply, are uniform throughout each company's district, it is obvious that the local authorities cannot have any special interest, and ought not to be heard, but the opposition confined to the Metropolitan Board. Any amendment of the Standing Orders ought to provide a remedy for this as well as the other points.

How far the recent regulations in gas matters, of selling shares by auction and the sliding scale of dividend, may render any alteration of the Standing Orders necessary, is altogether another question, and I only speak of it here to show that any alteration will require to be very carefully considered, or there will be further trouble respecting it.

(Signed) W. LIVESEY, Secretary.

THE BANKRUPTCY BILL AND GAS AND WATER RATES.

DEPUTATION TO MR. CHAMBERLAIN.

Last Tuesday, a small deputation, inaugurated by the Town Clerk of Blackburn (Mr. W. E. L. Gaine), waited upon the President of the Board of Trade in reference to section 63 of the Bankruptcy Bill of which the right honourable gentleman has charge in the House of Commons. This section provides that "a landlord shall not, after a person has been adjudicated bankrupt, distrain or proceed with a distress for rent due from him before the adjudication." By many private Acts of Parliament owners of both gas and water undertakings are empowered to distrain for gas and water rates in the same manner as landlords may for rents in arrear on common demise; and by section 34 of the Bankruptcy Act, 1869, a landlord may distrain after adjudication for one year's rent accrued due prior to adjudication. The effect of section 63 of the above-named Bill, therefore, is to place such corporations and companies, in case of a consumer failing, on the same footing in respect of water and gas rents as ordinary creditors.

Mr. GAINE stated the case of the deputation, urging that as gas and water might now be regarded as necessities of life, those bodies who had the supply of these commodities should have a prior claim over other creditors in case of the bankruptcy of any person taking a portion of such supply. He therefore submitted that the provisions of section 34 of the Act of 1869 should be continued.

Mr. CHAMBERLAIN, in reply, said it was thought right to limit somewhat the privileges hitherto enjoyed by landlords preferentially over other creditors, and he asked why should gas and water supplying corporations be treated better than landlords and better than other creditors. Corporations were in a better position than other creditors, as their interest was not so personal and direct. They were more wealthy probably than any individual creditor, and better able, therefore, to submit to a loss. He felt it would be difficult to justify in the House of Commons proposals to restrict the rights of landlords, and at the same time to preserve the rights of corporations. If corporations became trading bodies, they should accept all the incidents of the position. He would not give the deputation a positive reply then; but would gladly consider anything that could be said in committee in reference to their point.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, May 14, 1881.

Tar, 38s. to 40s. per ton at works.
Ammonia liquor (sp. gr. 1.03), 24s. per ton.
" sulphate (white), £20 5s. per ton.
" " (good grey), £19 10s. to £19 15s. per ton.
" muriate (brown), about £26 per ton.
Muriatic acid, £1 5s. to £1 10s. per ton delivered.
Sulphuric acid (brown vitriol), £2 17s. per ton.
Tar Products.—Anthracene, nominal, lower.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

In referring, in the last issue of the JOURNAL, to the proposal to experiment with the electric light in Edinburgh, I was led to make some general statements as to the causes which sometimes influenced candidates in seeking a place at the Council Board. Men are not always prompted by an unselfish desire to serve their fellow-townsmen, but at the same time it is seldom, in this country at any rate, that we hear of municipal dignitaries leaguely themselves together, and, taking advantage of the position which their election has conferred on them, forming a "ring" to forward their own interests. Now, I am not in the secrets of the gods, nor do I pretend to a knowledge of the unknown; but I have lately had hints which indicate rather pointedly the existence of a plot. For reasons which are well known to every lawyer, I shall not at the present moment mention names; but I may, in a word or two, state how the matter stands. Quite recently there was remitted to the Cleaning and Lighting Committee of the Edinburgh Town Council, for consideration, a motion, the purport of which was to report whether it was advisable to make certain experiments with the electric light. I confess I was somewhat astonished at such a motion being made, especially at this season of the year, when nature supplies all the light which one can desire, and I came to the conclusion that an unseen agency was at work. I was all the more led to this conclusion from the fact that on a former occasion, now some two years ago, when an effort was made to excite interest in the electric light, it turned out that a firm of lawyers, thinking they saw in this light a ready means of inducing people to speculate, created some local agitation; but all of a sudden the agitation collapsed. When this second attempt was made to foist the light upon the public, I began to look for a motive, and I think I have discovered one. It appears, if my informant is correct, that two Edinburgh Town Councillors are prominent members of a new electric light company which is not yet publicly launched, but which I make little doubt will be expected to do great things for the "Grey Metropolis of the North." There is no necessity to draw inferences, as the plain bearing of the fact is too obvious.

Most of the Scotch readers of the JOURNAL will learn with regret that Mr. Andrew Scott, Manager of the gas-works at Musselburgh, has sent in his resignation to his Board of Directors, and that he is about to retire from the active duties of his profession. Mr. Scott is amongst the oldest of the gas managers of Scotland, and when I say that he has gained the esteem and respect of a large circle, both within and without his own particular profession, I but feebly express the feeling entertained towards him. For 36 years he has made gas for the supply of Musselburgh and Portobello. In the year 1845 the annual make in Musselburgh was something like 4 million cubic feet, and the gas was stored in a holder enclosed in a substantial round building of stone. The iron tank for the holder was entirely above ground, and as the holder itself was, and is—for it exists to this very day—suspended from a chain attached to the centre, with a counter-weight,

it will be easily understood that it was peculiarly liable to capsize. In February, 1845, this actually happened, and Mr. Scott, then in the employ of a firm of engineers at Dalkeith, and who, under the direction of the late Mr. David Hunter, of the Phoenix Gas-Works, London, had erected several gas-works, was sent to Musselburgh to put the holder right. On his advice the repairs were allowed to stand till the summer. Meanwhile, the holder could be used to a certain extent. Before the summer arrived Mr. Scott had received the appointment of Manager. Among the first difficulties with which he had to cope was to supply the town with gas without the use of a holder, and with only three retorts at his command. This he did successfully. Mr. Scott's career at Musselburgh has been one of continued prosperity. His annual make has increased from 4 million to 20 million cubic feet. Including the old holder, which has a capacity of 10,000 cubic feet, and one at Portobello, he has now storage for 94,000 cubic feet of gas. When he entered into the employment of the Company the price was 7s. 4d. per 1000 feet, but it is now reduced to 4s. 7d. per 1000 feet. It may be mentioned that Mr. Scott is a firm believer in vertical retorts for gas making, and that he has worked them successfully at Musselburgh. The difficulty he experienced, however, was that of getting men to keep up the charging. After 36 years' arduous labours, and at the advanced age of 78, Mr. Scott retires into private life, followed by the good wishes of the entire profession.

Mr. Scott is not to be succeeded, as many people naturally supposed, by his son, who has long acted as his assistant, but by Mr. Hugh McGillivray, at present Manager at Penicuik. This gentleman enters upon his duties at a time when a dispute has arisen between the Town Council and the Gas Company respecting the charge for street lighting. The Company claim £185 15s. 4d., and at a meeting of the Council on Monday last, Bailie Riddoch reported that an offer of £117 had been made for the gas supplied as per town meter, but that the Company had refused this, and had intimated their intention of raising an action for the amount of their original claim. On the suggestion of the Provost, it was agreed to refer the matter to arbitration. Thereafter a motion, proposed by Bailie Riddoch, to the effect that three months' notice be given to the Gas Company to terminate the present agreement for lighting the streets, was carried. The Bailie further said that as the Company had now arranged to charge per meter instead of per lamp, the Council would be justified in protecting themselves by charging way-leave for the use of the public streets. A report on the subject has been ordered.

Before the second report of the Glasgow Jurors on gas-meters, governors, &c., passes into oblivion, I should like to direct attention to a point which some people may regard as of minor importance, but which involves a principle that ought not to be lost sight of when exactness is the end aimed at. In their report the Jurors say: "Each meter was tested for accuracy of registration," and then they give in detail the sizes of the burners, and the pressures. A little further down they state: "In the table the sign + indicates that the meter is fast; - slow; and 0 correct; + 2 means 2 per cent. fast—that is, the meter passed 102 feet for every 100 feet registered by the index; - 1 means 1 per cent. slow, or 99 cubic feet passed for every 100 feet registered." Now, it is with reference to the terms "fast" and "slow" that I should like to direct attention. According to the ordinary acceptation of the term, fast means "quick in motion, swift, rapid," and one would therefore expect that in tests for "accuracy of registration" it would only be when the register or index of the meter indicated a greater quantity passed than was actually the case, that the term "fast" could be applied to it. No doubt, it will be said that the meter was fast so far as any gas company was concerned; but the tests were not made from a company's point of view, but from a scientific point of view. The Jurors were testing for accuracy of registration, and if there was an absence of accuracy this ought to have been denoted by an exact term. I am prepared to maintain that when a meter allows 102 cubic feet to pass and only records 100, such meter is 2 per cent. slow, because, as must be obvious enough, the index is to that extent in arrear of the gas which has been measured out. If I am right in this contention, the converse of the proposition must be true—namely, that where a meter records 100 feet, when only 99 feet have been allowed to pass, such meter is 1 per cent. fast, for the registration is 1 per cent. ahead of the actual quantity of gas consumed. It will thus be seen that, in order to form a proper estimate of the value of the tests of the Jurors, all the "fasts" must be read as "slows," and *vice versa*. It might be too much to expect that the Jurors should recall their second report, and issue a third corrected one; but I think it is right to point out the fallacy of characterizing a meter which is really slow as fast, and one which is fast as slow.

The annual meeting of the Innerleithen Gaslight Company was held on Thursday last week—Mr. James Dalziel, Chairman of the Directors, presiding. The Directors' report for the past year, with the statement of accounts and balance-sheet, were read by Mr. Young (the Secretary), and adopted. After making allowance for depreciation, and carrying forward a balance to the reserve fund, a dividend of 9 per cent. per annum was declared. It was agreed to reduce the price of the gas from 5s. 10d. to 5s. 6d. per 1000 cubic feet from and after Whitsunday next. The two retiring Directors, Messrs. J. W. Walker and J. Ballantyne, were re-elected. It was stated that there had been 695 tons of coal carbonized during the year, producing 7,024,500 cubic feet of gas, which equals 10,100 cubic feet per ton, the gas paid for per ton being fully 9200 cubic feet. The leakage and condensation had equalled 9 per cent., and the average illuminating power of the gas was 29 standard candles. These figures reflect much credit on the energetic Manager, Mr. R. Miller.

Aberdeen, like many other cities, is beginning to experience the evil results of a short-sighted policy in laying water-mains. In the northern quarters of the city loud complaints are made as to the scarcity of water, and this is said to proceed from the inadequacy of the mains. Within recent years there has been a large increase in residents in this district, and the water-main has proved to be too small to supply the extending demand. The matter has been under the consideration of the Water Committee, and a scheme has been prepared by the City Surveyor for better distribution of the water. The carrying out of this scheme is estimated to cost not less than £11,000. The subject is to be considered at a future meeting of the Committee.

Within the past week or two some uneasiness has been created in the village of St. Vigens, about two miles from Arbroath, by an outbreak of typhoid fever. This outbreak has been traced to the water obtained from a particular well. At its source the water is remarkably pure, but it is conveyed to a tank by an ordinary field drain, and it is surmised that the heavy snows of the winter have washed into the drain organic matter from the highly manured lands, and thus to have contaminated an otherwise fine supply of water. The subject has been under the consideration of the Local Authority, and the evil will speedily be remedied by the conduction of the water through an iron pipe.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Mr. Foulis, General Manager to the Glasgow Corporation Gas Commissioners, has recently been authorized to make such arrangements as may be necessary for having one or more of the firemen connected with the various district police stations of the city so instructed in regard to

the gas supply as that, in the event of their arriving first at any fire or gas explosion, they may be able to shut off the gas supply without waiting for the arrival of any of the gas employees. This is certainly a wise provision to make.

I recently referred to some "high falutin'" remarks made by the London correspondent of a Scotch provincial newspaper in regard to the electric lighting experiments in the City; and I find the same gentleman is again at his work, *à propos* of the mishap that lately befell the Brush Company's arrangements. After noticing the explanation made by the Company's Secretary, he goes on to say: "It seems a pity that the West-end has not had the advantage of the trial. After six o'clock the City is almost deserted by the hundreds and thousands who live there during the day. The Gas Companies have awakened from their lethargy, and one of them has made a feeble effort to improve the light they supply to the public. Parliament Street is now illuminated with some burners constructed on an entirely novel principle. The result is a very brilliant light, but still one that cannot compare for one moment with electricity. The reason the West-end has been left in comparative darkness when the City has been so well illuminated is this: The City has but one set of rulers, the West-end any number. A Bill has been talked of over and over again for centralizing the local governments of London; but the Bill has never got beyond the stage of 'words, idle words.'"

At the usual monthly meeting of the Grangemouth Police Commissioners, held last Monday, the desirability of doing something in the way of trying the electric light at the docks of that town was under consideration, the mover in the matter being Mr. Crawford. Referring to the hopes held out some time ago by Mr. Macpherson, the Chief Magistrate, he said that a trial had been made with great success at Greenock, one lamp having, it was estimated, given as much light as 6000 candles. Having made some additional remarks, he concluded by suggesting that there should be an Electric Light Committee formed. Mr. Mackenzie said the Shareholders of the Gas Company would not like the change. In the opinion of Mr. Burrell, Convener of the Lighting Committee of the town, the matter was premature yet. They might, however, appoint an Electric Light Committee to watch what was going on as regards the subject, and report occasionally. The appointment of such a Committee was agreed to, the same to consist of the Chief Magistrate, Mr. Burrell, and Mr. Crawford.

During this week there have been two very successful demonstrations with Swan's electric lamp in this city—first, in the premises of Messrs. D. and G. Graham, telegraph and telephone engineers, and then in the large hall of the College of Science and Arts, the occasion being the annual distribution of prizes and certificates—Sir William Thomson presiding. The learned Professor, along with a number of scientific people, was also present at the display in Messrs. Graham's premises, on which occasion he spoke at some length on the production of the electric light, both on the arc and the incandescent systems, and dealt with what he considered to be the advantages and prospects of both. He had no hesitation in saying that domestic lighting by electricity was an accomplished fact.

Chiefly at the instigation of Provost Campbell, experiments in electric lighting are now in progress in Cathcart Square, Greenock, in front of the mid-Parish Church. The Provost has expressed great satisfaction with the results of the experiments; but as financial and other considerations have yet to be taken into account ere declaring for the permanent adoption of the light in such portions of the town as are under the government of the municipal authorities, the Committee will continue their inquiries, and bring up a report on the subject to the Police Board. Considering that the gas supply of the town is in the hands of that body, it is not likely that much money will be expended in electric lighting experiments. At the request of the Provost reports have been prepared by the Town Chamberlain and the Gas Manager, on the supposition that the Harbour Trust will in the near future use the electric light solely at the harbours and quays; and it has been found that, deducting the value of the coal necessary to produce the gas used at the harbour, and the wages of the men who attend to the harbour lamps, the loss would not be very great. The reporters (Messrs. Mackellar and Stewart) show that the loss is likely to be met by the increased demand for gas arising from the natural and ordinary expansion of the town. The Chamberlain states that the increase this year in the gas revenue of Greenock—which is mainly derived from dwelling-houses and shops—amounts to about £900, so that it is clear that any falling-off due to the action of the Harbour Trust will be far more than met.

An official visit was made yesterday by the Town Council of Hawick to the new water-works on the Dodburn, a distance of 6½ miles from the town, for the purpose of turning on the water at the intake. The reservoir is estimated to contain 60 million gallons; and it is contemplated by the arrangements now in progress to have a total supply of 800,000 gallons per day, or 50 gallons per day per head of the population. Commenced last September, it is expected that the works will be finished by the 31st of October. The cost of the entire scheme is estimated at £15,000.

The question of the leakage at Knowsdean reservoir has again come up in an acute form before the Town Council of Galashiels. Last Monday it formed the subject of a stormy and somewhat bitter discussion, resulting in a resolution to turn off the water from the reservoir, with the object of finding how long it will take to run off by the leak, the town to be supplied in the interim direct from the intake. The sore point which has caused so much strong feeling is the extent of the leakage. At the time the works were taken off the contractor's hands, the Engineer held out the hope that with time the leak would diminish, and probably cease altogether. Instead of this there is an apparent increase, as shown by the flow of water over the measuring board, and on Monday evening it was resolved, as stated above, to have the actual leakage gauged by shutting off the influx, taking the quantity of water in the reservoir, and marking the time it will take to empty itself. The continuance of the leak, not to speak of its possible increase, is a very serious matter for the town, as the maintenance of the clear water basin is an important part of the scheme. It is many months since I first referred to the question, which is still exciting so much anxiety amongst the municipal authorities of Galashiels.

There is room to fear that a portion of the district now supplied from the Wishaw Water-Works will soon have to be put on "short commons;" and the Paisley Water Commissioners are seriously considering the propriety of shutting off the water from ten o'clock at night till six o'clock in the morning.

Extreme depression has prevailed in the Glasgow pig iron market during the past week, and even from the lowest quotation very little recovery has been made. Business was done on Thursday down to 45s. 5½d. cash, and the highest price paid yesterday was 45s. 9½d. cash. The low level reached on Thursday was the lowest attained for about a year. Compared with last year the shipping business has fallen off enormously. Now that the trade is entering the quiet months, with a large stock and a large production, holders are selling out more freely.

There has been a fair week's shipment of coal, but the present orders are nearly exhausted. A considerable number of orders for gas coal are now being placed.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There is naturally a lessened amount of activity in the coal trade of this district, owing to the season of the year, and with recent warm weather the demand for the better classes of round coal for house-fire purposes has fallen off considerably. Common sorts, owing to the depressed state of trade throughout the district, are a complete drug in the market. Round coal is now so difficult to move that in large numbers of cases railway sidings are blocked to the full extent, and unless pits are stopped the alternative now in many cases is to put down stocks upon the ground, which has already been done to a considerable extent. The state of the market, so far as house-fire and manufacturing classes of fuel are concerned, is, of course, tending to affect the price of round coal for gas-making purposes; whilst in addition to this the long forward contracts which many gas-coal consumers entered into last season will have the effect of limiting requirements for the present season. At present there are not very many inquiries in the market, and prices can scarcely yet be said to have been actually tested. Colliery proprietors are endeavouring to hold out for better prices than the extremely low rates which were current last summer, and best screened Wigan Arley is not at present to be bought at much under 8s. per ton at the pit's mouth, but common Wigan gas coals range from as low as 6s. per ton upwards. For other descriptions of round coal the average prices at the pit's mouth are about 8s. 3d. to 8s. 9d. for good Arley for house-fire purposes, with common sorts obtainable at from 6s. 6d. per ton upwards. Pemberton four-feet is now quoted at from 6s. 9d. to 7s. 3d., whilst common round coal can in some cases be bought as low as 5s. per ton, with the average prices about 6s. 3d. to 5s. 6d. per ton at the pit. Engine classes of fuel are firm, but the abundant supplies of burgy prevent at present any upward movement in slack, although there is every probability of this class of fuel being scarce during the summer. For good steam burgy prices at the pit's mouth range from 4s. 6d. to 5s., and for good ordinary buying from 3s. 9d. to 4s. 3d. per ton.

Coke is in fair demand, and steady in price.

The iron trade continues extremely dull, and prices, so far as outside brands of pig iron coming into this district are concerned, have been weaker to the extent of 1s. per ton. Lancashire makers still quote 44s. to 45s., less 2½, for delivery equal to Manchester; but Lincolnshire iron has been sold at fully 2s. per ton under this figure. Finished iron is only in limited demand, and bars average about £5 12s. 6d. to £5 15s. per ton, with other descriptions of manufactured iron in proportion.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The call for forge coal has not improved, and the market is somewhat overstocked. Prices vary considerably, and there is no sort of uniformity or fixed rate. The system of underselling is pretty freely carried on. At the largest collieries prices average from 6s. to 7s. per ton loaded in boats. Household coal, though in somewhat improved request, is dull of sale, and buyers are giving orders sparingly, believing that further reductions will be made shortly. Best house coal can be purchased at 9s. 6d. per ton. The Cannock Chase proprietors are offering iron-manufacturing fuel on more advantageous terms. At most of the pits less time is being done.

Orders for finished iron are considered to be rather more numerous, and more inquiries are made on colonial account. Nevertheless, a great portion of the business transactions in finished iron are for the requirements of the district. Marked bars hold their price of £7 pretty firmly, but notwithstanding the almost unprecedentedly low prices now quoted, makers have experienced little or no improvement in the demand since the reduction. Second-class qualities receive more attention, and appear to be most suitable, at the prices, to the wants of consumers. Best and common sheets are a prominent feature of the class of business now being transacted in the markets. Makers of hoops and strips also command a full share of the transactions. Nail rods are not much inquired for, and prices are easy. At £8 10s. to £9 there is a slightly better inquiry for boiler plates, mostly, however, for consumption in the immediate locality. Tank plates are slow of sale. A steady trade is reported by girder-plate manufacturers, who have a fair quantity of orders on book. Prices rule from £8 5s. to £9, and in a few cases £9 5s. is the lowest quotation. Pig iron is still very dull in the market, and makers are doing but little business. Cinder pigs are quoted at as low a price as £1 17s. 6d. and £2, and without meeting much call. Hot-air are quoted £3 to £3 2s. 6d., and part-mine at £2 10s. Neighbouring makers are offering free delivery at 2s. and 3s. less money. Middlesbrough and hematite iron are also slow of sale, but a few transactions are made with the ironfounders. Northampton and Derby pigs are plentifully offered at easy rates. At a few of the heavy ironfoundries there is plenty of business in hand; tube makers are also slightly more busy, though the edge-tool makers and galvanizers are not doing so well.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The position of the Yorkshire iron trade seems to grow quieter. Some of the works have a fair number of orders on hand; but, taken as a whole, merchant iron is not in good request. The make of pig iron is not so large as it was, and the position of the trade is rendered worse, owing to the Railway Company having increased the tonnage rates for ironstone from North Lincolnshire, from whence most of the ore consumed is now obtained. Some of the Bessemer steel works are fairly active, but, on the whole, this branch of trade is quieter than it was a short time ago. Foundry material is not much sought after.

The collieries in West Yorkshire are only moderately off for orders for steam coal. Yet the West Riding and Silkstone collieries last month sent over 12,000 tons to Hull; being an increase of over 200 tons when compared with the corresponding month of last year. The business doing in the same class of fuel by the South Yorkshire pits has been pretty fair, considering the late season. Denaby, Manvers, and other firms have sent a large tonnage by water, which mode of transit is much cheaper than that by rail. The quantity sent to Goole from West Yorkshire, and to Grimsby from the South Yorkshire pits, is improving; but prices are very low, and likely to be so. Hard coal for locomotive purposes is largely supplied by contract.

The house coal trade is not over active, and some of the Silkstone pits are still working short time. There is a fair tonnage going to London, but the great output throughout South Yorkshire keeps the trade quiet, the production being in excess of the demand. The business doing with the Eastern Counties as well as with other markets is only moderate. Prices at the pits remain low, and do not bear any comparison with those charged by local merchants. A few collieries in West Yorkshire having access to the Midland are sending a fair tonnage to the Metropolis. A good many complaints are being received by colliery owners respecting the mixing of coal by the merchants.

No change can be noted respecting the business doing in gas coal, which is somewhat quieter, owing to the period of the year, when less gas is consumed. But little can be gathered respecting the pending contracts

for gas coal, but hopes are entertained that a fair share of the supplies will be drawn from South Yorkshire.

The coke trade, which for a long time past has formed one of the staple branches in South Yorkshire, is much quieter than it was a short time ago. The production has seriously fallen off, owing in some measure to the fact that the Manchester, Sheffield, and Lincolnshire Railway Company have increased the tonnage rates to North Lincolnshire fully 4d. per ton. Most firms are protesting against the impost, and have struck it out of their accounts; but the Company seem determined to enforce it. Owing to this and other causes, the Frodingham Iron Company have within the past few days blown out one of their large furnaces, and it is rumoured that some others will follow, as the prices at present obtained leave no profit whatever.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade of the Tyne and Wear has gone on very steadily over the past fortnight. Of coal, 180,000 tons—a considerable proportion gas—have been shipped within that period from the Tyne Dock. The exports from the other shipping-places on the Tyne, and upon the Wear and at Hartlepool, have been equally good. The shipments of gas coals to Cronstadt and the upper ports of the Baltic have commenced. As I predicted they would be, the freights are high. Steamers have been chartered in the Tyne to load coals for Cronstadt at 8s. The rates are 2s. a ton higher than was anticipated when the contracts were entered upon. The shipments of other classes of coals have likewise increased. The demand for coke has improved; but whatever advance there is in prices, is but light.

The coasting business is dull. More than two-thirds of the carrying trade in gas coals is done by the regular steamers. Freights to London do not exceed 3s. 10½d. per ton. Steamers are chartered for Hamburg, Havre, and to some of the nearer ports of Europe, to load gas coals; but the business thus transacted is not at all large. The Baltic and Mediterranean trades outwards are very firm.

The business done in coke is improving. Larger quantities are being sent to the iron-works. At the same time there are stocks at the collieries in the Durham district. Prices do not rise. They will continue at the present rate over the residue of the first half of the year.

There is no revival of business in the ironfounding branches of the Cleveland iron trade. Inquiries for gas and water pipes have been fairly numerous, but they have not resulted in many orders, as customers anticipated, from the fall in the value of pig iron, getting pipes on still more favourable terms than they have been doing. The pig iron trade is in a very depressed state. Quantities of stocks seem to have come into the hands of operators who are realizing, and are thus putting prices down.

The fire-clay goods trade on the Tyne continues to show an improved business. Shipments of best sorts are very brisk. The stocks which accumulated over the winter are being reduced very materially. In the northern metal market copper is dull and lead is neglected. It is found impossible to force up the price of timber of any kind. The quantity which goes into consumption is not large. At the same time merchants balance supply with demand as best they can. There is therefore very little change in prices.

MESSRS. T. PIGGOTT AND Co., of Birmingham, announce that they have purchased the business, stock, and plant of the Atlas Engine Company, Limited, and have thus secured every facility for manufacturing engineering of the highest quality.

MIDDLETON IMPROVEMENT COMMISSIONERS' GAS SUPPLY.—At the last meeting of the Middleton and Tonge Improvement Commissioners, the Chairman of the Gas Committee gave some particulars of the gas supply under their control during the financial year 1880-81. There were used at the gas-works 961 tons 6 cwt. of cannel, and 4002 tons 13 cwt. of coal; and 50,251,000 cubic feet of gas were manufactured, or on an average 10,123 cubic feet per ton of coal carbonized. The average illuminating power of the gas was 17.68 candles. Out of the total quantity manufactured, 42,392,000 feet were sold, which was an improvement upon 1879-80, and a considerable improvement upon the year 1878-79. In the latter year there were 54,474,000 feet of gas manufactured, while only 42,000,000 feet were sold. During the past year the mills consumed 13,142,900 cubic feet of gas; householders, 26,031,500 feet; public lamps, 2,597,600 feet; and at the gas-works 620,000 cubic feet were used. The number of consumers this year was 2880, against 2893 in the previous year—the falling-off being attributable in a great measure to the empty property in the district. The gross profit made was £4457; but out of this there was paid to annuitants £2549, and for interest on loans £1326, or a total of £3875. The amount of profit remaining was thus £582 on the year's transactions—enough to pay off the debit balance on the profit and loss account brought forward from the previous year, amounting to £50; the sinking fund of last year, amounting to £234; and the sum of £298 towards the arrears of sinking fund for the years ending March, 1878, 1879, and 1880, leaving a balance on the latter account (to be paid off) amounting to £328. The gas-rentals showed an increase of £546, and the receipts for residual products an increase of £242. Coal and cannel cost £255 more than before, but £130 of this was due to the colliers' strike. The other principal items of increase in the expenditure were: Repairs to mains and services, £40; repairs to buildings and plant, £33; meter account, for replacing old meters unfit for use, £43. One of the subsequent speakers, when referring to the difference in the amount of gas used and the amount manufactured during the last few years, mentioned the percentage of leakage, which he said was in 1879-80 over 22 per cent., whilst in 1880-81 it was only just over 15 per cent.; so that there was 7 per cent. in the saving of leakage. This saving was due to the activity of the Manager (Mr. C. L. Hartley) and of the Committee, in seeing that the old services were taken out, and new ones put in; and in affording proper means for a better supply of gas.

THE PUBLIC LIGHTING OF EXMOUTH.—At the meeting of the Exmouth Local Board on Wednesday, the 4th inst.—Mr. E. B. Ewen in the chair—the question of the supply of gas to the public lamps was again opened. The last contract for the public lamps expired in May last year. Under it the Board paid £2 10s. per lamp per annum, but they subsequently determined to pay the Company for the quantity of gas burnt, believing that it would be a great saving to the town. The Company, however, refused to accede to the alteration, and notice was given to them that the Board would burn the gas by meter, the price to be paid to be settled by arbitration. This had led to much discussion and correspondence, and Mr. Alfred Lass was appointed Arbitrator for the Company, and Mr. Dand for the Board. Recently the Company intimated their wish to confer with the Board, and Mr. Spettigue (the Chairman) and Mr. Crabb (the Secretary) attended a meeting as a deputation to arrange, if possible, terms for the supply of gas to the public lamps of the town. Mr. Spettigue said the Company were anxious to avoid the heavy expense of litigation in every respect. The cost of arbitration to each party would not be less than £160, whereas the amount in dispute was only £19. The Company were themselves extensive ratepayers, and individually he was also a large ratepayer; therefore, he most strongly objected to heavy law costs being incurred. He begged to submit to the Board a letter in which the Company stated

that they were willing to accept the previous offer of the Board of 4s. 6d. per 1000 cubic feet. Captain Stone did not think that the Board would be justified in accepting this offer of the Company, and he moved that the offer be not accepted. Mr. Lacey seconded the proposition. Mr. Dand, the Board's Engineer, observed that in their letter of the 2nd of February last the Company refused the Board's offer of 4s. 6d. Mr. Foster said the Board were as anxious as the Company to prevent litigation. In a neighbouring town the gas supplied to the public lamps cost 3s. per 1000 feet, and private consumers paid 3s. 9d. per 1000 feet. The average in other places was about 3s. 6d. per 1000 feet. He moved that the Board should make an offer of 4s. per 1000 feet to the Company; that the two bodies should pay equally between them Messrs. Willey's bill for fitting the public lamps with meters, which amounted to £47 5s.; and the Company charge 8s. per annum for each meter according to their Act of Parliament; both parties to pay their own costs of the arbitration already incurred, and the lamp-posts charged in Messrs. Willey's account to become the property of the Board. The motion was agreed to.—At the meeting of the Board on Saturday, the 7th inst., an offer was received from the Company to settle the matter in dispute on the following terms:—The Board to pay 4s. 8d. per 1000 cubic feet for the gas, and also Messrs. Willey's bill; both parties to pay their own share of the costs of the arbitration. This offer was eventually accepted, it being intimated that the Board would prefer that the Company should incur the cost of the meters, and allow the Board to pay rent for them.

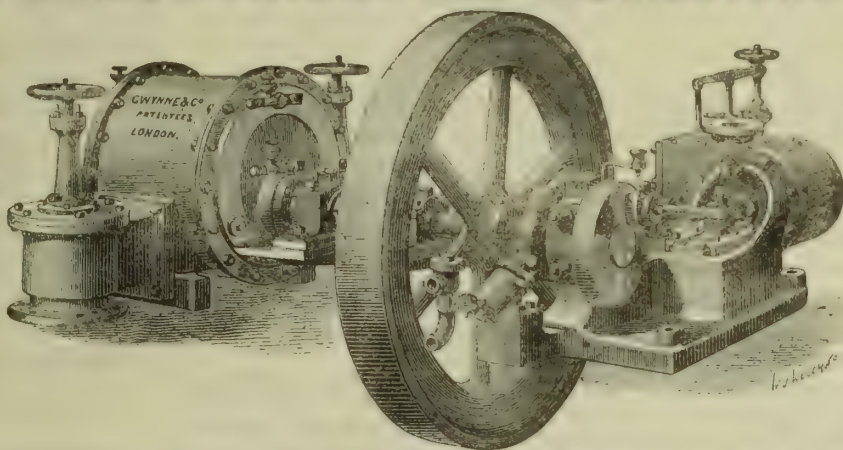
Return to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending May 11, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.8	16.6	17.0	8.6	7.7	8.0	0.1	0.0	0.0	None.	In excess.
	Camden Town	17.2	16.6	16.8	11.0	12.0	12.7	0.1	0.0	0.0	"	"
	Dalston	17.3	16.6	17.0	12.9	9.3	11.3	0.1	0.0	0.0	"	"
	Bow	17.8	16.6	17.3	10.0	8.6	9.3	1.0	0.7	0.8	"	"
	Chelsea	17.0	16.4	16.8	14.0	11.2	13.1	0.4	0.0	0.2	"	"
	Kingsland Road	17.8	16.5	17.2	14.6	11.8	13.3	0.2	0.0	0.1	"	"
	Westminster (cannel gas) . . .	21.4	21.1	21.2	9.0	7.3	8.1	0.0	0.0	0.0	"	"
South Metropolitan Gas Company . .	Peckham	16.8	16.2	16.6	11.5	10.4	11.0	0.3	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.4	16.8	17.0	10.7	8.0	9.3	0.4	0.3	0.3	"	"
	St. George-in-the-East	17.4	16.9	17.1	10.7	6.4	7.8	0.3	0.1	0.2	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.
Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is — "Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.,** Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address

C. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE OSCILLATION, FRICTION, AND POWER.

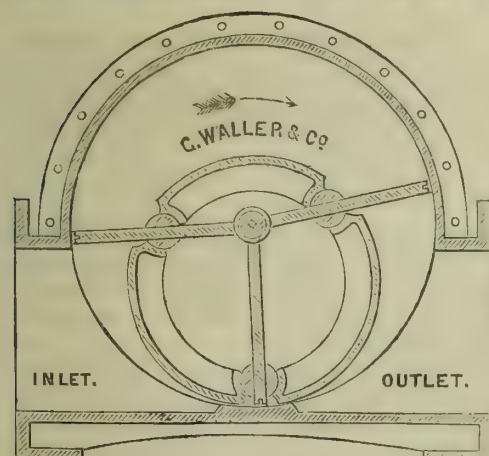
TO WORK BY BELT OR WITH

ENGINE COMBINED.

GEORGE WALLER & CO.,

MAKERS OF

BEALE'S EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, SELF-ACTING BYE-PASS VALVES, TAR, LIQUOR, & OTHER PUMPS, SCRUBBERS & PURIFIERS, CONDENSERS, BOILERS, &c.



Descriptive Catalogue of New Patent Gas Exhauster can be had on application.

PHOENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, **MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.**

WANTED.—The Advertiser, a young man, aged 31 years, will shortly return from a foreign engagement. Has a thorough Practical Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 13 years. A Situation in a like capacity preferred, either at home or abroad, and security to any reasonable amount given for the due performance of all duties in connection with the Office. Unexceptional testimonials as to character and ability. Understands the Spanish language well. Satisfactory reasons for change. Apply, by letter only, to No. 741, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Situation as Foreman or MANAGER of a small GAS-WORKS, where all the duties could be performed by myself during the greater part of the year; or a Works where four or five men are kept. Have had 20 years' experience as Manager of Gas-Works making about 20 million feet per annum. Wages moderate. Good references. Address **W. H., 21, Rillbank Road, LEEDS.**

WANTED, a good Plumber; one competent to fit-up Sulphate Plant preferred. Also a **TINMAN;** used to Repairing Wet and Dry Meters. Applications, enclosing testimonials, and stating wages required, to be addressed to the undersigned before Wednesday, the 25th inst. **C. STAFFORD ELLERY, Manager.** Bath Gas-Works, May 12, 1881.

WANTED, a Partner with a small Capital, to assist the Advertiser in Patenting and Manufacturing an Apparatus of great merit. Apply for particulars to No. 746, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Retort Worker for a small Country Gas-Works. Must be steady, and willing to make himself useful. Apply by letter only, addressed No. 747, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

INDOOR FITTER WANTED.

WANTED immediately, a steady, respectable Young Man as INDOOR FITTER; to fit-up Houses, Fix Meters, Attend Complaints, and make himself useful. Apply (with character and all particulars as to age, wages, and qualifications) by letter addressed to No. 744, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT SETTER WANTED.

WANTED immediately, a Retort-SETTER for the present season. Steady, reliable men only need apply, stating wages (or by piece work), references, &c. Address letter to No. 745, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WALTON-LE-DALE LOCAL BOARD WATER-WORKS.

WANTED, a Competent Plumber, to Lay Lead Services and do Internal Fitting Work. Preference given to candidates connected with and accustomed to Water-Works management. Candidates must apply by letter only, stating wages required, and enclosing not more than three recent testimonials, on or before Saturday, May 21, 1881, to the undersigned, endorsed "Water-Works Plumber." **W. and A. ASKOTT, Clerks to the Board.** 4, Cannon Street, Preston.

WANTED, at the Petworth Gas-Works (annual consumption 6 million cubic feet), a **WORKING FOREMAN,** who must be thoroughly experienced in the Manufacture of Coal Gas, including the working of an exhauster, and capable of taking the entire management at the works. Wages 30s. a week, with cottage, coals, gas, and garden. Apply, by letter only, with references as to character and present employment, to the **SECRETARY, Gas Company, Petworth, SUSSEX.**

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gasholder. Must be thoroughly sound. Price and particulars to be addressed to **MR. EDWARD BAKER, Engineer, Reading Gas-Works.**

FOR SALE—An Annular Condenser, Tower Scrubber, Station-Meter, Beale's Exhauster two Boilers, and some Hydraulic Mains and Retorts. Apply at the Gas-Works, **MAIDSTONE.**

TELESCOPIC Gasholder for Sale, 100 ft. by 53 ft., with excellent Guide Framing; only been in use 12 years. Now being removed from a large Provincial Gas-Works to make room for extensions, for which there is no other space. If properly re-erected, will be equal to new, and the cost much less. Particulars on application to **SAMUEL CUTLER AND SONS, Millwall, LONDON, E.**

THE Gravesend and Milton Gas Company have **FOR SALE,** Four 12 ft. square **PURIFIERS,** 4 ft. deep, with 12-in. Connections and eighteen 12-in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 10-in. **GOVERNOR,** by A. Wright and Co., Westminster. One **SCRUBBER,** 26 ft. high, 8 ft. diameter. For further particulars apply to the undersigned. **S. SOWOOD, Manager.**

CROYDON COMMERCIAL GAS AND COKE COMPANY.

FOR SALE—Four Purifiers, 18 ft. by 18 ft. by 6 ft. One Set of Condensers with Valves. One Centre Valve for four purifiers, by Cockey. Two ditto for one purifier each. One Exhauster (40,000 feet per hour) by Burton and Waller. All with 16-in. Connections. One District Governor by the Gas-Meter Company, Limited, with 12-in. Connections. The above are all in good condition, and have been removed and larger apparatus substituted. Apply to **Mr. Robert Wilson, at the Gas-Works, Waddon, Croydon, Surrey.**

By order of the Directors,
WILLIAM J. RUSSELL, Secretary.
Offices, Katharine Street, Croydon, May 10, 1881.

THE Gloucester Gas Company have the

undermentioned APPARATUS for Sale:—About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections. Exhauster (Jones) to pass about 15,000 feet per hour. Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above. Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes. Two 12-in. four-way faced Valves, by Cockey. For further information, &c., apply to the undersigned, **R. MORLAND, Engineer.**

GAS PLANT FOR SALE.

THE Gas Committee of the Corporation of Newbury having ceased to manufacture Gas at their Old Works, have the undermentioned APPARATUS for SALE:—

- 25 15-in. Circular Mouthpieces, Wrought-Iron Lids and Cross-Bars.
 - 25 4-in. Bridge-Pipes.
 - 25 4-in. Ascension-Pipes.
 - 1 Wrought-Iron Riveted Hydraulic Main, 36 ft. long, and pierced for settings of 5 Retorts.
 - 5 Furnace Frames and Doors.
 - 1 6-in. Double Vertical Condenser, with Tar Boxes, &c., complete.
 - 4 Purifiers, 6 ft. by 6 ft. by 4 ft. 6 in., with Covers, Lifting Gear, Hydraulic Centre Valve, and 6-in. Connections.
 - 12 Brackets suitable for carrying a 12-in. Main Pipe.
 - 1 6-in. Bye-Pass Valve and Connections.
 - 5 6-in. Rack and Pinion Valves.
 - 1 30-ft. Gasholder, with Cast-Iron Tank, 18 ft. deep, Columns, Girders, Syphons, and 8-in. Valves, in good condition.
 - 1 Four-way 12-in. Bye-Pass Valve by Cockey, and a sundry lot of different Pipe Connections.
- For further information, &c., apply to the undersigned, **J. G. O'FARRELL, Engineer.**

THE Tunbridge Wells Gas Company

having ceased to Manufacture Gas at their Old Works, have the undermentioned PLANT and APPARATUS FOR DISPOSAL:—Iron Roof for Retort-house, 75 ft. long by 50 ft. wide. Cast-Iron Hydraulic Main, 138 ft. long, pierced for settings of five retorts. Cast-Iron 12-in. D Pipe, 200 ft. long, with Man-holes and Lids. Three 10-in. Slide Valves and twenty-six Brackets for supporting same. Twenty Furnace Doors and Frames, Brace Bars, and Sundries. Eighty Mouthpieces for 21-in. by 15-in. D Retorts, with wrought-iron Covers, Cross Bars, and Screws. Two 10-in. Jones's Exhausters, with Slide Valves complete. One Horizontal and one Vertical 4-horse power Steam Engine. Two Steam Boilers, 7 ft. 6 in. by 4 ft., with Fittings. One Round Scrubber, 18 ft. high by 4 ft. diameter. One Square do., 18 ft. high by 4 ft. Three Cast-Iron Purifiers, 13 ft. 3 in. by 9 ft. 3 in., with four tiers of Wood Sieves, Covers, Lifting Apparatus, and Centre Valve complete. Station-Meter, by Wright, with 8-in. Bye-pass Valve and Connections. One 12-in. Station Governor, with Valves and Connections. One 14-in. ditto ditto. One 70-ft. Telescopic Gasholder, 20 ft. deep, with eight cast-iron Columns and Girders. One Cast-iron Tank for ditto. One 60-ft. Telescopic Gasholder, 18 ft. deep, with eight Cast-Iron Columns and Girders. One Cast-Iron Tank for ditto. And sundry other Gas Apparatus and Plant; of which, and the foregoing, detailed printed particulars can be had on application to the undersigned. **JOHN READ, Secretary.**

THE Directors of the Horsham Gas Company, Limited, invite TENDERS for the Supply and Erection of Three PURIFIERS. Full particulars may be ascertained by forwarding a stamped envelope to **R. SHEPPARD, Secretary.**

TENDERS FOR GAS COAL.

THE Corporation of Walsall invite TENDERS for the Supply of 24,000 tons of Staveley, Yorkshire, or any other good GAS COAL, to be delivered during One year from the 1st of July next, either at the London and North-Western or Midland Railway Stations at Walsall, or the Corporation siding at the New Gas-Works.

The Coal will have to be delivered at the rate of from 100 to 850 tons per week, as the Corporation may from time to time require. Payments monthly. The Corporation do not bind themselves to accept any tender, and they reserve the right to divide the contract between several firms. Tenders sealed, and marked outside "Tender for Gas Coal," and stating the price for large Coal, and also for Nuts, are to be sent to the undersigned on or before Saturday, the 28th inst. **SAML. WILKINSON, Town Clerk.** Bridge Street, Walsall, May 12, 1881.

STOCK OF THE BRISTOL UNITED GASLIGHT COMPANY.

MESSRS. H. R. FARGUS and CO. will Sell by Auction, in pursuance and under the provisions of the Bristol United Gaslight Company's Act, 1873, at their Sale-Room, 4, Clare Street, in the City of Bristol, on Thursday, June 9, 1881, at Two o'clock precisely, £20,000 CAPITAL STOCK, issued by them under the authority of the above-named Act. The Stock will be sold in lots of £100 each. For conditions of sale and any further particulars apply to the AUCTIONEERS, Clare Street, BRISTOL; to the SECRETARY of the Company, Canons' Marsh, BRISTOL; or to Messrs. BRITTANS, LIVETT, and MILLER, Solicitors, Albion Chambers, BRISTOL.

STAFFORD CORPORATION—GAS DEPARTMENT.

THE Gas Committee of the Stafford Corporation are prepared to receive TENDERS for 450 Yards 6-in. Cast-Iron 8. and S. PIPES, each Pipe to weigh 2 cwt. 0 qr. 16 lbs. Sealed tenders, addressed to the undersigned, and endorsed "Tender for Pipes," to be sent in on or before Saturday, the 28th of May. The Committee do not engage to accept the lowest or any tender.

By order,
JNO. STORER, Manager.
Gas-Works, Stafford, May 12, 1881.

TAR.

THE Directors of the Ilkley Gas Company invite TENDERS for the Purchase, at a price per ton, of the Surplus TAR made at the Gas-Works, Ilkley, from July 1, next, for One, Two, or Three years. Further particulars may be obtained by applying to the Manager on the works. The Directors do not bind themselves to accept the highest or any tender. Sealed tenders (addressed to the Chairman, Gas Office, Ilkley) not later than May 26, 1881.

AMMONIACAL LIQUOR.

THE Directors of the Ilkley Gas Company invite TENDERS for the Purchase, at a price per ton, of the AMMONIACAL LIQUOR made at the Gas-Works, Ilkley, from July 1 next, for One, Two, or Three years. Further particulars may be obtained by applying to the Manager on the works. The Directors do not bind themselves to accept the highest or any tender. Sealed tenders (addressed to the Chairman, Gas Office, Ilkley) not later than May 26, 1881.

WIDNES GAS-WORKS.

THE Gas Committee of the Widnes Local Board are prepared to receive TENDERS for the Supply of GAS COAL, to be delivered at their Works in such quantities as may be required, during One, Two, or Three years, commencing July 1, 1881. Conditions and forms of tender may be obtained from the undersigned. Tenders to be addressed to the Chairman of the Gas Committee, endorsed "Gas Coal," and delivered at the Gas-Works Office, Widnes, not later than Saturday, the 4th of June. The Committee do not bind themselves to accept the lowest or any tender. **H. Y. ROBERTS.** Gas-Works, Widnes, May 3, 1881.

WATFORD GAS AND COKE COMPANY.

GASHOLDER TANK.

THE Directors of this Company are prepared to receive TENDERS for the Construction of a GASHOLDER TANK, at their Works at Bushey. Plans can be seen, and copies of the specification obtained on application at the Works of the Company; and of the Engineer, **H. E. Jones, Esq., C.E., Gas-Works, Stepney, London, E.** Tenders, endorsed "Tender for Gasholder Tank," to be delivered at the Company's Office, 5, Derby Road, Watford, on or before the 28th of May, 1881. The Directors do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM ROWELL, Secretary.
Dated this 10th day of May, 1881.

THE Mansfield Improvement Commissioners invite TENDERS for the Supply of 2500 tons of Best Screened GAS COAL, required for use at their Gas-Works, to be supplied from the 1st of June, 1881, to the 31st of May, 1882, in the following proportions, viz:—175 tons in each of the months of June, July, August, and September, 1881. 275 tons in each of the months of October, November, and December, 1881, and January, 1882. 175 tons in each of the months of February, March, April, and May, 1882. The Coal to be delivered at the Mansfield Station or at the Works, at the option of the sender, and to be free from sulphur, bats, bind, and refuse. Tenders to be sent in on or before the 25th day of May, 1881, marked "Tender for Coal," and addressed to **R. J. PARSONS, Clerk to the Commissioners.** Mansfield, May 4, 1881.

TENDERS are invited by the Directors of the Armagh Gaslight Company, Limited, Ireland, accompanied with designs and specifications complete for a Single-Lift GASHOLDER, 74 ft. 2 in. diameter by 18 ft. deep with 10 Columns and 10-in. Inlet and Outlet Pipes, &c. Tenders not accepted will be returned as soon as possible. Sealed tenders, endorsed "Tender for Gasholder," to be addressed to **John S. Biggs, Esq., Chairman,** not later than May 23, 1881. The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
JOSEPH GIBB, Manager.
Armagh Gas-Works, Ireland, April 27, 1881.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

J. S.—Noticed in our issue of the 3rd inst.

SUBSCRIBER (Glasgow).—See notice below, as to anonymous correspondence.

RECEIVED.—“The Purchase of Gas and Water Works, with the Latest Statistics of Municipal Gas and Water Supply.” By Arthur Silverthorne, C.E. London: Crosby Lockwood and Co., 1881.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 24, 1881.

THE SOUTH METROPOLITAN GAS BILL.

ON Wednesday last the Bill of the South Metropolitan Gas Company was taken into consideration by the Committee of the House of Commons to which it was referred, and on Friday afternoon it was passed by the Committee practically unaltered from the form in which it was introduced. The interest felt in the fortunes of the Bill has naturally been very great on the part of those concerned in the safety of gas property. It is the first instance in which a Company, already conducting its trading under the influence both of auction clauses and sliding scale, has needed to come again to Parliament, and so present an opportunity for reviewing, if not revising, the operation of the legislation inaugurated in 1875. In proportion to the interest and importance of the inquiry will be the satisfaction felt with its issue.

The attack made by the Metropolitan Board of Works upon the initial or standard price was inevitable sooner or later; but while it would have been less conspicuously indecent some years hence, it would, we most firmly believe, have been

equally unsuccessful. It may be remembered that when the sliding scale was first proposed by the Metropolitan Board (Metropolis Gas Companies' Bill, 1875), it was intended to operate only in one direction—it provided that dividends should decrease if, from any cause, the price of gas had to be raised; but offered no advantage to the Companies in return for reductions in price, however considerable. This original proposal gives the key-note to nearly all the proceedings of the Board, and other authorities representing the consumers of gas in London, and explains also the persistent dissatisfaction with which they have regarded the fruits of their own labour. It cannot be gainsaid that there has been a sincere conviction on their part that the price of gas has been too high; but this opinion has been based upon the earning by the Companies of their full dividends, not upon a well-grounded knowledge that gas could and should be supplied at a lower rate. Although, in deference to the views of their own chief witness (Mr. George Livesey) and of the Board of Trade, who had adopted his opinions, the Metropolitan Board consented, in 1875, to alter their scheme by supplementing the “stick” with the “bunch of carrots”—in the interests of sound sense, as well as fair play, letting the scheme operate in both directions—yet they did so grudgingly, and still avowing their preference for their own narrow plan. Such being the case, it was hardly to be wondered at that the Companies were, at the time, generally unfavourable to the scheme, even as amended. Little faith was felt in the sincerity of the Metropolitan Board's professions, but much in their historic consistency. If they had been excited to action by a ten per cent. dividend, what chance of rest would there be if the Companies should pay twelve per cent.?

This view of the matter was the more natural at the time because of the opprobrium which was being cast upon the revision clauses displaced by the sliding scale. These clauses, introduced not by the Companies but by the Municipal Authorities, in the interest of the consumers, had been of great service to the Chartered and Imperial Companies, enabling them to meet the heavy burden of the coal famine by increasing the price charged for gas. We are quite prepared to admit that the decisions of the Commissioners who interpreted these clauses may have erred in the direction of being unduly favourable to the Companies; but further experience, and perhaps some verbal amendment, might well have set matters right. No time, however, was allowed for any such improvement; the clauses had acted differently to what had been expected of them by their sponsors, and they were finally condemned as loudly as they had before been advocated. If these clauses had been intelligently applied after the coal famine, it is probable their action would have been sufficiently effective in reducing the price of gas as to have satisfied even the Metropolitan Board. If, for instance, as was suggested in the recent inquiry, the revision clauses were now in operation, the price of gas would be reducing, and the Metropolitan Board probably be satisfied with the machinery as being suitable for their purpose. If, on the other hand, the sliding scale had been adopted in 1869—antecedent to the coal famine—then its effect would have been to reduce dividends, and the Board would still have been satisfied. An increasing price of gas would not have troubled them when accompanied by lessened profits to shareholders, but a rapidly reducing charge for gas brings neither comfort nor satisfaction to them when the shareholders are participating in the advantage. We repeat, therefore, that the attack just made on the initial price was inevitable, but we shall be surprised if it is soon repeated.

It was clearly a fortunate circumstance that the Company first available for attack was the South Metropolitan. This Company have, from the first, taken kindly to the sliding scale, and their chief officer, Mr. George Livesey, has done more than any other man to give it the all-round popularity which it at present enjoys. Again, in the case of the South Metropolitan Company, it was clearly seen and agreed to in 1876, when they accepted an initial price of 3s. 6d., that though it was lower by threepence per thousand feet than had been granted to the Chartered and Commercial Companies, yet, as they were supplying their consumers at 3s., it was sufficient to at once give them a dividend considerably in excess of their then maximum. There was consequently no room for affectionation of surprise at its favourable result in this direction. Again, the South Metropolitan Company have been used by the Metropolitan Board as an example of efficient and honourable management of gas property, and the latter could not appear other than ungrateful in offering the Company such recompense as they lately designed for them. More than all this, the Board in 1876 had declined to oppose the granting

to the Company an initial price of 3s. 9d. per thousand feet, which would at once have given them a dividend of twelve and a quarter per cent., while they now desired to reduce the price from 3s. 6d. to 3s., because with it, after some years of able and earnest striving, the Company were earning twelve per cent. Inconsistency could hardly go further. These circumstances placed the Company in a specially favourable position to resist the proposed spoliation. After the case for the promoters was concluded, Mr. Bidder, on behalf of the Board, declined to call witnesses, and so secured for himself the last word with the Committee, and deprived Mr. Michael of his opportunity of replying to such arguments (?) as had been used. Mr. Bidder's chief contention was that, in relation to a very large proportion to the lately amalgamated Company now applying to Parliament, he was asking not for a "revision" of the standard price, but to have it determined for the first time; that when, in 1876, the South Metropolitan Company obtained their Act, they stood alone, no amalgamation having taken place; and that, therefore, Parliament had not had an opportunity of saying what was a fair price for the Phoenix and Surrey Consumers' Companies, since absorbed. Such an argument was in itself an apology for attempting to alter the initial price which had been fixed, but it was also transparently hollow. Parliament, when fixing 3s. 6d. per thousand as the price for the South Metropolitan Company, gave them also power to amalgamate other Companies south of the Thames, and by approving machinery for this purpose, rendered impossible any reconsideration of the price. Thus it is clear that the intention of the Committee in 1876 was to fix a price that should continue to apply to the Company through all such changes. When, however, it is remembered that in 1876 the Phoenix Company were charging 3s. 6d. per thousand feet, the Surrey Consumers' Company 4s., while the South Metropolitan Company were content with 3s., and that at the time of the amalgamations the prices of the two absorbed Companies were respectively 4d. and 9d. per thousand feet higher than that of the South Metropolitan, it is clear that, 3s. 6d. being a fair initial for the latter Company alone, it should have been increased, if altered at all, when the less successful Companies were added to it.

We believe that this case will do much to remove the objections still felt to the new legislation. That the action of the sliding scale would be hampered in its fair and equitable operation by narrow-minded efforts to deprive it of any advantage to the Companies, was foreseen from the commencement. Now, when the effort has been made—when it is seen how slight is the case that can be adduced in favour of disturbing the arrangement once made, there will be a readier acknowledgment of the general fairness of the system. We think that the present decision is at variance even with the opinion expressed by Mr. G. W. Stevenson, when he said: "I quite admit that circumstances might arise that might render a revision of the price a proper thing, and the *raison d'être* of the Metropolitan Board of Works being here is to appear in the interest of the consumers of gas. If it be in the interest of the consumers of gas that the standard price should be reduced, I think it ought to be reduced; but I am prepared to show that the reduction of the standard price of gas would be disadvantageous to the public." The settlement having been once fairly made, the consumers are entitled to all the benefit they can get out of it; but so also are the Company. If, then, anything has been determined in the case under consideration, it is that the latter shall be as inviolate as the former.

We cannot conclude these remarks without congratulating the South Metropolitan Company, and especially Mr. George Livesey. The case of the Company was presented to the Committee with such transparent candour and fairness, that the compliment paid to Mr. Livesey by the Chairman was a perfectly natural one, and generally acknowledged to be well deserved. The gas interest throughout the country will also be indebted to the man who, amid no little obloquy, first urged the sliding scale as a fair settlement of the rival claims of Gas Companies and their consumers, and has now been able, after five years' experience of its operation, to justify the utmost he had said in its favour.

THE BRITISH ASSOCIATION MEETING.

We are now in possession of the settled order of proceedings of the meeting of the members of the British Association of Gas Managers at Birmingham during the second week of the ensuing month. An innovation, which partakes of the nature of an improvement, will be observed in the already indicated arrangement for breaking up the daily proceedings. To sit sedulously through a day's reading of papers and discussions thereon, in bright summer weather, has frequently

been observed to be more than a number of members are capable of enduring, and therefore the intended alteration of practice will be generally appreciated; except possibly by some who may object to the additional day which has, in consequence, to be taken for the business of the meeting. The members will meet as usual in the morning. On the opening day, Tuesday, June 14, the President, Mr. Charles Hunt, will deliver his second Inaugural Address; in regard to which it may be safely predicted that all who heard his first presidential utterances in London last year will endeavour to be in their places betimes. After the usual formal business shall have been transacted, the meeting will adjourn for an afternoon visit to the Saltley and Windsor Street Gas-Works, where members will find much to interest and instruct them. In the evening, in lieu of the usual lecture, a paper on the important subject of Regenerative Heating will be read by Mr. G. E. Stevenson, of Peterborough, and Dr. C. W. Siemens, F.R.S., will take part in the subsequent discussion. The illustrious physicist and electrician spoke on the same subject during the past year's meeting; but then his remarks were very much of an *impromptu* character. The prospect of having the privilege of hearing Dr. Siemens fully on a theme so identified with his name, and perhaps on yet novel developments of the same principle, may be trusted to prove a great attraction to many. Next day there will be papers to read and discuss, of which we have no precise details, and the afternoon will be devoted to an inspection of Messrs. Tangye Brothers' works at Smethwick, which are remarkable not more for the amount, variety, and quality of the work turned out therefrom, than for the perfection of all the internal organization of the establishment. At night the Mayor of Birmingham, Alderman Richard Chamberlain, will receive the members at the Town Hall. Thursday will be an entirely business day, when the remaining papers will be disposed of, and the discussion on the proposed alteration of rules, &c., will be taken. The Annual Dinner will be held on this evening, and on the following day, with an excursion to Enville, the seat of the Earl of Stamford and Warrington, the meeting will be brought to a close.

As will be seen, the coming gathering promises to be a more than usually interesting one, and the locality being easily accessible from all parts of the kingdom, it should be well attended. We hesitate to say anything on the vexed question of managers' expenses for attending these meetings; but cannot refrain from urging upon all those who have the power, the positive duty they owe to their undertakings to facilitate in every way the intercommunication between engineers and other officials responsible for the administration of gas-works. No perusal of printed transactions can equal in educational value the actual hearing and seeing the speakers, with the power of questioning which this also implies. No man would go to meetings of this kind solely for pastime; and it is not too much to say that no earnest man, with his heart in his work, ever returned from one of them unenlightened and uncheered by converse with his fellows. It is, in fact, a prolonged and social consultation for such men, and it is not usual for consultants to pay their own fees.

DISTRICT ASSOCIATION MEETINGS.

THE bright weather and long days have brought round the early summer meetings of the various district gas managers' associations. We have recently chronicled the gatherings of the West of Scotland and the Midland Associations, and this week we have to record the meeting at Ipswich of the members of the Southern District Association, when Messrs. E. and D. F. Goddard very cordially received their visitors, and endeavoured with abundant success to make the day's proceedings enjoyable. Mr. Gandon contributed to the business section of the programme a useful and unpretending discourse on "Letting Gas-Stoves on Hire," in which he gave some instructive observations based on the experience of the Crystal Palace District Gas Company in this department of their administrative operations. A current of fair representation of facts and candid expression of opinion upon them, whether making for or against the points raised, is traceable throughout this communication, and materially enhances its value. Mr. Gandon is at any rate not one of those thick-and-thin advocates who do the cause they espouse more harm than good in the estimation of impartial judges.

The next of these pleasant professional gatherings for semi-professional objects will be the meeting at Buxton, next Saturday, of the members of the Manchester District Institution, when Mr. Smedley will be the local host. The mention of Buxton to a Manchester man is quite sufficient attraction, and the absence from the programme of the day's work of papers

to be read, will probably not be considered a serious drawback to the popularity of the gathering. The inspection of the new gas-works will give the necessary technical flavour to the proceedings, beyond which, however, the engineering faculties of the visitors will have almost complete rest for at least one afternoon.

ROCHDALE CORPORATION GAS SUPPLY.

THERE is a decided amendment in the state of trade at Rochdale, if we are to attach the usual meaning to the statistics of the last year's working of the Corporation gas undertaking, as given in another column, which show that the consumption of gas increased during the twelve months ending the 25th of March last by nearly 12½ million cubic feet, as compared with an increase of not quite 4 million cubic feet recorded for the previous year. Last year's increase is about 5 per cent. of the total consumption of the year ending March 25, 1880, so that it would appear as though the district had regained its normal vitality. Some of the observed increase is doubtless due to the fact that there had been a reduction of price during the last quarter of the year, notwithstanding which the profit shown by the present accounts is quite 25 per cent. more than was realized during the previous year. There is no doubt that the Committee have it in their power to make an early and substantial reduction in the price of gas, and we trust this course will now be taken. It does not look well for a Corporation to gather profits from their gas business averaging between one-fourth and one-fifth of the gross revenue of the concern, besides paying the usual instalment to the sinking and depreciation funds. The undertaking is well managed, and the cost of manufacture is shown to be steadily decreasing, while from the manufacture of sulphate of ammonia, shortly to be taken in hand by the Committee, still greater economy will be obtained. The accounts are presented in a very clear form, and point most conclusively to the propriety of the reduction in price which we have advocated. In the report there is no mention made of the St. John and Rockwell apparatus. This is to be regretted, as it appears that although the production of gas has increased, the actual weight of cannel used has decreased in the past year by a considerable amount, although the illuminating power of the gas has been maintained at about the average of former years. It would be interesting to know the reason for these facts, taken in conjunction, and whether the apparatus referred to is to be credited with the whole or any part of the improvement.

THE SALFORD GAS COMMITTEE IN DIFFICULTIES WITH THEIR AMMONIACAL LIQUOR.

THERE appear to have been some curious negotiations going on of late between the Gas Committee of the Town Council of Salford and Mr. August Klönne, of Dortmund, with reference to the manufacture of sulphate from the ammoniacal liquor produced at the Salford Gas-Works. Why the authorities of Salford should especially care to treat with a gentleman residing in Germany for the establishment of sulphate works, or why Mr. Klönne should desire to go so very far out of his way as to establish such works in South-East Lancashire, is not easily determinable. It cannot be that the inhabitants of the neighbourhood of Manchester are altogether unacquainted with the process of working up gas liquor, so that the Continent had to be scoured for an enterprising gentleman who would undertake to show the local chemical manufacturers how to do it. On the contrary, it is well known that the environs of Manchester are studded with ammonia works, and the city is a great market for all kinds of tar products. Whence, then, this negotiation with the gentleman from Germany? When the Salford Gas Committee advertised for tenders for their ammoniacal liquor, there is no doubt that they received many very good offers; or, if they had the power, they could have set up works for converting the liquor on their own account. It seems evident, however, from the last report that has reached us of the correspondence between the Committee and Mr. Klönne, that the former have no power to do anything of the kind, but had allowed themselves to entertain the idea of making some special arrangements, whereby the latter should act as a sort of agent for them, and so manufacture the sulphate on his own account in a kind of subsidiary works erected for the purpose in close relation to the gas-works. The two parties have had some preliminary dealings with a view to a settlement of terms, but quite recently it has appeared that neither knew precisely what the other expected to have done. There was talk of building works and laying mains, &c.; but it was by no means clear which party was to find the capital for these purposes. The clearest point of the entire maze appeared to be that Mr. Klönne wanted a concession of the

whole of the ammoniacal liquor, or of the right of manufacturing sulphate, which was the principal thing not possessed by the Corporation themselves. Eventually, at the last meeting of the Council, it was decided to drop the negotiation with Mr. Klönne, and to take steps at the earliest date for obtaining the powers required to enable the liquor to be converted at the works. This is, of course, the right conclusion of a difficulty which ought never to have arisen. The Committee should have been aware that they had no more power to treat with Mr. Klönne than with any local chemical manufacturer. That gentleman must have thought he was about to make a good bargain, and is therefore to be pitied because he has been carefully taken up and afterwards dropped so unceremoniously. Still, he is not altogether blameless, for to a man who could calmly contemplate coming over from Germany to set up in Manchester or Salford an old chemical process, must attach somewhat of the same ridicule that would apply to him who should propose to send coals to Newcastle.

GAS COMPANIES' CONTRACTS.

A PAINFUL case of strife between a Gas Company and one of their customers is that of which a report is given in our "Legal Intelligence" to-day. The dispute between Mr. Sheffield and the Wandsworth and Putney Gaslight and Coke Company was one which should never have been carried before the High Court of Justice. In its essence it was simply a claim by the Company for a quarter's rental due at Christmas, 1879, computed on the account for the corresponding quarter of the previous year, the meter used by the consumer having ceased to register during the period in question. Payment of the account so made out was refused, and after some time the supply was cut off, and the matter passed into the Court. The following step was an attack by the consumer on the Company, for failure to supply gas, and damages were sought to be recovered on this score, the Company, of course, bringing up their suit for payment by way of counter-claim. The case was never doubtful, for the consumer had entered into a written contract with the Company, upon making application for a supply of gas, which especially reserved to the Company power to estimate, in the manner afterwards adopted by them, the consumption for a period when a meter should fail to register. An interesting point of law was raised as to the ability of Gas Companies to make contracts with their consumers containing provisions of the nature of those quoted; but although the question was not fought out to the end, the Company were allowed to take a verdict, the Judge expressing himself very strongly in favour of many of their contentions. There can be no doubt that Gas Companies have considerable power to make contracts with consumers under public legislation, without reference to any private Acts by which they may be regulated, and as long as these contracts do not contravene the provisions of the law, they are as binding as agreements between any other parties. The fact of one party being a Gas Company does not vitiate a legal contract, and we are pleased to see that, in the case in point, the Judge was so fully assured of this sometimes discredited principle.

THE GAS-WORKS OF THE BIRMINGHAM CORPORATION.

WE publish in the present number of the JOURNAL the first instalment of a series of articles and illustrations by which we propose to describe the gas-works of the Corporation of Birmingham. The present issue of the plan and account of the Saltley works, to be followed next week by similar details in respect of the Windsor Street works, will be of especial use to intending visitors to Birmingham on the occasion of the forthcoming meeting of the British Association of Gas Managers to the great Midland town. It is scarcely necessary to make any comment here upon the verbal description of the Saltley works, which is given in another column, but attention may be directed to one or two of the more striking points. The condensing and scrubbing plant at Saltley is very complete and distinctive, and the same may be said with even greater force of the exhausting arrangements, among which will be found the largest reciprocating exhauster now in existence. The station is a very important illustration of an old manufacturing plant extended and modernized in accordance with a special design. It is now one of the largest works in the kingdom, and is being continually enlarged as the district supplied is becoming more and more thickly peopled. It is, of course, to be understood that this establishment, under the management of Mr. Haek, represents an entirely different section of the now united undertaking to that supplied from Mr. Hunt's works at Windsor Street.

Water and Sanitary Affairs.

THE Annual Report of the Metropolitan Board of Works made its appearance on Friday last. As usual, it is a well-written document, and gives a very clear and comprehensive review of the year's proceedings. With all the doings of the Board we do not necessarily agree, nor with all the ideas that find expression in the report. Several pages are devoted to the subject of the Metropolitan Water Supply, including a history of the Bill brought in by Sir Richard Cross, and the inquiry conducted by Sir William Harcourt's Committee. "The extravagant character of the compensation which the Water Companies would have received under the provisional agreements," is said to be clearly shown by the fact that £33,000,000 "was the price to be paid by the public for undertakings, the total cost of which, according to the report of the Select Committee, had not much exceeded £12,000,000." It is time this fallacious way of putting the question was abandoned. The £12,000,000 thus spoken of was already worth about seven per cent., while the £33,000,000 was based on three and a half per cent. The certainty that the seven per cent. would rise was also an element in the problem, while the interest of the stock to be created under the Bill could undergo no advance. Figures such as those quoted in the report of the Board have been made to dance before the public eye after a fashion which is simply delusive. The improved nature of the security may be a fair argument, and it may be urged that this was not sufficiently considered by Mr. E. J. Smith in his negotiations. But there can be no doubt that it was well considered by the Companies, and the question remains whether the latter were to be forced to sell their undertakings at a price less than that which they were willing to accept. The Board state the case with tolerable fairness when they say "it was proposed to create a three and a half per cent. stock, to be called Consolidated Water Stock, which was to be transferred to the water shareholders in such amounts as would produce to them annually the same income as they were deriving from their interests in the respective undertakings; such amounts of stock to be increased by additions made at various fixed periods during the succeeding twelve years, in respect of the prospective increase of the value of their interests." The only objection to be made to such terms—if it be an objection—is, that the income would be formally guaranteed. But the Board further try to show that the amount to be paid was too large, independently of the guarantee, which we submit was not the case. The only occasion for dispute was the comparative value of the security—in the one instance a guarantee founded on the rateable property of the Metropolis; and in the other on the assured success of a commercial undertaking which had passed through its period of trial, and was obviously entering on a career of prosperity. But even if the Board had been satisfied with the price, they would not have been content with the Bill, owing to "the imperfectly representative character of the proposed Water Authority." Looking forward to the scheme shadowed forth by the report of Sir W. Harcourt's Committee, we now read: "The Board can only express the hope that the measure to be introduced will be of a nature to satisfy the reasonable requirements of the public, and to lead to an equitable and permanent settlement of the question." Perhaps Sir W. Harcourt may himself be thankful that there is little chance of his Bill seeing daylight in the present session of Parliament.

The annual dinner given by the Chairman of the Metropolitan Board is an occasion when something of note may possibly be said, but we do not find anything very remarkable in the utterances of the distinguished persons who spoke at the banquet in Willis's Rooms on Saturday night. Mr. Shaw-Lefevre, in replying to the toast of "Her Majesty's Ministers," is said to have congratulated the Metropolitan Board of Works on the fact that there never was a time when the relations of this body with the Government "were more friendly than at the present time." The Speaker of the House of Commons said "he had often thought it was passing strange that whenever this great community wanted to have better water or brighter light, to construct a bridge or make a road, they must come to Parliament." From sundry other remarks made by Mr. Brand, it would appear that his experience as Speaker of the House makes him earnestly desirous that Local Authorities should be allowed greater liberty in the settlement of their affairs, so that they might give less trouble to the Legislature. This might answer tolerably well, so long as the Local Authorities left other people alone; but we fear if they were

allowed to settle matters after their own fashion, they would sometimes do strange things. Supposing the Water Companies handed over to their tender mercies, we wonder what would be the result! There may be some things in which Parliament has perhaps interfered rather more than is desirable, as signified by Sir James Hogg in his complaint that the Legislature had "manacled" the hands of the Board, so that the latter had found it impracticable to carry out certain important street improvements. There is apparently some ground for complaint on this score, the conditions imposed on the Board being so stringent as to be fatal to anything like satisfactory progress. The position of the Board is certainly a remarkable one, its powers being derived, as the Chairman states, from "at least one hundred Acts of Parliament." It would indeed be wonderful if there were no red tape where there is so much law. Even the Egyptian obelisk could not be set up on the Embankment without an Act in that case made and provided.

A paragraph in Lieut.-Col. Bolton's monthly report, just issued, states that the New River Company "are quite prepared to give constant supply, when called upon to do so by the public authorities, throughout the whole of their district." Considering that the population within the district of this Company is estimated at a million, the announcement is one of peculiar importance. In the annual report of the Metropolitan Board, the subject of the constant supply is touched upon in a way which is not very hopeful. A notice from the Kent Company of their intention to provide a constant supply of water in further parts of the parishes of Woolwich and Charlton is said to be "the only notice which the Board have received during the year, of the intention of any Water Company to extend the system of constant supply." But how is it that there are no notices issued by the Board? They admit that the Companies are making progress, but the Board will not do anything to accelerate the work.

Lord Norton stands amazed at the subtleties of English law, whereby—according to his lordship's view of the matter—the Birmingham District Drainage Board are enabled to do what the Council of the Borough of Birmingham were prohibited by injunction from doing. The injunction was a perpetual one granted against the Birmingham Town Council, restraining them from permitting the sewage of the borough to flow into the River Tame, so as to occasion a nuisance to the plaintiffs. But the sewage outfall and intercepting works have since been taken over or purchased by the newly created Birmingham, Tame, and Rea District Main Sewerage Board, having jurisdiction over the borough of Birmingham and some adjacent localities. Lord Norton therefore sought to have the decree in the former suit made binding on the new Board, but the Court of Appeal, as appears from the report in another column, decided against his lordship. It was observed that in the old suit the injunction was only against the Council, their servants, workmen, and agents, and "did not run with the land." Hence if the land were sold, the injunction would not affect the purchaser. If the latter committed a nuisance, a fresh action could be brought against him; but he would be in no way bound by the former proceedings. Lord Norton has sought consolation in a letter to *The Times*, but rather exaggerates his grievance when he says that new proceedings cannot be taken against the former owners, as the latter "are merged in the new and larger ownership." His lordship cannot proceed against the Birmingham Town Council, but he has the same chance with the new Board that he had with the old one, supposing the new authority to be offending in an equal degree. The only hardship of which his lordship can properly complain is that, under the terms of the injunction, a new proprietorship necessitates fresh proceedings without reference to the past.

SALES OF GAS SHARES.—On Friday, the 13th inst., Messrs. J. J. Burnett and Sons sold by auction, at Southampton, five original £50 fully paid 10 per cent. shares in the Southampton Gas Company at £85 each, and five £20 shares (5 per cent.) at £20 each.—On Wednesday, the 18th inst., Messrs. Pendered and Son put up to auction some shares in the Wellingborough Gas Company, which, after a spirited competition, were disposed of at the following prices:—5 £25 fully paid "A" shares, at £50 15s. each; 1 do., at £50 17s. 6d.; 2 £25 "B" shares (£15 paid), at £31 10s. each; 2 do., at £31 5s. each; 1 do., at £32 12s. 6d.; 1 at £32; and 1 at £31 17s. 6d.

PROPOSED PURCHASE OF THE KIDDERMINSTER GAS-WORKS BY THE TOWN COUNCIL.—At the meeting of the Kidderminster Town Council last Wednesday, a notice was on the agenda paper, that application be made to Quarter Sessions for an order to inquire into the accounts of the Kidderminster Gas Company. The notice was, however, withdrawn, for the reason that a letter had been received from the Company (in reply to a communication from the Council) stating that the Directors were willing to treat with the Corporation for the sale of their undertaking on fair and equitable terms.

THE BIRMINGHAM CORPORATION GAS UNDERTAKING.

In view of the forthcoming meeting of the British Association of Gas Managers, which will take place in Birmingham next month, we have had prepared—from plans kindly placed at our disposal by Mr. Charles Hunt and Mr. Henry Hack, the Engineers respectively of the Windsor Street and Saltley works—two lithographs, showing the present disposition and contemplated additions to these, the two principal gas manufacturing stations of the Birmingham Corporation. The plan of the Saltley works accompanies the present number of the JOURNAL, while that of the Windsor Street works will appear next week.

By the purchase of the two local Gas Companies in 1875 the Corporation of Birmingham acquired five works—viz., the Windsor Street and Fazeley Street works of the Birmingham Gaslight and Coke Company; and the Saltley, Swan Village, and Adderley Street works of the Birmingham and Staffordshire Gas Company. These had in the aggregate a manufacturing capacity of $14\frac{3}{4}$ million cubic feet per diem, and storage for a little less than 12 millions. For a considerable time previously, however, the growing gas consumption had indicated the necessity for further extensions; and, in particular, the Birmingham Company had made several abortive attempts to obtain additional parliamentary powers, and were at the time of the transfer promoters of a Bill by which it was sought to raise further capital, and acquire a large tract of land for the construction of new works. To meet this pressing need was the first care of the newly-constituted Gas Committee of the Corporation, and they addressed themselves to the task with considerable energy. After due deliberation it was resolved, as a first step, to develop the Saltley works to their fullest extent for the purposes of manufacture. These works, which were commenced in 1857 and started in 1858 by the Birmingham and Staffordshire Company—the late Mr. J. E. Clift being at that time their Engineer—occupy 17 acres of ground, between the Midland Railway and the Warwick Canal, direct access being obtained by the railway to the important coal-fields of Derbyshire and South Yorkshire. By Mr. Hugh Young, who, as our readers are aware, was for many years Chief Engineer of the Company, the works were considerably enlarged, so that at the time of the transfer they were of a sufficient capacity for a production of $5\frac{1}{2}$ million cubic feet per day. Upon Mr. Henry Hack, the present Engineer of these and of the Swan Village works, devolved their further extension and completion; and they are now capable of producing upwards of $8\frac{3}{4}$ million feet of gas per diem—thus entitling them to rank amongst works of the first magnitude, whilst the general arrangements are such as to enable the manufacture in all its details to be carried on with the utmost possible economy. At the same time large additions were made to the storage plant. Upon some newly-acquired ground at Nechells, to which further reference will be made, a telescopic gasholder, capable of containing upwards of 2,100,000 cubic feet, was at once erected, from the designs and under the superintendence of Mr. Hunt, and now forms an adjunct to the Saltley works. Following this a similar one was erected at the Windsor Street works—details of which will be found illustrated in “King’s Treatise on Coal Gas.” And, lastly, two of the existing holders at the Saltley works were, from the designs and under the direction of Mr. Hack, converted from single into double-lift holders, by which the capacity was increased to over 2 million cubic feet each, or nearly double. As a net result of these operations, and of minor improvements at the various other stations, the total manufacturing power of the undertaking, after deducting the Fazeley Street works, which had in the meantime been abandoned, was raised by the end of 1879 to 18 million cubic feet per diem; and the storage to $17\frac{3}{4}$ millions—being an increase during the four years in the former of over 22 per cent., and in the latter of nearly 48 per cent. A further addition of $1\frac{1}{2}$ million cubic feet has since been made to the storage, by the substitution at the Swan Village works of a 2 million feet holder, designed by Mr. Hack, for several smaller ones which have had, for various reasons, to be abandoned. As a proof that these extensions were by no means in excess of the requirements of the undertaking, it may be mentioned that in 1879 the greatest daily consumption had reached a total of over 19 million feet. It therefore became necessary to consider the question of making further provision.

Under the able guidance of their then Chairman, Alderman (now the Right Hon. Joseph) Chamberlain, M.P., the Gas Committee had, at the outset, completed the purchase of 31 acres of land at Nechells, which had been fixed upon by the late Birmingham Company as the site of their proposed new works, and a provisional agreement for which had been entered into by them. This land is situated in close proximity to the Saltley works, adjoins the Warwick Canal, is adjacent to two lines of railway, and is in all respects a most eligible site for gas manufacture. As already stated, upon a portion of it a commencement has been made by the erection of a gasholder; while, of the remainder, about 11 acres have been fenced off and granted as a temporary loan to the public for a Recreation Ground, the expense of maintaining which is borne by the gas undertaking. Almost immediately afterwards the Committee availed themselves of an opportunity that offered of acquiring about 21 acres of land adjoining the Windsor Street works, a portion of which was at once resold to the London and North-Western Railway Company, to enable them to construct a siding into the gas-works. The Corporation thus became possessed of two most admirable and extensive sites for future growth, and their foresight in securing them in anticipation of their requirements is already apparent.

Referring specially now to the plan of the Saltley works, we shall proceed to notice some of the additions which have been made since the transfer of the works to the Corporation.

Retort-Houses.—Retort-house No. 3 has been extended from the dotted line in the direction of the Midland Railway, and there have been provided therein 684 additional mouthpieces, in settings of nines. In the extension of this house the stage-floor system has been adopted, tramways being provided on the stage level, to facilitate the unloading of coal to the retorts; and also on the coke-floor level, for the removal of the coke to the canal basin. On each side of the house are covered ways for the coal trucks, the coal being thrown from the trucks into hoppers, from which it falls to the stage floors in the position required. In retort-house No. 1 a further addition of 104 mouthpieces has been made by altering three of the ranges from settings of fives to settings of sevens, bringing the total number of mouthpieces at the works up to 1956.

Condensers.—C2 and C3 on the plan form the extensions which have recently been made to the condensing plant. Condenser C2 is of the vertical annular type, the external pipe being in a corrugated form, by which a larger cooling surface is obtained on the same circle. Condenser C3 consists of end rectangular chambers and fourteen rows of 9-inch pipes, six in a row. A brick water-tank is built around the lower portion, by which it can be converted into a water condenser in hot weather. By an arrangement of valves this condenser can be used to its full extent or in sections, to suit the varying temperatures and make of gas.

Scrubbers.—To the old scrubbing and washing plant, “tower scrubbers,” S1 and S2, have been added. S1 consists of four, 15 feet diameter by 60 feet high; S2 being 20 feet diameter by 60 feet high.

Exhausters.—The exhausting plant has been increased by one of Körting’s steam-jet exhausters for 100,000 cubic feet per hour, in building E3; and a mechanical exhauster for from 250,000 to 300,000 cubic feet per hour of the double-acting piston and cylinder type, consisting of three cylinders 37 inches in diameter, 2 feet stroke, worked from one shaft by vertical compound condensing engines. Adjoining the house (E2) for this new exhauster are situated a boiler-house, B2, and pump-house, H2, containing the requisite additional boiler power; also tar, liquor, water pumps, and hydraulic machinery.

Purifiers.—The purifier-house for purifiers P2 and P3 is a brick building 235 feet long by 90 feet wide. The purifiers consist of eight oxide boxes, 30 feet by 30 feet by 5 feet deep, and four lime purifiers, 30 feet by 30 feet by 5 feet deep. They are on the ground level. The covers are lifted by central rams; six hydraulic cranes for lifting the material from the purifiers being provided on the revivifying floor above. The hydraulic pumps and machinery for working the same are in building H2 on the plan, with the accumulator adjoining. Each set of the four oxide purifiers is fitted with a 24-inch improved centre-valve, by which either three or four purifiers may be worked in succession—the ordinary centre-valve enabling the working of but three purifiers at a time. For the lime purifiers specially designed wooden disc-valves have been provided. The old oxide purifiers, P1, are 24 feet square, and were formerly in the open, but have since the transfer been covered in by a revivifying floor above them, the floor being again roofed over with an iron and slated roof. The purifier covers are lifted by chains connected to hydraulic rams placed at one end of the building, one over each line of purifiers, and the material is raised from the purifiers to the revivifying floor by hydraulic cranes similar to those used in the new building. In connection with this block of purifiers there were originally four lime purifiers 32 feet by 16 feet; but these have been removed to the Swan Village works, and replaced by three 40 feet by 30 feet purifiers, 5 feet deep, lifted with centre rams by the same hydraulic power which works the purifiers just mentioned, and which is provided in building H1 on the plan.

Station Meters.—The measuring capacity at the works has been increased by one 100,000 cubic feet per hour meter in building M2, and the substitution of a 100,000 cubic feet per hour for a 60,000 cubic feet per hour meter in building M1.

Gasholders.—The extension to the storage consists in the erection of a new telescopic gasholder for upwards of 2 million cubic feet, upon the land at Nechells, above referred to, marked No. 5 on the plan; and the conversion of holders Nos. 2 and 3 from single into double-lifts, whereby a further increase of 2 million cubic feet was gained. As the original design did not contemplate telescoping, more difficulty than usual was experienced in accomplishing this alteration.

Generally.—In planning the extensions it was found impracticable to keep all the plant of one description together (as is desirable in designing new works), on account of the position occupied by some of the old plant. It was therefore decided to divide the works into two sections; the gas made in the new retort-house being condensed, purified, and measured in the old plant; while that produced in the old retort-houses passes through the new portion of the apparatus just described; the two streams uniting after passing the meters.

WALLASEY LOCAL BOARD GAS AND WATER SUPPLY.—Last Thursday the adjourned quarterly meeting of the Wallasey Local Board was held, when Mr. Martin moved the confirmation of the minutes of the Gas and Water Committee, which contained a recommendation that £300 should be set apart towards the depreciation fund, two-thirds of the sum being on account of water and the remainder on account of gas. Mr. Davies, in opposing the proposal, observed that the gas and water works, so far from being a depreciating property, were now worth 50 per cent. more than they originally cost. He considered it an absurdity to lay aside the small sum recommended by the Committee, seeing that the Board were about to spend £15,000 or £20,000 upon the gas-works. He contended that the sum should be reduced to the amount which had already been spent—viz., £117. It was stated by the Chairman that the depreciation fund on account of the gas and water works already amounted to £5000. The amendment was carried.

THE DISTRIBUTION OF GAS.

WE have received from MM. Giroud et Cie., of Paris, their new Catalogue, or Album,* of apparatus used in regulating the pressure of gas, for which this firm is celebrated, and of other specialities representing the latest improvements in the French practice of gas distribution and utilization. M. Giroud has been well known as a manufacturer of the so-called rheometers since 1867, when he first published a description of his inventions. These inventions, so far as they relate to regulating the pressure and flow of gas are divisible into three classes. First, the rheometer itself, which gives a constant rate of emission from a single burner, whatever may be the pressure in the pipes. Secondly, we have the regulators intended to give a constant pressure in a section of pipes and burners cut off from the rest. Lastly, there are the station governors, calculated to automatically modify the pressure in the outlet-main of the works, so as to keep a constant pressure in the district of supply.

Many varieties of wet or dry rheometers are illustrated in the present volume, which also shows the newest Paris models of high-power Argand or clustered flat-flame burners for street illumination. MM. Giroud apply the rheometer in the construction of a jet photometer of peculiar design, which, unlike the similar apparatus in use in this country, is not intended to give the illuminating power of gas by simple inspection, but appears to hold a position between the ordinary jet photometer and the illuminating power meter. They also utilize the rheometer in a small appliance termed by them the "burner-analyzer," which is intended to indicate the rate of consumption of a burner of any size without the use of a meter, and to show also the various effects of pressure upon different kinds of burners. By the use of this instrument MM. Giroud have arrived at the conclusion that there are in reality no burners of fixed rates of consumption, such as 5 feet, 6 feet, or 10 feet per hour, without the addition of a regulator of some kind to ensure the required rate in any particular case; the burner by itself having only the power to influence the form and intensity of the flame. It is impossible to overrate the importance of this truth, which, although well known to many persons, is not appreciated nearly as it should be by consumers of gas, who are the individuals most interested in the question. Consumers are generally either at the mercy of itinerant vendors of burners, who demand high prices for very ordinary goods, or they consider that anything is good enough wherewith to burn gas, being meanwhile ignorant of the great fact that a burner may consume 10 feet of gas an hour and give less satisfaction, both as regards light and comfort in use, than a better burner consuming less than half this amount.

MM. Giroud describe in great detail their principle of regulating the pressure of gas in the mains by the use, with the special type of compensating equilibrium station governor, of a so-called distributor situated in the middle of the district supplied, from which a small return pipe is carried back, independently of the gas-main, to the governor at the works. The initial pressure at the works is thus always regulated, by the gas of the return pipe, to give precisely the amount of gas required from time to time by the exigencies of the service. In this way it is claimed that all the advantages of having gasholders in the centre of the area of supply can be attained.

It is quite impossible, in the limited space to-day at our disposal, to deal minutely with the ingenious plans of MM. Giroud in respect of the distribution of gas. Suffice it to say that the present book contains much information on this important subject which is of general interest to gas engineers, irrespective of the descriptions of the special forms of apparatus to which MM. Giroud's attention is naturally confined. The Album is generally well got up and clearly illustrated.

In the obituary column of *The Times*, last Wednesday, the following notice appeared:—"On the 16th May, at Elm House, Clapham Common, James John Stevens, late of Darlington Works, Southwark, in the 75th year of his age."

DEATH OF MR. J. WATSON.—The death is announced, on Monday last week (the 16th inst.) of Mr. James Watson, formerly Engineer of the Crystal Palace District Gas Company, and for the last five years Lessee of the Herne Bay Gas-Works.

ROCHDALE CORPORATION WATER SUPPLY.—At the last meeting of the Rochdale Town Council, the abstracts of the borough accounts for the twelve months ending March 31 were presented. These contained, among others, those of the Water-Works Department of the Corporation. From them it appears that the Council during the year borrowed and re-borrowed for the purposes of the water-works the sum of £58,230, the greater part of which was spent upon the Spring Mill reservoir. The net loss on the works was £9531, or about £1000 more than the previous year. An increase of £570 was shown on the gross revenue from water supply, but the deductions for empty houses and arrears not collectable were £170 more than during the corresponding period, therefore reducing the net increase to £400. At this rate it will consequently be long before the receipts overtake the expenditure, the deficiency at present being £9500 per annum, with a prospect of considerable increase when the Spring Mill works are completed, and the repayment of the money borrowed commences. Perhaps, however, with an improvement in trade, the receipts from water supplied for manufacturing purposes will increase more rapidly than they appear to do at present. Last year the receipts from this source were £2363, as against £2174 in the previous year. The total cost of the water-works up to March 25, 1881, has been £541,505, no less a sum than £466,000 having been expended by the Corporation since the works were purchased from the old Company in 1866. Cowm Brook reservoir now appears among the completed works, the total amount expended thereon having been £281,932. On the Spring Mill reservoir £157,857 has been spent, and the accumulated interest brings up the total expenditure on this reservoir to £182,268.

* "Album des Régulateurs et Rhéomètres Spéciaux à l'Industrie du Gaz." Paris, 1881.

Notes.

THE TREATMENT OF AMMONIACAL LIQUOR.

The *Compte Rendu* of the last meeting of the Société Technique de l'Industrie du Gaz en France contains a "Note" by M. Marché on the manufacture of sulphate of ammonia by a process which, unlike those in general use for this purpose, is applicable to small gas-works. The process consists of the employment of crude sulphate of alumina, or alum-cake, instead of sulphuric acid, as the reagent. This material costs about 2s. 6d. per hundredweight in the centres of production, and the authors of the process assert that in consequence of the high tariff imposed upon acids conveyed by rail, sulphuric acid would be less costly in the form of sulphate of alumina than in that of chamber or concentrated acid. The apparatus employed consists of (1) a wooden vat which is filled with liquor, to which the reagent is added in the proportion of 4.5 kilos. per degree per hectolitre, and after standing from 10 to 12 hours the liquor is converted into sulphate of ammonia; (2) an evaporating pan of sheet iron, in which the concentration of the liquor is effected by means of the waste heat from the ovens; (3) a small cask in which lixiviation is effected—the mother liquor returning into the pan and mingling with the liquor of other operations. The reaction is as follows:—The liquor contains sesqui-carbonate of ammonia, and, in feeble proportion, hydrosulphate of ammonia. On coming in contact with the sulphate of alumina, the two salts are brought into the state of sulphate of ammonia, which remains in solution in the liquor. A precipitation of hydrate of alumina takes place, which completely purifies the liquor, while the carbonic and hydrosulphuric acids are liberated. The alumina is precipitated completely in 12 hours, and increases so rapidly in density that it may be taken out with the shovel when the cask is half empty. Therefore, it is sufficient to remove every three days the excess of dense precipitate, which really contains but little sulphate of ammonia—not more than 2 per cent., in fact. The reaction is therefore complete. The advantages of the process are that the expense of fitting up the appliances is extremely trifling—there is not any expense for fuel, no supervision is needed, there is no wear and tear of plant, nor is any manipulation of the acids required, while the weakest liquors are utilized. The process is applicable to the smallest works, and also to those the farthest removed from the works where the acid is produced, and with it there is the possibility of obtaining sulphate from the first distillation, owing to the purification effected by the reagent. With the same apparatus may be produced chloride of ammonium containing 30 per cent. of ammonia, while the sulphate contains only from 24 to 25 per cent.

THE DIFFUSION OF CARBOLIC ACID IN WATER.

The extraordinary permanence of the taste of carbolie acid when largely diluted with water was illustrated during the past winter at Newark, New Jersey. The inhabitants of this town having noticed a decided flavour of carbolie acid in the drinking water, which is taken from the Passaic River, the contamination was eventually traced to a paper-mill ten or twelve miles up the stream. At this mill carbolized paper was occasionally manufactured, the process consisting of the saturation of paper with the best liquid carbolie acid, such as is used in medicine. Some of the waste and torn sheets of this paper were stored for at least six months in the loft of the mill. Not over a gallon of carbolie acid had originally been absorbed by this parcel of waste, and at least 30 per cent. of the liquid must have evaporated in the time named, leaving not more than 7 lbs. of acid in the material when it was decided to work it up again. As it had become dusty, it was washed in the mill-pond, the outlet from which passed into the river, which was then running with a volume of about 150 million gallons daily, and in which the taste of carbolie acid became distinctly perceptible a few days afterwards at Newark, although a portion of it had been aerated by passing over rapids and dams for four miles, and afterwards through seven miles of pipes. It should be stated that there was no perceptible smell of carbolie acid in the waste paper before it was washed. The above narrative is well authenticated, and adds another example to prove the extraordinary contaminating power of carbolie acid, or matters containing it, when introduced into water. The persistence of the taint from coated main-pipes is well known, in which the actual proportion of the contaminating substance may be as small as in the foregoing case.

THE STORAGE OF ELECTRICITY.

It is reported that M. Faure has made material progress in the storage of electricity by his improvements on the so-called secondary battery of M. Gaston Planté. In its essence this battery consists of a means whereby a current of electricity from some other source is caused to effect certain changes in the materials composing the battery, which represent the strength of the current. This exciting current being out off, the changes it has produced in the secondary battery remain until a proper connection is arranged, whereupon the materials quickly resume their original condition, setting free, in so doing, a current of electricity nearly equal to that which was used in altering their state. M. Faure makes his battery of two strips of lead, covered with minium or other insoluble lead oxide, and then sheathed with felt firmly secured by lead rivets. The two electrodes are placed near each other in water acidulated with sulphuric acid. A battery composed of these cells, weighing 150 lbs., is said to be capable of storing up sufficient electricity to give out again in amount equal to 1-horse power of actual force for an hour. There is, of course, nothing continuous or recuperative

in these cells—they merely receive a charge, in the same manner as a Leyden jar, to give it up again, less waste; but unlike the Leyden jar, which discharges itself instantaneously, the secondary cell occupies some time in doing so. The storage is described as being very effective, a battery having recently been charged in Paris and then removed to Brussels, where it was used the next day without re-charging. And more recently M. Faure sent a charged battery from Paris to Sir W. Thomson at Glasgow, the box containing the cell being less than one cubic foot in capacity, but holding a reserve of power of nearly a million foot-pounds. It is proposed to sell electric force in a portable form by the aid of these cells, the batteries being charged at a central station by an economical source of power, such as a large fixed steam-engine, and sent out fit for use to drive small machinery, or to supply electric lighting in private houses. Nothing is said of the steadiness or otherwise of the discharge, on which evidently much depends. The cost of power distributed in the proposed manner to the consumer is estimated at 1½d. per horse power per hour.

THE DANGER OF WATER GAS.

A striking illustration of the poisonous nature of water gas was lately furnished in Brooklyn, U.S., on the occasion of the death of a German servant-girl who had recently taken service in that place. The district in which the deceased was employed was supplied with gas by the Citizens' Gas Company, who use a proportion of water gas as manufactured by the Fulton Municipal Company. One morning, a few days after the girl had gone to live in Brooklyn, her body was found in her bed-room under somewhat extraordinary circumstances. There were two gas-brackets in the room, and one burner was found burning, the other being turned off. Pervading the chamber was a strong smell of gas, which was discovered to proceed from a small leak at the joint of the unlighted burner. The deceased was fully clothed, with the exception of her shoes and stockings, and as she had evidently been dead some hours, it was conjectured with reason that she had been overcome by the escaping gas from one bracket shortly after having lit the other burner preparatory to retiring for the night. The door and window of the room had previously been closed, and therefore, although the escape which had proved destructive to life must have continued in the closely shut-up apartment—in which moreover another jet was burning—during many hours, the mixture of gas and air did not attain explosive proportions before the deplorable occurrence was discovered, in the usual course, by the absence of the victim from her work next morning. There are no available data for arriving even approximately at the amount of gas which was present in the air of the room when the girl was killed. The odour of carburetted water gas is so objectionable that it is improbable that there could have been much of it in the apartment when the door was closed. It is believed that the gas supplied in this district of Brooklyn contains usually but about one-third of its volume of water gas, in which again carbonic oxide, the active principle in the present case, is not present in greater proportion than about 40 per cent., and yet the extraordinary swiftness of the gaseous poison was only equalled by its insidious character—both being fully exerted when, to the senses, there was little evidence of a leak, and still less of indication of danger from explosion. There have been many instances of almost unaccountable death from the escape of carbonic oxide contained in water gas, but the last is by far the most striking, as showing that the greatest danger to life may exist without the presence of a warning sign appreciable to the senses of an adult individual.

A CRITICAL time for gas suppliers is at hand, if more than the usual amount of reliance is to be placed on one of the utterances of the American press most recently brought under our attention. The *Brick, Tile, and Metal Review*, in its first number, published during March, at Pittsburgh, U.S.A., thus notices the Edison light: "Mr. Edison is certainly a gentleman of unflagging zeal and unbounded confidence in his ability to overcome all obstacles which may appear in his pathway to success. Despite the repeated failures and disappointments which he has encountered in his endeavours to perfect his electric light, he has persevered, and now announces that within 90 days wonderful things may be looked for. 'There are, he says, 300 local Edison Electric Light Companies organized in cities and towns in the United States, with ample capital, prepared to set to work as soon as he gives the word 'ready'; and that within three months 300 machine shops will be working exclusively on material for the Edison light. Each one of these Companies, Mr. Edison says, will want to be supplied with lamps and machines by the parent Company first, and preparations are now being made, under his personal supervision, for rushing the manufacture of those articles. He states that 400 million dollars are invested in gas in this country, making it the largest manufacturing interest in the world, and the one which pays the best dividends, never falling below 10 per cent., and frequently largely exceeding that rate. 'When we move on this enemy,' says Mr. Edison, 'we have got to move quick, and we are ready to. Every plant will be put in by our own engineers.'" With less than the ordinary amount of "Hail Columbia!" style, our youthful American contemporary concludes: "We hope Mr. Edison is not again to be disappointed in his expectations, and that his light may turn out to be all, and more than he claims for it. But past experience has taught us to await results before going into ecstasies over the matter. There is still a chance of failure."

CRAYS GAS COMPANY.—The following is a list of tenders received for the erection of a telescopic gasholder at this Company's works, at St. Mary Cray, according to particulars recently published in our advertising columns:—Laidlaw, Sons, and Caine, £2357; Willey and Co., £2153; J. and W. Horton, £2150; Newton, Chambers, and Co., £1982 10s.; W. C. Holmes and Co., £1969; The Horseley Company, £1950; S. Cutler and Sons, £1896; J. Tildesley, £1725; D. Howard, £1675; Ashmore and White, £1672; J. T. B. Porter and Co., £1624; E. Cockey and Sons (accepted), £1601. Mr. Alfred Penny, C.E., of 20, Abingdon Street, Westminster, is the Company's Engineer.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—Absence from town has been the cause of my omission to notice the letter of Mr. Longworth, that appeared in your issue of the 10th inst. In reply, I beg to say that I had previously received the instructions of the Committee to send to each member a copy of proposed alterations to the rules, and this will accompany the programme of the meeting in the course of a few days.

With reference to the letter from Major Dresser, in your last issue, it is a matter for regret that the various meetings to which he refers should have been so inconveniently arranged. As regards that of our own Association, however, I may say that the date is invariably fixed at the previous General Meeting, and is consequently known a year beforehand; whereas the date for the annual meetings of the foreign Societies are, if I am rightly informed, determined upon subsequently, by their respective Committees.

W. H. BENNETT, Secretary.

22, Great George Street, Westminster, May 21, 1881.

METER TESTING.

SIR,—In the JOURNAL of the 10th inst. you gave a table of gas-meter testings at the Glasgow exhibition, and the report, explaining certain signs in the table, says that a meter passing 102 feet and registering 100 feet would be 2 per cent. fast; also that a meter passing 99 feet and registering 100 feet would be 1 per cent. slow. I intended writing last week, but left it for your Edinburgh correspondent to explain that the first would be slow instead of fast, and the second fast instead of slow. No doubt, many would think this too small a matter to write about; but considering that the JOURNAL has a very wide circulation, and many would be likely to read a scientific report of the kind—and as assistants in testing meters at our many offices, under the Sale of Gas Act, would put into practice the theory above mentioned—it cannot be too soon or too strongly contradicted. A meter 2 per cent. either way would not make any difference, as it would be correct within the meaning of the Act. But supposing a consumer disputed his account, and the meter when tested passed 100 feet and registered 80 feet, that meter, according to the Glasgow theory, would be 20 per cent. fast, whereas it would be really 20 per cent. slow, making too wide a difference to be lightly disregarded. Of course, a single meter might be passed over, but it must be remembered that there are some hundreds of meters sent to the meter testers every quarter, for the purpose of getting certificates of the state of the measurement, whether accurate or not, and if this topsy-turvy way of calling fast meters "slow," and slow meters "fast," came into use, the loss and inconvenience would be something considerable. Would it not be better in future for jurors to master their subject before appearing in print?

London, May 19, 1881.

R. P.

SIR,—Your Edinburgh correspondent has detected an obvious error in the report of the jurors on instruments for the measurement and regulation of gas; and I take the earliest opportunity of correcting it, especially as the error makes the report inconsistent with the tabulated results. The paragraph on p. 790 of the JOURNAL of the 10th inst., and about the middle of the first column, should read thus:—"In the table the sign + indicates that the meter registers fast; - slow, and 0 correct: + 2 means 2 per cent. fast—that is, the meter passed only 98 feet for every 100 feet registered by the index; - 1 means 1 per cent. slow—or 101 feet passed for every 100 feet registered." In the paragraph commencing "Considerable variations," near the foot of the same column, the words "consumer" and "vendor" should be reversed.

Glasgow, May 21, 1881.

WILLIAM WALLACE.

WASHERS AND SCRUBBERS.

SIR,—In the JOURNALS bearing date May 10 and 17, I notice with much interest the remarks on "Washers and Scrubbers," especially the remarks of Mr. J. G. Hawkins: "We introduce into our scrubbers here 25 gallons of pure water per ton of coal carbonized; and it issues forth fully at 10 oz. strength. Our total make of liquor is not less than 36 gallons per ton of 10 oz. liquor." I submit that Mr. Hawkins and others who are going in for washing and scrubbing as a purifying agent, have omitted one point, which must be the basis of comparison between any system of scrubbing and washing—viz., the quantity of "virgin" liquor produced at each works per ton of coal carbonized. I have found, in carbonizing coal of different qualities, that the "virgin" liquor ranges in quantity and quality from 21 gallons of 7 oz. to 13 gallons of 11 oz. per ton.

I infer from the figures given that the 36 gallons of 10 oz. liquor per ton of coal carbonized, are made up of 25 gallons of pure water and 11 gallons of "virgin" liquor; but 11 gallons of "virgin" liquor is a very low estimate, especially where a percentage of cannel is used. The most important question for consideration is, What soluble gases, per ton of coal carbonized, does 25 gallons of pure water absorb? Where the old parliamentary standard is in use, such liberties cannot be performed on the gas; a more scientific method is adopted, which requires greater attention to the quality of the gas than the supposed quality of the tar and liquor.

May 20, 1881.

WILLIAM LYON.

SIR,—I have joined in a hearty laugh at my own expense on finding myself so neatly nonplussed by Messrs. Dempster. Since reading the correspondence which appeared in your last publication, I have perused their circular, and find almost nothing therein to warrant an interpretation other than that I had put upon it. I am pleased, however, to find that such large yields of ammonia are obtainable elsewhere, and as I am getting the uttermost fraction from the coals in use here, it is clear that I must go into other markets if I am to show higher results.

Leeds, May 21, 1881.

HENRY WOODALL.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION 1881.
PROGRESS MADE TO SATURDAY, MAY 21.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Commons Bill	March 29	April 7	May 13	..	..
Alnwick Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 8	March 28	..
Barrow-in-Furness Corporation Bill.	Lords	Commons Bill	May 5	May 13	May 19	..	..
Beverley Water Bill	Commons	Jan. 27	Jan. 28	Feb. 7	April 5	April 28	..
Bingley Water and Improvement Bill	Lords	Commons Bill	May 5	Feb. 2	April 8	May 3	..
Birkenhead Corporation (Gas and Water) Bill.	Commons	Jan. 27	Jan. 28	May 12	March 22	April 7	..
Bradford Water and Improvement Bill	Lords	Feb. 4	Feb. 7	Feb. 15	..	..	..
Bray Township Bill	Commons	Commons Bill	March 25	April 4	March 11	March 24	..
Brighton and Hove Gas Bill	Lords	Jan. 27	Jan. 28	Feb. 2	March 24	April 7	..
Cambridge University and Town Gas Bill	Commons	Jan. 31	Feb. 2	May 19	March 18	April 8	..
Caterham Spring Water Bill	Lords	Commons Bill	April 8	Feb. 4	..	..	..
Cheltenham Corporation Water Bill.	Commons	Feb. 18	Feb. 18	Feb. 25	..	..	..
Cleator Moor Local Board Bill	Lords	Commons Bill	March 15	..	March 3	March 14	..
Colne and Marsden Local Board Bill.	Commons	Jan. 27	Jan. 28	March 21	March 22	March 25	..
Dudley Gas Bill	Lords	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
Dundalk Water Bill	Commons	May 10	May 11	..	..	..	..
Eastbourne Water Bill	Lords	Commons Bill	May 6	May 16	..	..	..
East London Water Bill.	Commons	Jan. 27	Jan. 28	Feb. 2	April 5	May 5	..
Egremont Local Board Bill.	Lords	Commons Bill	May 5	May 13	March 15	April 25	..
Fylde Water Bill	Commons	Jan. 27	Feb. 7	Feb. 14	March 15	March 21	..
Goole and District Gas and Water Bill	Lords	Jan. 28	Jan. 28	Feb. 3	..	..	..
Hexham Gas Bill	Commons	Lords Bill.	March 28	..	..	..	..
Holland (Parts of) and Sutton Bridge Water Bill	Lords	Commons Bill	April 1	April 8	March 22	March 31	..
Hyde Gas Bill	Commons	Feb. 2	Feb. 3	Feb. 15	..	..	..
Irvine Burgh Bill	Lords	Jan. 28	Jan. 31	Put off for six months	May 19	..	..
Kirkcaldy and Dysart Water Bill	Commons	Commons Bill	April 5	May 12	March 18	April 4	..
London Sea Water Supply Bill	Lords	Jan. 27	Jan. 28	Feb. 15	March 7	March 11	..
Lower Thames Valley Main Sewerage Board Bill	Commons	Jan. 28	Jan. 28	Feb. 8	..	..	..
Matlock Water Bill	Lords	Lords Bill	March 14	March 23	..	..	..
Oban Burgh Bill	Commons	Commons Bill	April 5	May 9	March 11	April 4	..
Paisley Water Bill	Lords	Jan. 27	Jan. 28	Feb. 2	March 11	April 4	..
Reading Corporation Bill	Commons	Commons Bill	March 31	April 8	May 10	May 13	..
Richmond Gas Bill	Lords	Jan. 27	Jan. 28	Feb. 9	March 18	March 29	..
Ryton Local Board (Water) Bill	Commons	Commons Bill	May 5	May 13	May 20	April 25	..
Sevenoaks Gas Bill	Lords	Jan. 27	Jan. 28	Feb. 8	March 18	May 13	..
Sheffield Water Bill	Commons	Commons Bill	March 31	April 8	May 10	May 13	..
South Metropolitan Gas Bill	Lords	Jan. 28	Jan. 31	March 2	March 18	March 29	..
Stalybridge Extension and Improvement Bill	Commons	Commons Bill	April 1	Feb. 2	March 22	March 31	..
Stirling Water Bill	Lords	Jan. 31	Feb. 2	May 9	March 25	April 5	..
Westbury-on-Trym Gas (No. 1) Bill	Commons	Commons Bill	April 7	Feb. 14	March 25	..	..
Westbury-on-Trym Gas (No. 2) Bill	Lords	Jan. 28	Jan. 31	Feb. 7	..	..	..
Westgate and Birchington Gas Bill.	Commons	Commons Bill	May 17	Feb. 7	April 1	May 16	..
Woking Water and Gas Bill	Lords	Commons Bill	May 13	Feb. 7	April 1	May 12	..
"	Commons	Jan. 28	Jan. 31	..	..	..	..
"	Lords	Jan. 28	Jan. 28	March 14	..	..	..
"	Commons	Jan. 28	Jan. 28	Feb. 1	Preamble	not proved.	..
"	Lords	Commons Bill	April 1	..	..	..	..
"	Commons	Jan. 27	Jan. 28	March 2	March 22	March 31	..
"	Lords	Jan. 28	Jan. 28	Feb. 1	March 11	March 22	..
"	Commons	Lords Bill	March 25	April 4	..	..	..
"	Commons	Commons Bill	March 22	March 31	April 5	May 5	..
"	Lords	Jan. 27	Jan. 28	Feb. 4	March 4	March 21	..
"	Commons	Jan. 27	Jan. 28	Feb. 4	April 8	..	..
"	Lords	Commons Bill	March 29	April 7	May 12	May 16	..
"	Commons	Jan. 27	Jan. 28	Feb. 7	March 15	March 28	..
"	Lords	Commons Bill	March 25	April 4	April 5	..	..
"	Commons	Jan. 31	Feb. 2	Feb. 7	March 15	March 24	..
"	Lords	Commons Bill	March 22	April 4	April 5	April 8	..
"	Commons	Jan. 31	Feb. 2	Feb. 21	March 15	March 21	..
"	Lords	Commons Bill	March 11	March 21	March 31	April 4	..
"	Commons	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	..
"	Lords	Commons Bill	..	..	..	..	..
"	Commons	Jan. 27	Jan. 28	March 4	May 20	..	..
"	Lords	Commons Bill	May 19	..	..	..	..
"	Commons	Jan. 28	Jan. 31	Feb. 7	March 15	May 17	..
"	Lords	..	..	..	..	..	..
"	Commons	Jan. 31	Feb. 2	Feb. 7	..	..	..
"	Commons	Jan. 27	Jan. 28	Feb. 4	Bill withdrawn	..	..
"	Commons	Jan. 27	Jan. 28	Feb. 7	Bill withdrawn	..	..
"	Lords	Commons Bill	March 24	April 7	April 8	May 6	..
"	Commons	Jan. 28	Jan. 31	Feb. 7	March 11	March 22	..
"	Lords	..	..	..	..	..	..
"	Commons	Jan. 28	Jan. 31	Feb. 7	May 17	..	..

HOUSE OF LORDS.

TUESDAY, MAY 17.

A petition against the Beverley Water Bill was presented from Owners of lands, houses, and other property in the borough of Beverley.

HOUSE OF COMMONS.

MONDAY, MAY 16.

Requisitions to withdraw their petitions against the London Sea Water Supply Bill were presented from (1) Metropolitan Board of Works, (2) Westminster District Board of Works.

THURSDAY, MAY 19.

Requisitions to withdraw their petitions against the following Bills were presented:—

London Sea Water Supply Bill, from the Grand Junction Water-Works Company.

Stirling Water Bill, from (1) Owners of property and householders and inhabitants of St. Ninians, Newhouse, &c.; (2) Sir Henry James Seton Stuart, Bart.

FRIDAY, MAY 20.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill was reported without amendment.

HOUSE OF COMMONS COMMITTEE.

WEDNESDAY, MAY 18.

(Before Mr. F. W. KNIGHT, Chairman; Mr. JACOB BRIGHT, Mr. FREEMANTLE, and Mr. HAMAR BASS; Sir JOHN DUCKWORTH, Referee.)

SOUTH METROPOLITAN GAS BILL.

Sir E. BECKETT, Q.C., Mr. MICHAEL, Q.C., Mr. CHANDOS LEIGH, and Mr. O'HARA appeared for the promoters; Mr. BIDDER, Q.C., Mr. LEDGARD, and Mr. ALFRED CRIPPS for the Metropolitan Board of Works; Mr. SHIRESS WILL for Trustees under the will of Coles W. J. Child, deceased; and Mr. DRYDEN for Ellen Elizabeth Page Fryer and Sir Henry Page Turner Barron Barouch, petitioners against the Bill.

Sir E. BECKETT, in opening the case on behalf of the promoters, said the object of the Bill was to enable the South Metropolitan Gas Company to buy more lands, construct new works, raise further capital, and also to amend their Acts. The Company had been formed partly of themselves,

and partly by amalgamations with other Companies, under various Acts of Parliament, giving such power to amalgamate, in order to save keeping up an unnecessary staff, and also for the purpose of having larger works farther down the river—and, in fact, saving money in a variety of ways. The money to be raised by the present Bill, which was the principal point in question, required a little alteration in clause 4, which stated that the Company "may, in addition to their present capital, raise from time to time such further capital as they may require, not exceeding in the aggregate, including the premium"—which was manifestly an alteration suggested by Lord Redesdale—"received on the sale of such stock, £1,500,000." It originally stood at £1,000,000, not saying anything about the premium which was to be realized on the sales; but inasmuch as the Company were required to sell all their new stock by auction, and inasmuch as these sales by auction produced a considerable premium, Lord Redesdale thought it better to take the premium together with the capital, and to alter the clause as it stood at present. The history of the gas undertakings in London might for all practical purposes be dated from the year 1860, when there were within the metropolitan area no fewer than 21 gas companies. In that year a Bill was introduced, no matter by whom, which ultimately became a Bill of the Metropolitan Board, dealing with 13 of these companies, some of which were not under any general legislation before. It was not, however, worth while to trouble the Committee at present with the regulations that were then imposed upon the companies. In 1866 another Bill was brought in, which led to the appointment of a large Committee, which sat for a long time, and made sundry recommendations, the result being that when some Bills were before Parliament in 1867, introduced by the companies, another Bill was brought in, but by whom nobody clearly knew, for interfering with the companies. All the Bills were referred to a Committee presided over by Mr. Cardwell, and certain recommendations were made in a well-known report; but in the end none of the Bills were passed, owing to the companies not approving of the recommendations. In 1868 the same Committee was re-appointed, with the change of only one member. Then, again, there were several Bills before the Committee, and also a general Bill; and the latter Bill was passed, imposing practically a set of new regulations upon all the companies who thought fit to accept them. The most important of the recommendations which were so accepted in the Act was that the companies were to regulate and manage their proceedings under the inspection of certain persons who were called Referees. They were to be entitled to earn as near a dividend of 10 per cent. as they could. If their affairs became such that they were not able to pay this percentage, there was the power of application to the Board of Trade for the appointment of Commissioners who could revise their rates for the purpose of giving them a dividend approaching 10 per cent. If, on the other hand, their affairs became very prosperous, there was a similar power on the part of the local authorities of applying for the appointment of Commissioners, and the rates could be revised downwards. In 1869 the Imperial Company, who had been reduced to extremities, made an application to Parliament for an increase of capital because they were no longer able to comply with the public demands. The Bill was referred first of all to an ordinary Committee, and was passed with some small alterations. There was then some commotion stirred up about it in the House, and the Bill was re-committed to the same Committee, with the addition of a few more members, the result being that it was passed with a little further alteration. The South Metropolitan Company also had a Bill before the Committee, which was likewise passed, with some slight alteration; but the two Bills differed in certain particulars. The Imperial Company said that, from various circumstances, with which the Committee were satisfied, they could not afford to accept all Mr. Cardwell's proposals, and therefore they must submit to the general rule of taking their new capital at 7 per cent. instead of 10 per cent. The South Metropolitan Company, however, were in a different condition; they could afford to accept Mr. Cardwell's terms, and said so. They accordingly obtained leave to earn and receive 10 per cent. if they could, subject to revision. They also consented at the same time to issue their new shares by auction; to raise the illuminating power of their gas from 14 to 16 candles; and to allow the gas to be tested by the Metropolitan Board—the mode of testing to be prescribed by the Referees appointed by the Board of Trade. Afterwards, although not at that date, the South Metropolitan Company consented to adopt the sliding scale—that was to say, to receive 10 per cent. dividend so long as their price remained at 3s. 6d., but to fall below or rise above 10 per cent. as the price rose or fell below 3s. 6d., at the rate of 5s. per cent. for every 1d. in price; and also to have their accounts certified by auditors appointed by the Board of Trade. These were the conditions under which the South Metropolitan Gas Company existed at the present time, although they did not come under all of them until the year 1876. In the previous year, 1875, there had been a Bill brought in, either by or on behalf of the Metropolitan Board, which was referred to Mr. W. E. Forster and a Special Committee, who sat for a considerable time discussing the question of how the gas companies should be dealt with, and they came to the conclusion that the sliding scale—which had been invented, in fact, by the South Metropolitan Company—should be applied to all the companies in London. This Bill, being a public Bill, was reported upon by the Board of Trade, on the 31st of May, 1875. In the report it was remarked that "The Bill of the Board of Works proposes to fix the price at 3s. 9d. for 16-candle gas for all companies, with no power to raise it except on condition of reducing the dividend. Such a provision appears to Her Majesty's Government to be a breach of the existing arrangements with the companies, to which, as stated by the Chancellor of the Exchequer on the second reading of the Bill, they could not agree." The Board of Trade saw it was a breach of the existing arrangements with the companies to try and alter by force the conditions upon which their capital was taken; but he (Sir E. Beckett) was afraid that different views seemed to prevail now. "But it appears to them, as pointed out in the letter of the Board of Trade above referred to, to be a question well worthy of consideration whether the principle of a sliding scale, in which the price shall vary inversely as the dividend, would not be a more effectual mode of securing due care and economy than the present mode of official revision." He supposed, reading between the lines, this meant, although the Government saw it would have been a breach of faith to force it upon the companies, if the companies could be tempted by offering a sufficient initial price, and could arrange to acquiesce in this mode of dealing, it would be a good thing; and it would be found that this was the case. After reading some further extracts from the report presented by the Board of Trade, the learned Counsel said that the South Metropolitan were the very first Company to acquiesce in the proposed scheme; and they not only acquiesced, but went so far as to send their Engineer before Mr. Forster's Committee to say they would do so. The effect of this upon all the other companies was obvious. As soon as Mr. Forster and his Committee found that a large and important Company like the South Metropolitan saw the advantage, both to themselves and to the public, in so acquiescing, it was natural they should suggest it to all the companies. When he said "the advantage to themselves and the public," he did not mean merely a pecuniary advantage, because this, of course, was looked after. The proposition was not only supported very cordially by the representative of the South Metropolitan Company, but by Mr. Burke, the ex-Chairman of the Imperial Company, who said

it would be worth a great deal to the companies to be saved the perpetual worry by the Metropolitan Board. This Board, in 1860, had called for a reduction of price, a higher illuminating power than before, a maximum dividend, alterations with reference to the purity of the gas—a certain number of grains of sulphur—and a variety of other things; and the companies at the time naturally supposed they would be quietly left alone for, at any rate, a decent number of years—10, 15, or 20. But no! In 1867 and 1868 the Metropolitan Board were at them again; and in 1869 the Imperial Company were not allowed to pass their Bill without being worried by the Board. Again, in 1875, although all the large companies had done their best to comply with the requirements of the Board, and to amalgamate the small companies as far as they could, and thus save capital in this way, there was the Metropolitan Board worrying them; and, as Mr. Burke said, it would be worth a great deal to the gas companies to submit to any reasonable terms, provided they had some assurance that the Metropolitan Board would keep something like good faith with them, and they actually did keep faith for a year. It was a great feat, but they managed to perform it. Up to the time mentioned, none of the companies had said they would accept the sliding scale—in fact, they were objecting to it, and they were all rather frightened, except the South Metropolitan Company's Engineer. Mr. Burke, however, said that "though there are certain disadvantages, yet if I could be certain that the Board of Works would keep good faith, I would say, grant it;" and he also said, "I am so satisfied that in course of time we shall be able to keep the price of gas down, I would accept that as a mode of doing it. We should have a double temptation—one would be to please the public, which is something; but then there would be the additional temptation of getting more dividend, because, of course, for every penny which we reduce the price of gas, we get 5s. per cent. extra dividend." He (Sir E. Beckett) might mention that a reduction of 1d. per 1000 feet in the price of gas was equivalent to a bonus to the public of £15,816, whereas the benefit to the companies was only £4512.

The CHAIRMAN said he did not quite understand why the benefit should be so different from the bonus.

Sir E. BECKETT said it depended upon the quantity of gas made; but this would be given more fully in evidence. As he had read Mr. Burke's statement, he would also read that by Mr. Livesey, who said: "I am thoroughly persuaded that the only satisfactory plan of serving the consumer would be to make it the interest of the company to do the best they could for the consumer, because no regulation of any other kind would be of effect. When it is distinctly the direct interest of the company to serve the consumer, then the consumer will be well served. I would attain that object by means of a sliding scale—I would let the dividend depend upon the price charged for the gas. It ought to be possible to frame a scheme, to be embodied in a general Act, that should cause the interests of gas companies and their customers to run side by side—to make the consumers, in a sense, partners in the gas company, whereby both should participate in any improved or more economical working, by giving the companies a slightly increased dividend for every reduction in price below a certain standard, and to be perfectly fair by reducing the dividend if they raised the price beyond that standard." It ought to be mentioned that, although Mr. Livesey was the Engineer of the South Metropolitan Gas Company, and gave the evidence just quoted, that Company had no Bill before the Committee. Therefore it was entirely voluntary on his part, and it would be recollected that some of the gas companies thought he was somewhat of a traitor to the cause in supporting the sliding scale. Whether they thought it right or wrong did not matter; but there was practically an end of the opposition, because the other companies knew it was no use going on opposing after that. After quoting at very great length from the report of the proceedings before Mr. Forster's Committee, with reference to the adoption of a standard price of 3s. 9d., the learned Counsel said he would make some remarks on the special circumstances connected with the South Metropolitan Gas Company. When the time came for so doing, Mr. Cripps submitted a proviso to a certain clause of the Bill, to affect the South Metropolitan Gas Company—who were not before the Committee—and he said, to justify that clause, "As to the South Metropolitan Gas Company and the Independent Gas Company, we think that their increase of dividend ought not to take place if they are charging more for gas than they are charging at the present time. The South Metropolitan Gas Company can have an increase of price at the present time. If they went to a 3s. 4d. price, they might raise their dividend 1 per cent. We have no objection to their doing that in any other way, but we think the price which the people are paying ought not to be raised in order to enable them to divide a larger dividend at a future time." Then said Mr. Richards, who was acting for the South Metropolitan Gas Company, "I am instructed by the South Metropolitan Company to oppose this. At the present moment that Company would be entitled to take 12½ per cent. under the operation of this Bill. According to the view taken throughout, they deserve it as a reward for their good conduct in working at a 3s. price; and, as I understand the remarks thrown out by the right honourable Chairman, your intention was that the thing should operate uniformly upon the companies—that is, if they are in a position to take 12½ per cent., they are to do so. The instant the Metropolitan Board see that the thing is likely to operate so that the South Metropolitan Company will take 12½ per cent., they seek to alter the price, and make the 3s. 9d. price not applicable to them, and that seems to me inconsistent with good faith." The Chairman then put this question to Mr. Cripps: "Do you mean that they should not get the 12½ per cent., continuing to charge 3s.?" Mr. Cripps replied that, "if by continuing to charge 3s. they could get 12½ per cent., they might do so; but they should not raise the 3s. to 3s. 6d., or some other price, for the purpose of getting it. I wish very much to leave the matter to the Committee." In other words, he did not press it very strongly. Then said the Chairman: "Our opinion of what is fair to the South Metropolitan is, that they should not suffer because they set the example both of economy and good management; and if they are immediately able to do it, it results from what, for the purposes of the consumers, may be thoroughly good conduct or good fortune. What you want to guard against is, that they should get a larger dividend at a higher price than they charge now." Mr. Cripps rejoined: "If they continue to charge 3s., they would be entitled to divide 12½ per cent., and that we shall not object to. They may divide 12½ per cent. out of the next money they get, but they should not alter that charge of 3s. in the first instance for the purpose of dividing a larger dividend." This appeared to be a very awkward kind of logic; but he (Sir E. Beckett) was not concerned in that, because he was objecting to their charging a lower price. Then his friend, Mr. Richards, said: "My learned friend's position is still more unintelligible than I thought it was. He proposes that the South Metropolitan Company, if they charge 3s., may take 12½ per cent.; but supposing they think it necessary hereafter to raise their price to 3s. 5d., then they shall not be entitled to take 11 per cent., which they would be entitled to." The Chairman said: "I do not imagine that there is any practical fear, especially judging from the kind of evidence brought before us, that the South Metropolitan will not take what it can get (and I think it will get as much dividend as it can), and go on with its price. That clause would be open to very considerable difficulty, because

circumstances might happen that would oblige them to go up, and they would not be able to get the benefit of working the clause between 12½ per cent. and 10 per cent." The Committee consequently did not accept the proviso. At that time, any special legislation against the South Metropolitan Gas Company would have been compulsory, because they had not a Bill; but the very next session they introduced one, and then the following proceedings took place, which were a little hard upon them, though not so hard as compulsory legislation would have been. The Metropolitan Board in 1876 actually did keep faith, and, as he had said, did not interfere with the South Metropolitan Company when they brought in their Bill; but a number of Vestries, who, of course, were represented by the Metropolitan Board, did not choose to be represented by them in point of good faith, and thought they would try what they could get; but the good behaviour of the Metropolitan Board was not quite worn out, and Mr. Cripps said: "So far as the Metropolitan Board of Works are concerned, I, on behalf of that Board, having raised that question before Mr. Forster, and it having been decided by him last year, have not thought it right and proper to raise the question over again; and therefore, as I intimated earlier in the matter, upon the question of the price in the South Metropolitan district, although it is a question specially affecting the consumers, and although they may persuade you that their case is a right one, I am precluded from raising the question at all." The Committee, however, after hearing the opposition of the Vestries, decided that, as the South Metropolitan Company were by a former Act limited to a maximum charge of 3s. 6d. per 1000 feet, they did not feel themselves justified in going beyond it, and therefore 3s. 6d. was fixed as the initial price for the Company, although in the same session another Company—The Gaslight and Coke Company—were, by another Committee, allowed 3s. 9d. The Metropolitan Board also proposed to the Committee, as an accompaniment to the sliding scale, the insertion of clauses for the sale of all new shares by auction, which had become common, and this proposition was adopted. Another object of the present Bill, he (Sir E. Beckett) said, was to increase the works of the Company—to erect new works down in the Greenwich Marshes, on a site occupying 135 acres. It had been intended to take a much larger piece; but when the owners found for whom it was wanted, they—or somebody for them—started a dock company, and were suddenly smitten with the most earnest desire to build docks. Of course, the result could easily be guessed—viz., the Company were asked such a price for the land that they were obliged to be content with 135 acres; and even upon the 135 acres, an old woman, who had a cottage there, thought she could make some more money out of the Company, and was going to try the experiment. The tendency of all legislation about gas-works in London for several years past had been to push them farther down the river, and to as nasty a place as possible; and the promoters had succeeded in getting to a very nasty place indeed, where nobody was likely to be interfered with. The necessity for it hardly needed enlarging upon, but it might be mentioned that the increase in ten years of the Company's supply had been no less than 87 per cent., and this happened to have been a little under the average increase of all London. It would be no use throwing quantities of figures and so on at the heads of the Committee—these would be given by the witnesses—but the present capital of the Company was £2,000,000, exclusive of borrowing powers, and they sought to add a million in one sense, and a million and a half in another sense, to it. The Company sold 3½ million cubic feet of gas per day at present; they had five gas-making stations, none of them capable of being enlarged, and if they tried to enlarge them, probably there would be some objection to it. The only one that really was capable of any material enlargement was the one on the Surrey Canal; but this was a very inconvenient place; it was sometimes crowded with coal barges, and it might be readily conceived that the quantity of coals required would be very large indeed. Sometimes the canal was frozen, and then there was a general block of everything, and the liability to this involved a stock of coal being kept for a long time, which was not merely a waste of money, but had another disadvantage. Gas coal could not be used too quickly—it was a very vaporous thing indeed, and if it was merely kept dry in a store it was continually evaporating. The great Company on the north side of the Thames had found this to be so much the case that, by various processes, and by the adoption of certain means, they were at present actually getting the Durham coal into their retorts to be made into gas in three days from its leaving the pit. Of course, to a certain extent, stored coal contaminated the air, as whatever was lost from the coal went off into the air. London air was bad enough, and certainly did not want making any worse; and this was a good reason for doing whatever could be done to avoid storage, besides the waste of money. The only complaint that was made against doing so was the foolish complaint—which he (Sir E. Beckett) could hardly think even the Metropolitan Board would put in seriously—that the promoters did not want any considerable increase of funds. With regard to the petition of the Metropolitan Board of Works, the first important paragraph was the fifth: "Power is sought by the Bill for the Company to raise an additional capital of £1,000,000"—that was as it stood in the Bill as it was printed, but why in the world they said what they did in the next sentence could not be conceived: "Thus more than doubling in nominal amount the capital of the Company as fixed and authorized by the said Act." It did nothing of the kind. The capital was two millions, and even the Metropolitan Board "calculating boys" could hardly make an addition of one million a duplication of two millions. Then they said: "The premium which the Company may probably obtain upon the sale of the said capital in manner provided by the said Act will give them a considerable sum of money to be expended for capital purposes beyond the nominal amount of such capital, and power is also sought to borrow to the extent of one-fourth." This introduced into the question a calculation on which a great deal turned. It was perfectly true that, inasmuch as the shares of the Company stood at present at a considerable premium, they would sell by auction for a great deal more than the nominal capital; and it was upon this footing Lord Redesdale made the alteration in the clause which had been mentioned to the Committee. The larger the premium the shares fetched, the more money went into the concern without earning dividend, because dividend was only earned upon the nominal capital, and not upon the premiums. To put it shortly, if the Company could sell £100,000 worth of shares for £200,000, that would be practically reducing the actual dividend which anybody received by one-half; for while he appeared to be receiving 10 per cent. dividend, he would only be receiving 5 per cent. There was no object to meet in pouring useless capital into the concern; it was only putting so much more money into the bank. The more dividend-paying capital was poured into the works, the better for the shareholders, if they took the whole of the profits, but this was not the case. The public had part, and therefore the alarm as to getting too large a premium was the very last alarm the Metropolitan Board ought to be under. As an illustration of his remarks, he (Sir E. Beckett) would hand in some calculations which had been made, from which it appeared that at the beginning of the present year the Company sold by auction stock to the nominal amount of £80,000, which realized a premium of £25,400, making the money actually received £55,400. Consequently, as

both the nominal capital and the premium were invested alike in the undertaking for the general benefit, although the Company paid a dividend of 12 per cent., the public only paid interest of just a trifle over 6½ per cent., because 12 per cent. upon £80,000 would be identical, within a small fraction, with 6½ per cent. upon £55,400. If the standard or initial price were reduced from 3s. 6d. to say 3s., the dividend would fall from 12 to 10½ per cent., and taking the premium received for the 12 per cent. as the basis of calculation, a comparison between the 12 and the 10½ would show that the nominal or dividend-bearing capital would, in the same proportion, be £34,288, and the premium would be, as far as could be calculated, £20,712, the total being £55,000, or a little under what it was before. Dividends at 12 per cent. on £80,000 would be £3600; dividends at 10½ per cent. on £34,288 would be the very same thing—£3600. But this was not all there was to be said. The consumers' interest lay in the price actually charged, and not in the initial price; a reduction of the initial price, unless below the rate charged at the time, would not confer any benefit on the consumers, because, in effect, the sliding scale with auction clauses made the consumers and shareholders parties in the advantage of a lowering of the price of gas. The respective proportions of such advantage depended (apart from the amount of capital per ton of coal carbonized) upon the premiums received upon the sale of stock. The larger the amount of such premium, the greater would be the proportion of advantage to the consumer every time the price of gas was reduced; for the value of the 5s. per cent., being constant, unaffected by the terms upon which the capital was raised, depended upon the amount of such capital (so long as par was obtained), while the value of 1d. per 1000 feet depended upon the quantity of gas sold, to make which premium was just as good as capital. The shareholders of a company under these regulations had no more interest in raising new capital than the consumers themselves. The premiums were applied to the general purposes of the undertaking, and the contingent advantages arising therefrom were shared between the consumers and the company in the proportion of about 3½ to the consumer and 1 to the company. The learned Counsel then read the following extracts from the statement he had handed in:—"In raising new capital it is to the interest of both the company and the consumer to get as large a premium as possible, so as to keep down the dividend-bearing portion of the capital, and augment the other portion; but a reduction of the initial price would have precisely the opposite effect. The fallacy of this proposal is shown by the following example:—Last year the quantity of gas sold was 3545 million cubic feet"—these were, he remarked, figures beyond talking about—"1d. per 1000 on that quantity would be £14,770. The capital upon which dividend was paid for the same date (exclusive of loan capital) was £1,832,000, and an increase of 5s. per cent. on this would be £4580. The consumers, therefore, get more than three times as much as the company at each reduction, even at the present time, and as the consumption increases every year in a far greater proportion than the capital, the consumers get a larger and larger proportionate benefit at every reduction, as shown by the following example:—Taking the case of the new capital just raised with the high premiums by itself, the result works out as follows:—£55,000 at £5 per ton (the proportion that capital bears to coals) would represent 11,000 tons." He was afraid he did not quite follow that.

The CHAIRMAN: Was the cost of the coal £5 a ton?

Mr. MICHAEL: No; that is the amount of capital. Supposing there are 5000 tons of coal used, there are £25,000 of capital invested in the works to make the gas from that coal.

Sir E. BECKETT: We know that for every ton of coal we turn into gas we have, somehow or other, to spend £5.

The CHAIRMAN: That is when the work is done?

Sir E. BECKETT: Yes. "11,000 tons of coal at 9250 feet per ton, the quantity actually sold last year"—that is to say, the number of feet of gas that we make per ton of coals used—"would produce 101,750,000 cubic feet of gas, and this quantity at 1d. per 1000 gives £424."

The CHAIRMAN: That is the answer to the question I asked?

Sir E. BECKETT said it was. "At 12 per cent. the nominal or dividend-bearing capital would be £30,000, and an increase of dividend at 5s. per cent. on that would be £75. At 10½ per cent. the nominal or dividend-bearing capital would be £34,288, and an increase of dividend at 5s. per cent. on that would be £85 14s." Then it said: "These last calculations do not, of course, represent matters as they are at the present time, but they represent the conditions under which all new capital will be raised hereafter, and every addition of new capital tends to lighten the whole." Then followed a very important statement, that there had been no case yet where the initial price granted by Parliament had ever been altered afterwards; and obviously it would be a great breach of faith to do so, because every penny that had been raised, both by auction and by money invested in shares since 1876, had been invested on the faith of the (particular) initial price; and to take it away was an amount of robbery for which there was not any precedent in Parliament, although whether or not there would be was not known. "The initial price has never yet, in any case, been altered after it has once been established. If done now, it will be the first time, and form a precedent for other cases; and if done once, the public will have no confidence in the regulation. The premiums will become less and less, and the consumers will be prejudiced as much as the company thereby." Once let the public get the notion into their heads that parliamentary bargains could be upset afterwards, and there would be an end of all premiums, which, of course, were given upon the assumption that the parliamentary bargain would be kept; and that if, under certain circumstances, the price was reduced, the dividend would be raised. When the same sort of thing was attempted in 1875, the Board of Trade ventured to tell Parliament that it was unjust to alter, by force, terms which had been granted by Parliament, and upon which money had been previously raised. If the company could be tempted to do it, well and good; that was always open. *Volenti non fit injuria*. The next paragraph in the petition was: "Your petitioners allege that the amount of money which the Company seek power to raise is far larger than is required; that the dividend on the original capital and interest on money to be borrowed will impose a heavy and unnecessary burden upon the consumers of gas, and will be injurious to the inhabitants of the Metropolis; and your petitioners object thereto." If they could, by any kind of conjuring, satisfy the Committee that raising additional capital by auction, under present circumstances, could do them any harm, well and good, but this was not the real game they were going to play. The following was the sting of the petition: "Your petitioners also humbly submit that if the privilege of raising additional capital beyond the amount limited by the said Act of 1876 be conferred on the Company"—of course it must—"it should be accompanied by a reduction in the standard price fixed by that Act." Nothing could be more distinct than this. The very people who in 1875 and 1876 said that, whatever strangers might do, they themselves were precluded from raising this question at all, now actually put down in their petition that there ought to be a reduction of the standard price fixed by the Company's Act. Such a thing as this could not be argued about; it told its own story. No doubt the orators of the Metropolitan Board would enlarge upon this topic; but until this was done, nothing more need be said. They had better at once state that the South

Metropolitan Gas Company should be handed over to the Metropolitan Board at their own price, in the same way that they wanted to have the Water Companies. Then came the following: "Power is also sought for the Company to purchase about 230 acres of land within the Metropolis, on the south bank of the Thames, near Greenwich, and to erect and maintain thereon works for the manufacturing and storing of gas, and the conversion of residual products, and it is also proposed to purchase 30 acres of land not to be used for the manufacture of gas."

The CHAIRMAN: Is that where the 135 acres are?

Sir E. BECKETT: Yes.

Mr. MICHAEL said it was originally 230 acres, but since the petition had been drawn it had been reduced.

Sir E. BECKETT said the petitioners next submitted "that the acquisition of the said land by the Company will be costly and unnecessary," and they objected thereto. "Your petitioners desire to point out that the said lands are"—too large, and stuff of that kind. The next objection was: "Power is also sought (clause 17) for the Company to supply gas in bulk for re-sale and distribution to any local authority, gas company, or person authorized to supply gas in the adjoining parish or district, beyond the limits prescribed by the Company's special Acts. Your petitioners humbly submit that, in the event of loss arising in any such operation, the Company might make good the amount thereof out of money charged upon the gas consumers in the Metropolis." Was it to be conceived that the Company would do such a thing as make any bargain with adjacent companies if they ran any risk of loss? If they did, of course it would fall upon themselves; but he (Sir E. Beckett) thought he was not doing the petitioners injustice in saying that the whole sting of their petition was contained in the words, "The reduction of the standard price fixed by the Act of 1876." The only other petition appeared upon was that of Mrs. Fryer, who said that the works were calculated to cause a nuisance; and it was essential they should be conducted upon some large open space. Mrs. Fryer's land was what was called "scrub" land, which was usually overflowed at high tides, and the Committee would see what it was surrounded by. There were two other petitions which were, however, not appeared upon, and therefore he would not make any remarks upon them.

The following evidence was then called:—

Mr. George Thomas Livesey, examined by Mr. MICHAEL.

I am a Member of the Institution of Civil Engineers, and have been Engineer to the South Metropolitan Gas Company since 1861. In 1871, on the death of my father, I was appointed Secretary also to the Company. The works of the Company have been very much enlarged during the time I have been Engineer; they are now about four times as large as they were 20 years ago. The South Metropolitan Gas Company consists now of the original South Metropolitan and the Surrey Consumers', which was amalgamated with it on July 1, 1879, and the Phoenix Gas Company, which was amalgamated on Jan. 1, 1880, by schemes sanctioned by the Board of Trade and confirmed by Order in Council. At the time of the amalgamation the Surrey Consumers' Company charged 3s. 9d. per 1000 cubic feet for their gas; the Phoenix Company, 3s. 4d.; and the South Metropolitan 3s. per 1000 feet. These differences in price gave rise to a great deal of dissatisfaction. People in one street paying 3s. 9d., while in the next street they were paying only 3s., would naturally grumble. The immediate result of the amalgamation was that the Surrey Consumers' price was reduced to 3s. per 1000 feet, in order that their Shareholders might obtain an increased dividend, which was the inducement to them to amalgamate with the South Metropolitan Company; in fact, they stipulated that from the date of the amalgamation they should receive 11 per cent. dividend. With regard to the Phoenix Company, we were authorized by the Board of Trade to retain their charge of 3s. 4d. per 1000 for twelve months; but at the end of six months, on July 1, 1880, in order to increase the dividend, the price was reduced to 3s., which had the effect of giving shareholders 11½ per cent. dividend for the half year. The 9d. reduction in the Surrey Consumers' district amounted to £20,000 a year, and the 4d. reduction in the Phoenix district amounted to £28,000 a year, or in those two districts together to £48,000 a year.

By the COMMITTEE: The increase of dividends, consequent on a reduction of price, took place through the action of the sliding scale, which was settled by Mr. Forster's Committee. Taking 3s. 6d. as the standard price, and 10 per cent. as the initial dividend, the Board of Trade and the Metropolitan Board of Works assented to the proposal that for every reduction of 1d. in the price the companies should be allowed to increase their dividend 5s. per cent. This was done in order to give the companies an inducement to reduce the price; and, on the other hand, if they raised the price beyond 3s. 6d., they were to suffer a reduction of dividend. Previously to 1876 the dividend was limited to 10 per cent., no company being allowed to go higher. In fact, the companies were practically guaranteed 10 per cent., and the authorities objected to it. I may say I took the side of the authorities on that occasion, and met with the greatest obloquy and objection on the part of the companies because I did so. I contended that the public ought not to be in such a position that the companies were able to charge what price they pleased in order to secure to themselves their 10 per cent., and I proposed a scheme whereby they should get a slightly increased dividend by reducing the price, or that the dividend should be reduced if the price was raised.

Examination resumed: The companies were limited to a dividend of 10 per cent., and they were allowed to put by a certain amount of surplus profit until it reached, say, 5 or 10 per cent. upon the capital, as defined by their respective Acts, as a reserve fund. Beyond this, if there was a surplus, it was their duty to reduce the price to the consumers, but there were no means to compel them to do so; and, as a result, there was every inducement to them to raise more capital in order to get a large dividend upon it. In those days the capital was allocated *pro rata* amongst the shareholders, and an allotment of 10 per cent. at par was a very good investment. This was, however, altered by the compulsory sale of shares in future by auction, which made any premium go into the capital of the company without bearing dividend. A reduction in the price of 1d. per 1000 cubic feet is equivalent, in round numbers, to £15,000 a year.

Mr. MICHAEL: That is to say, you charge £15,000 less to the consumer for every 1d. which you at the present time take off the price of your gas?

Witness: Yes; that is so.

If you contrast that with the benefit of the 5s. which accrues to the shareholders, what is the equivalent for the 1d. taken off?—The capital on Dec. 31, 1880, was £1,832,000, subject to the sliding scale, and 5s. per cent. upon this is £4580. The shareholders, therefore, get for each 1d. reduction £4500, and the consumer gets £15,000; so that more than three times as much benefit accrues to the consumer compared with the benefit which accrues to the shareholder.

But the benefit in that proportion is continually going on, as an inducement to the greater economy in the make and sale of gas, by giving the corresponding benefit, on the other hand, to the consumer?—Yes. As an example, I may say that the South Metropolitan from the 1st of January this year reduced the price of their gas 2d. per 1000 cubic feet over the whole district. It was rather a risky thing to do, because, upon an estimate

being made, it was found we could only just about make both ends meet; but in order to get the increased dividend which a reduction of 2d. would give, we reduced the price to 2s. 10d. at the earliest possible moment, which is equivalent to a further reduction of £80,000 a year, and for this the shareholders will get £9000.

A MEMBER OF THE COMMITTEE: Do you think you get a large increase of consumption by reducing the price?

Witness: It is hardly perceptible in that way; I can only take it over a series of years. The old South Metropolitan Company have been selling gas at a lower price than their neighbours for the past ten years, and I find they have rather more than doubled their business during this time, while the neighbouring Companies increased about 75 per cent.

By the COMMITTEE: Our gas is cheaper now than any other in the Metropolis. I think the cheapest gas in the United Kingdom is at Leeds, where the price is somewhere about 2s. per 1000 feet, but they have been talking of reducing it to 1s. 10d.

By Mr. MICHAEL: There the gas supply is in the hands of the Corporation at the present time.

By the COMMITTEE: The size of our district is about 12 miles long, and an average of about 5 wide, but it is undefined on the east.

Examination resumed: By the Act of 1876, the South Metropolitan Company had the sliding scale imposed upon them, with a standard price of 3s. 6d. per 1000 feet, and an increase or reduction of dividend for every variation of 1d. in the price. They were also compelled to sell all shares by auction. They had previously been compelled to comply with certain conditions as to purity, and they were also obliged to supply 16-candle gas as a minimum; although previously to that time the gas supplied by them according to statute was 14-candle gas. To be absolutely accurate, however, the Referees' standard of purity was imposed in 1869. Owing to our present price of 2s. 10d. being 8d. below the initial price, we are allowed to divide an additional 2 per cent.—in fact, to increase the dividend from 10 to 12 per cent. By Act of Parliament we can be called upon to supply gas to any persons within our district. In effecting the amalgamations we considered we were carrying out what Parliament had decided was the proper course to be adopted by the Metropolitan Gas Companies, in order to secure the greatest advantages to consumers on both sides of the Thames. At the time of amalgamation the South Metropolitan Company were well off, both for land and capital. We had power to raise £250,000 by sale of shares by auction, and to borrow £250,000; in all, plenty of money to have carried us on for 10 or 15 years. We also had a large area of land available for supplying the South Metropolitan district, which was admirably placed for the purpose. The Surrey Consumers' district was a comparatively small one. They had expended all but £20,000 of their capital, and had no land on which to erect additional works. Their district abutted on the river, and was bounded by the river from London Bridge to Deptford Creek. We have applied to the Board of Trade, and now come as an amalgamated Company before Parliament to ask for further capital and further land, in order to carry out the necessities of the amalgamated Company. The other two Companies might have gone on for a few years, but not for very long. The present authorized capital of the Company is £2,082,000 share and £310,000 loan. An important item in considering the price of gas to the consumer is the amount of capital per ton of coals carbonized—that is, the amount of capital employed in the works, both for manufacture and distribution, as compared with the tons of coal carbonized and used. If a company has a capital amounting to £10 for every ton of coal carbonized in the year, it would have to pay a much larger amount in dividend than if it had only £5. Supposing two companies, each using 20,000 tons of coal in a year; if one has £5 of capital per ton, or £100,000, it would only have to pay interest on that £100,000; but if the other company has £10 of capital per ton, it would have £200,000 for doing the same work, and would of necessity pay a larger sum in dividends. This is a very important element in discussing the conduct of the company with respect to their consumers, and allowing them to charge a low price for the gas made. The South Metropolitan had a lower capital per ton of coal than any of the London Companies. In 1879 it was £4 11s. 7d. per ton, while the Surrey Consumers' amounted to £5 5s. 7d., and the Phoenix to £6 11s. 7d. The capital of the whole amalgamated district per ton of coals is £5 0s. 9d. now; but if the Metropolitan Board leave us alone it will, I hope, be much less. The rental of the South Metropolitan Company for the past year was, in round numbers, £50,000 for public lights, and £501,000 for private lighting; altogether about £552,000.

Mr. MICHAEL: You have reduced the price, and therefore probably there may be some lesser amount of rental this year, as compared with the past year, or do you hope that there will be an increased consumption?

Witness: The first quarter of the year is just over, and we find a considerable reduction of rental, owing to the reductions of price which have taken place—6d. in the Phoenix between this quarter and the corresponding quarter of last year, and 2d. over the others, has landed us with a diminished rental of about £13,000 for the quarter.

You hope, both from the natural increase in the consumption of gas, and also from the stimulus caused by charging a less price, to recoup yourselves—that the rental will again come up to £550,000?—Yes; and we calculated upon selling our coke rather better this year, and this warranted us in reducing the price.

Examination continued: The quantity of coals carbonized during last year was 387,000 tons, and the gas made and accounted for amounted to 9800 feet per ton of coal.

By the COMMITTEE: Our coal came chiefly from Durham—that is, 375,000 tons of it; 12,000 tons was cannel coal, which came partly from Lancashire and partly from Scotland. During the last ten years the variation in the price of coal has been enormous. In the case of the South Metropolitan Company we had to pay an increase in price from 6s., free on board, to 20s. in 1873. We had, however, a good reserve fund, and were anxious to keep down the price of gas to the consumers, and we did so.

Examination resumed: We drew upon our reserves, and also had to economize and put off repairs, and things of that sort; but we carried ourselves through the coal famine without altering the price at all. We lost, however, a large proportion of our reserve fund. If the coal famine had continued, we must either have raised the price or else have reduced our dividends; and it is because we did not raise the price that the Metropolitan Board of Works made use of me in 1875.

By the COMMITTEE: At the present time the price of coals free on board is a trifle higher than it was; but freights are lower, so that the actual price is lower than I have ever known it.

Mr. MICHAEL: A recurrence of the coal famine would make it impossible for you to supply gas at the price you do now, and therefore there must be an increase of price and a diminution of dividend?

Witness: Certainly.

Which, of course, was in contemplation when the Act was passed—that, on the one hand, there might be a stimulus to you to use as much economy as possible to get a large amount of profit, and when the time came that coal, labour, and iron were dearer, you should have every inducement to charge as low a price as possible to maintain the dividend

as against the harder times which would then take place?—Certainly; that was what, in fact, helped us to get over the coal famine. Tar, which previously sold at 1d. per gallon, went up suddenly to 3½d., and this helped us. Tar went up when coal went up. Coke also went up, and by using these aids, and our reserve fund, we pulled through. Ammoniacal liquor did not go up so much as the tar, but it did help us; there were also some new colours manufactured at that time from the tar.

Examination continued: The quantity of gas sold by the three Companies in 1870 was, in round numbers, 1900 million cubic feet, and in 1880 it amounted to 8545 million cubic feet. The rate of our unaccounted-for gas is between 5 and 6 per cent.

Mr. MICHAEL: That is very low indeed, as compared with the general quantity for gas all over the kingdom?

Witness: In London the other Companies are doing about the same; but it used to be a great deal worse.

That is one of the things in which good management and economy have been shown—in reducing the lost gas, and bringing it over to the credit of the consumer in the way of cheaper gas and increased dividend?—Yes.

By the COMMITTEE: Part of the unaccounted-for gas escapes registration by the meters, which are allowed a certain range. They are considered correct if they register 2 per cent. against the consumer or 3 per cent. against the company. There is probably 2 per cent. lost in this way, and another 2 or 3 per cent. is lost by leakage. I have every reason to suppose that the enormous increase in the consumption of gas during the last ten years is still going on at a similar rate. I am not at all afraid of the electric light coming in and interfering with us. I do not think it likely that, so far as public use is concerned, the electric light companies will take the whole of the streets; but, if they do, it is only one-tenth, or one year's increase in our business. I do not think the electric light is at all suitable for lighting the streets; I consider gas is much better. In the small crowded streets of London it would be absurd to have ten times more light than is wanted.

Examination resumed: When the amalgamation has been continued for a course of years there will be a great saving of duplicate main laying, and so on; and there are also other causes which will be very beneficial to the general interest both of the Company and of the consumers. We have derived benefit already; because directly the amalgamation was effected I gave orders to connect all mains at the different points of contact, with the result that we were able to supply the whole district last winter better than it had been before supplied by the separate Companies, and at a lower pressure. It is a very important element that the gas should not be driven at a great rate through the mains, resulting in a heavy loss by leakage, and a great loss to the consumer through the gas not being properly consumed at the burners. The greatest quantity we supplied in 1879 on any one day was, in round numbers, 18 million cubic feet, and in 1880 19 million cubic feet. Our present works are capable of supplying 22 million cubic feet in one day without additional retort-houses. There are many tracts of land laid out for building purposes in the amalgamated district, and a great many thousand houses are built every year.

Mr. MICHAEL: We will pass on to the requirements of the Company at the present time, and the reason for presenting this Bill before the Committee. You have found that the amalgamated Company require facilities for carrying on business, and additional land for the construction of new works, and also power to raise further capital?

Witness: Solely to meet the obligations imposed upon us by Parliament.

Looking at the present position of the Company, is it any benefit whatever to the existing shareholders to raise additional capital, because I see in their petition the Metropolitan Board say: "On account of the privilege of raising new capital certain restrictions should be imposed?"—Certainly not; it is not one atom of benefit to us.

May it not result, if you are obliged to supply gas whether you are willing to do so or not, that it is really imposing a burden on you of expending money, which, being in excess of the necessity of the requirements of the moment, may result at the same time in a comparative loss?—It may. We may have to spend money on the land, which will for some time be unproductive. If we could go on for years without increasing our present plant and capital, it would suit us very well, because under the auction clauses we do not get any advantage whatever by the issue of new capital.

In fact, you bring in strangers who would get any advantage there might be from the capital that is raised?—Exactly.

Examination continued: I do not object to the auction clauses, because, under the circumstances in which gas companies are placed, I do not think it fair that they should have the allotment of large sums of capital among themselves. I told Mr. Farrer one day that, as a gas shareholder, I did not like the auction clauses—I would rather have allotments; but, looked at from a general point of view, I felt satisfied they were fair, and worked well. Any capital to be raised under the present Bill—and Lord Redesdale has fixed it, both with premium and capital raised, at 1½ millions—the public will have the full opportunity of purchasing, at whatever they think the fair rate; and the price will be regulated by the dividend paid. The larger the amount of dividend they think of getting, the larger the amount of premium that will go into the capital of the Company bearing no dividend, thereby enabling us to supply gas at a cheaper rate. There is this check against spending capital unnecessarily, that if it is raised interest will have to be paid upon it, and the old shareholders will lose the increased dividend which they otherwise would have had. We are adopting at present every means to economize, because the expenditure of capital is an injury to the old shareholders. [Witness described on a map the position of the various manufacturing stations of the Company, and proceeded:] The works can be extended at Rotherhithe to some small extent, but at great expense. We can extend considerably in the Old Kent Road, but the disadvantage of extending on this site is that, being upon the canal, it costs us at least 1s. per ton more to get our coals there than it does at waterside premises; and with wharves at Greenwich we could obtain coals at 1s. 6d. per ton less than we could get them in the Old Kent Road. In the first place, the coals have to be brought by steamer into the Surrey Dock, and this adds a trifle to the freight, for the steamers have to wait for the tide, because they can only get in and out at high water. Then we pay 6d. per ton for canal dues, and also the cost of lighterage, and the expense of lifting. Warehousing and lifting cost 4½d.; the canal dues 6d., making 10½d., and the lighterage another 3d.; in all we pay 15d. per ton. Whereas at the new site, once lifted, we shall be able to take the whole of the coals into the retort-houses direct. Last winter, during the severe frost, we had great difficulty in keeping the canal open. In fact, after the frost had been going on for a fortnight, we had 500 men employed in breaking the ice in the canal. We had three weeks' stock of coal, and we maintained that stock during the whole of the frost, but to do so we were obliged to employ the large number of men I have spoken of. On the last day of the frost, however, we were beaten; and this necessitates, in order to provide against similar contingencies, our having large coal stores, which adds to

the cost of the works. The necessity of having large stores of coal also increases the cost in this way: The coal by being kept depreciates considerably, and is liable to take fire, and besides we have to put it into the store, and to take it out again by hand labour. The quantity of land proposed to be taken by the Bill is about 135 acres. We originally intended to take about 238 acres, but we have given up 100 acres of it to the South-Eastern Railway—joint promoters of the scheme for the docks. It is marsh land, many feet below high-water mark, and to my mind unfit for anything except manufacturing purposes. A great part of the land is now laid out in market gardens, but there are, along the banks of the river, cement works, biphosphate-guano works, creosote works, and other works of this kind. We propose to embank the land on the river front, and for this purpose to take a portion of the land belonging to Mrs. Fryer on the river bank, which is the worst piece of all. Besides, it is outside the river wall, and is covered, as to the larger part of it, by every spring tide. All parties, except Mrs. Fryer, are agreed that we should take the land for the purposes intended. Four of our stations are very inconveniently crowded, and a great deal more gas is made upon them than they are at all fitted for. It is of great advantage to have abundance of room in gas-works; the manufacturing plant can be arranged so much better, and precautions can be taken against inconveniencing the neighbours, which cannot be done where the works are crowded. We are placed under stringent regulations not to create a nuisance in carrying on our works. In 1864, when the South Metropolitan Company bought 30 acres of land in the Old Kent Road, it was considered by everybody that it was an excessive purchase—that it would last us for all time; but even if we stood alone we should soon get to an end of it. There will be an advantage to the district in the construction of our works. I put it to the Committee that in the carrying on of the undertaking, it will be a great advantage to have these powers, enabling us to have facilities for making gas at a cheaper rate and in a better manner; and that, in various other ways, large savings will be effected. With regard to the capital, the usual practice has been to double it, and then it was supposed the company would have to apply again in ten years; but we do not go for doubling it. The amount we propose to raise includes both capital and premium.

Mr. MICHAEL: In 1876, when you applied for the Bill under which you are now governed, the Metropolitan Board of Works, though appearing, did not at that time ask that your initial price should be changed, although the Vestries appeared against you on account of your having a power in your Act only to charge 3s. 6d. per 1000 feet, as against 8s. 9d. which had been originally fixed as the uniform price over the whole of Metropolitan?

Witness: The Metropolitan Board certainly did not object.

They said they could not, after the parties they had been to previous legislation, ask the Committee to alter the price to 3s. 6d.?—Quite so.

Was not the result that, the Vestries opposing, 3s. 6d. was fixed as your price, as expressly stated by the Committee, because it was the limit of the price which existed at the time in the Act governing the affairs of the Company?—Yes.

Although at the time you were only bound to supply 14-candle gas, whereas the additional obligation was put upon you in the future to supply 16-candle gas?—Yes; we had the price of 3s. 6d. under our Act of 1869, with a power to revise.

I am putting it shortly thus—that if, in the course of the conduct of your affairs, it had been found that 10 per cent. could not be earned at 3s. 6d., you had the power to go to the Board of Trade to appoint Revision Commissioners to consider what should be the price charged to enable you to earn as nearly as possible 10 per cent.?—Yes.

And it was to be in the power of the Metropolitan Board of Works, if they thought you were earning too much, to apply to these Commissioners to say what diminution should take place on the 3s. 6d.?—Yes.

Then the sliding scale was put on to meet the case of your getting a larger amount of dividends in good times, and to induce you to charge little in bad times, you suffering a diminution if you charged more than the standard price of 3s. 6d.?—Exactly; and the Metropolitan Board themselves in 1876 were willing to allow us 3s. 9d. as our standard price, which at the time would have given us a dividend of 12½ per cent.

Has there been, since that time, a very considerable transfer and dealing in the shares of your Company upon the basis of the 3s. 6d. and the sliding scale?—There has. The South Metropolitan Company came under the sliding scale arrangements on July 1, 1876. The total stock of the Company—the old South Metropolitan—is £500,000. Since July 1, 1876, there have been transferred and sold in the market £170,000, or equal in amount to one-third of the whole of the stock. The Phoenix and Surrey Companies were amalgamated, and came under the sliding scale arrangement on Jan. 1, 1880—or, rather, the Phoenix did, and in their case there has been a transfer of £208,000 of stock in little more than 15 months.

That is to say, the public have bought shares on the Stock Exchange by transfers, and have had those shares transferred on the faith of the legislation that has taken place. May I put it, in round numbers, that they have bought £100 at the price of £200 on the faith of the legislation being permanent?—Yes.

By the COMMITTEE: No doubt the "electric scare," as gas people call it, has materially affected the market value of gas companies' shares. In the case of The Gaslight and Coke Company, the £100 stock reached £210; but in consequence of the "scare" it fell as low as £150; and is now £178. There is another thing which I fancy may have had some effect in keeping down the premiums on the market value of these gas shares—viz., the possible fear, on the part of the investing public, that the dividends are not safe—that the initial price might be interfered with—and, therefore, instead of getting 12 per cent., they might be cut down to 10 per cent. The outside public have that fear, but we have not.

Examination continued: No attempt has been made up to the present time to meddle with the legislation in any part of the country with reference to the sliding scale, or to reduce in one single instance the initial price fixed by Parliament; and I must say this attempt of the Metropolitan Board of Works is a very half-hearted one, because I know from the public reports that the Parliamentary Committee of the Board were opposed to interfering with it.

Mr. MICHAEL: It has never been asked by any municipal authority that Parliament should alter the legislation which has been fixed as regards the sliding scale until to-day?

Witness: It has not been thought of. We should not have asked for it, and if we had we should not have had it.

Supposing this Bill passes, and the price of all the materials increases so much as to make it necessary to charge more than 3s. 6d. per 1000 feet, you must in that case submit to a dividend of less than 10 per cent.?—If we raise the price even one penny, we shall reduce our dividend from what it is now.

It was the intention, taking the ordinary current of affairs, that if prices were low you were to have the benefit of it, and if prices were high you must submit to a loss?—The contention I made before Mr. Forster's Committee was that the companies should not be guaranteed as against any portion of the loss, but that if prices went up they should suffer some portion of the loss with the consumer.

By the COMMITTEE: The price of coal at the pit's mouth in the North of England is about 6s. 8d. per ton, to which must be added the freight, city dues, and other things, bringing it up to from 12s. to 14s.

Cross-examined by Mr. LEDGARD: I do not think Parliament can revoke the standard price in the case of the Metropolis without a great breach of faith. As a gas shareholder I should feel I was being very badly treated if I had my income reduced after I had accepted it in good faith. If the companies had been wise, they would have accepted 3s. 9d. in 1875, but they would not do so. My own Company, among the rest, were equally foolish. I gave evidence in opposition to them, and in 1875 we were obliged to take 3s. 6d.

Mr. LEDGARD: The amount fixed by the Parliamentary Committee in 1875 is, in your judgment, final, or should be final, once for all, in respect of all the Gas Companies within the metropolitan area?

Witness: If they accepted it.

They did not accept it, as a matter of fact, did they?—No, they did not.

May I take it in this way, that it should be final on the ground that the companies did not accept it as a final bargain in 1875?—It is not a bargain at all, but when a bargain is made it ought to be held to.

What is the standard price for all the Gas Companies within the metropolitan area?—For the Commercial and Chartered 3s. 9d., and 3s. 6d. for the South Metropolitan.

Am I to understand you contend that the decision of the Committee in 1875 as to the standard price of 3s. 9d. was only binding and conclusive on such companies as in that session of 1875 chose to accept it?—Yes.

In the case of any company who did not accept it in 1875, it would be competent for Parliament properly to inquire into what the standard or initial price should be at any time in the future?—Quite so.

As a matter of fact, you did not accept the 3s. 9d. in 1875?—My people did not.

You are one of the companies, according to your own admission, the question with regard to whose initial price might properly be gone into by Parliament at any future time after 1875?—Yes.

And, as a matter of fact, to show that you entertained that view in 1876, you yourselves proposed to raise the question for the first time, so far as you were concerned, as to your standard price in the following session of Parliament?—Yes.

You then proposed by your Bill, did you not, to raise your statutory price of 3s. 6d. under your old Act to 3s. 9d. by the Bill of 1876.

Mr. MICHAEL: One was the maximum price, and the other the standard price.

Mr. LEDGARD: I am sure the Committee thoroughly understand that under the Act before 1876 they had the only maximum price of 3s. 6d?

Witness: The maximum price of 3s. 6d., with a power of revision.

And the power of revision was an incident which might have been exercised upon the application of the companies at any time, supposing they still continued under the old provisions?—Upon the application of either party to the Board of Trade.

In inquiring what the price for the year should be, the whole of the matters affecting the cost of manufacture and any other incident which might have an effect on the price of the year would be thoroughly gone into and tested, before the maximum price was fixed?—Yes; and it was owing to the unsatisfactory nature of those inquiries that the Metropolitan Board promoted their sliding-scale Bill.

That is to say, that although the Metropolitan Board were willing to continue the principle of revising the price from time to time, the machinery which had been applicable was found to be unsatisfactory?—The Metropolitan Board were not willing to continue it. I was in intimate communication with the Chairman of their Parliamentary Committee at that time—Mr. Newton—and I heard from him over and over again that they were so utterly dissatisfied with the working of the revision clauses that they would not have them continued.

In nowise did Mr. Newton, who you say then represented the Metropolitan Board, give up the principle of periodical revision of the companies' maximum or standard price being necessary in the public interest. It was merely for bringing in a Bill for better carrying out the same principle?—I think not; a revision of price by the Commissioners appointed by the Board of Trade is a different thing to an alteration of the initial price by a Parliamentary Committee.

Do you admit that Parliament, in 1876, when you proposed to have an initial price fixed for yourself, for the first time had a right, as you say, to look into all the circumstances, and say what the initial price should be?—And we had a right to refuse to accept that if we chose. We accepted 3s. 6d.

Am I to understand that, in addition to your suggestion that Parliament ought never to review the legislation of 1875, Parliament should also never review the legislation, with regard to your own Company, which took place in 1876?—Not in regard to the capital then authorized.

The 3s. 9d. in 1875 was brought forward in a clause by the promoters of the Bill—namely, the Metropolitan Board of Works. Was any evidence given before the Committee as to any basis upon which this price was fixed, or was it accepted by some of the companies as satisfactory to them, without evidence on the point being given before the Committee?—That book [pointing] is full of evidence on the point.

What was the standard price that was introduced into the Bill as deposited in 1875?—I do not know what was put in the Bill of the Metropolitan Board.

Mr. MICHAEL: It was in blank first, and then 3s. 9d. was inserted.

Mr. LEDGARD: Was it inserted in the filled-up Bill before evidence was given, or after?

Witness: I do not know when the 3s. 9d. was inserted, but I do know that the matter was talked over both by the Companies and the Metropolitan Board, and the Committee arrived at 3s. 9d. as a compromise between the two, which they thought would be fair. The contention of the Chartered Company was that in the previous year they had, in consequence of the high price of coal, to raise their price to 5s., and they said it was altogether unfair to fix them with so low a standard price as 3s. 9d., because it would have the effect, on the rise of coal, of reducing their dividend materially; but Mr. Forster's Committee considered 3s. 9d. was fair between the companies, and I myself, as the leading witness for the Metropolitan Board, said that, in my judgment also, 3s. 9d. was fair; and the companies were very angry with me for saying so.

In 1876, when you came before the Committee, what was the maximum price you could charge for gas under your old Acts; was it not 3s. 6d. per 1000 feet?—Yes; or more, by applying to the Board of Trade.

Did you then apply to the Committee, and propose to have the power to charge a standard price of 3s. 9d.?—We did, because the Committee of 1875 said we ought to have 3s. 9d., and the Metropolitan Board assented. I may tell you another thing. We were, under our Act of 1869, required to supply only 14-candle gas at 3s. 6d. per 1000 feet. We were compelled under the Act of 1876 to increase the quality of the gas by two candles, and this raised the cost 2d. or 3d. per 1000 feet.

Let me ask you whether the Committee who, in their judgment, fixed upon 3s. 6d. as the basis of charge, are never to have the power of inquiry into the question of reducing or raising the standard price under any cir-

cumstances whatever?—The mistake your people make is in assuming that the standard price is the same as the old maximum price. Under the old system a maximum price was fixed, which, as a general matter, was above the price at which the companies could supply gas, and when they came to Parliament from time to time the maximum price was generally lowered—say from 6s. 6d. to 4s. 6d.—but the new system practically altered this, and I am satisfied it is owing to a misunderstanding of the action of the new system that the Metropolitan Board are opposing us here.

You give us credit, then, for *bona fides*, but not for much intelligence?—I think you do not understand the altered circumstances.

Must it not be a material thing, in determining upon the initial price, to have regard to the conditions under which the manufacture of gas is being carried on?—Yes, and if you fix the initial price too low you do not give the companies an inducement to reduce their price, because they feel it is hopeless.

The question of fixing it too high or too low is not one that Parliament ought to have an opportunity of reviewing from time to time, you think?—Not when a bargain has been made. Parliament has never broken faith yet, I believe, and I do not think it ever will.

In what way are you affected by the standard price of 3s. 6d. per 1000 feet?—I might explain that the maximum price was fixed under the old system. There are companies now supplying gas at less than 4s., who have a maximum price of 6s.; that is, they may raise their price at their own option to the maximum without going to Parliament, if it should be necessary to enable them to pay full dividends, but in the greater part of the Metropolis the maximum price has been done away with.

What was the bargain which you say was made between yourself and the Metropolitan Board, which should preclude Parliament from ever again considering the question whether the standard price which was fixed was the proper one or not?—We gave up the power to go to any price to enable us to pay our maximum dividends in order to get this sliding scale. We could have gone, by application to the Board of Trade, to 6s. per 1000 cubic feet in order to clear our 10 per cent., but we relinquished this so that we might have the sliding scale applied to us.

(To be continued.)

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

LINCOLN'S INN.—WEDNESDAY, MAY 18.

(Before the MASTER of the ROLLS and Lords Justices JAMES and LUSH.)
THE ATTORNEY-GENERAL V. THE BIRMINGHAM, TAME, AND REA DISTRICT DRAINAGE BOARD.

This was an appeal from a decision of Vice-Chancellor Bacon under the following circumstances:—In July, 1858, a suit was instituted in the Court of Chancery by the Attorney-General, at the relation of Sir Charles Bowyer Adderley (now Lord Norton), and by Sir C. B. Adderley, as plaintiffs, against the Council of the Borough of Birmingham, the then Sanitary Authority for Birmingham; and on the 16th of April, 1875, a decree was made by Vice-Chancellor Bacon, granting a perpetual injunction to restrain the defendants, their servants, workmen, and agents, from permitting the sewage of the borough to flow into the River Tame so as to occasion a nuisance to the plaintiffs. The operation of the injunction was suspended for five years, to enable the defendants to complete some works for the purification of the sewage. In 1877 a Provisional Order was made by the Local Government Board, under section 279 of the Public Health Act of 1875, constituting the borough of Birmingham and some adjacent districts a united district for sanitary purposes, to be called the Birmingham, Tame, and Rea Main Sewerage District, and to be governed by a Joint Board. This Order was afterwards confirmed by an Act of Parliament passed in 1877. The new Board thus constituted took over or purchased, under the powers given to them by the same Order, the outfall and intercepting works belonging to the Council of the Borough of Birmingham. The period of five years, for which the operation of the injunction was suspended, expired in April, 1880, and in February, 1881, the plaintiffs in the former suit commenced the present action against the new District Board, asking a declaration that the decree in the former suit was now binding as between the plaintiffs and the new Board. The Statement of Claim did not allege that the new Board had committed any breach of the injunction, or, indeed, that any breach had, in fact, been committed. The defendants demurred to the Statement of Claim, on the ground that it did not show any cause of action against them. Vice-Chancellor Bacon (as reported in the JOURNAL of the 3rd inst.) overruled the demurrer. The defendants appealed.

The SOLICITOR-GENERAL, Mr. HORTON SMITH, Q.C., and Mr. COZENS-HARDY were for the defendants; Mr. DAVEY, Q.C., Mr. RODWELL, Q.C., and Mr. CARSON for the plaintiffs.

The MASTER of the ROLLS was of opinion that the action could not be maintained. The case was clearly one of first impression; no one had ever heard of such an action before. There was nothing like it in the old practice of the Court of Chancery. The first observation was that in the old suit the injunction granted was only against the Council of the borough, their servants, workmen, and agents, and it did not run with the land. If they sold the land, the injunction would not affect the purchaser. If he committed a nuisance, a fresh action could be brought against him; but he would be in no way bound by the former proceedings. It was said, however, that by virtue of the Public Health Act of 1875 the new Board were bound by the old decree. Of course, an Act of Parliament could do anything. The section of the Act relied upon was the 275th, and it was said that the effect of it was to transfer to the new Board the obligations of the Council. This section, however, was limited to obligations attaching under the Act. The obligations arising under the decree had nothing to do with the Act, and, therefore, the section did not make the decree binding on the new Board. No other ground having been suggested, the demurrer should have been conceded, and the appeal must consequently be allowed.

Lord Justice JAMES agreed with the Master of the Rolls. He had never seen such a bill before. The action was either wrong or unnecessary.

Lord Justice LUSH was of opinion that the Statement of Claim was defective in two respects, either of which was fatal to it. It did not allege that there had been any breach of the injunction, and it did not show any privity whatever between the defendants and the Council, against whom the injunction was awarded.

The appeal was accordingly allowed, with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

MONDAY, MAY 16.

(Before Baron POLLOCK, and a Special Jury.)

SHEFFIELD V. WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

This was an action to recover the statutory penalty of 40s. a day for the non-supply of gas to the plaintiff's premises. The defendants denied their liability, and by counter-claim sought to recover from the plaintiff the

sum of £7 10s., being the value of a meter detained by him, and the sum of £8 19s. for gas supplied.

Mr. GRANTHAM, Q.C., and Mr. DOUGLAS KINGSFORD appeared for the plaintiff: Mr. JELF, Q.C., and Mr. LYON for the defendants.

Mr. GRANTHAM said this case was of a somewhat unusual character, but it really formed itself into a question of whether the defendant Company had a right to act in the arbitrary manner in which they had acted with reference to complaints made to them by the plaintiff, as to the improper quality of the gas they supplied to him. The plaintiff was the owner and occupier of Burlington House, Upper Tooting, which house was supplied with gas by the defendants. At the end of 1879 the gas was constantly very bad, and when the plaintiff complained he was told that it was owing to the frost, and afterwards that it was owing to the water in the pipes; but upon having the pipes opened no water was found therein, and after the frost disappeared the same cause of complaint still existed. When turned low the gas would suddenly go out, the consequence being an escape; and after the plaintiff had been put to great inconvenience in this manner, the meter was examined, when it was discovered that it had not registered. Now the 19th section of the Act of Parliament under which the Company supplied gas to the plaintiff's neighbourhood, provided that the Company should keep all meters in proper order for correctly registering gas, and in default of so doing the occupier should not be liable to pay rent for the same. What happened was this: The Company claimed to have payment made to them for gas consumed at the same rate as in the corresponding quarter of the previous year; but the plaintiff said he would not do this. The Company claimed, to begin with, for the hire of the meter which was of no use at all, and which, according to the Act, they had no power to charge for; and then they cut off the supply of gas. After this the plaintiff was summoned before the district Magistrate, but the summonses were allowed to stand over, *sine die*, until after the present action had been disposed of. The plaintiff said he had not been supplied with proper gas; and that the Company had placed themselves under the liability of the 36th section of the statute, which provided that whenever the Company neglected to provide a proper supply of gas they should be liable to a penalty not exceeding 40s. a day. It seemed to be conclusive that they had acted *ultra vires*, and were liable to the penalty, though the plaintiff did not press for excessive damages, but merely wished to show that the Company could not act in the very arbitrary way in which they had done. The Company's defence was this: "Thus, we are liable under the section, but when you gave us notice to have the gas put on, you signed a contract which saves us from the liability of the penalties of the particular Act of Parliament, and consequently you cannot recover." When a person applied for a supply of gas the following form was sent to him by the Company to be signed:—"I request you to supply gas to my premises, and to provide a meter subject to the conditions at the back;" but when the plaintiff signed this he never supposed there was anything in the shape of conditions at the back, which would entirely ignore the Company's liability under their Act of Parliament, and divest him of his rights as one of the public.

Baron POLLOCK asked which clause of the contract the defendants relied upon.

Mr. GRANTHAM said clause 9, which provided that should a meter, from any cause, register imperfectly, the charge would be regulated by that of the corresponding period; or if a meter were tested by a Government Inspector, and found to register imperfectly, the subject of error would be charged for, or allowed, as the case might be, on the current quarter's consumption only.

Baron POLLOCK: Do you say that is *ultra vires* or illegal?

Mr. GRANTHAM: Yes; the Company must show that the plaintiff entered into it as a substantive contract, which would deprive him of his right to say, "You are bound to supply me with a proper quality of gas."

Baron POLLOCK said he was assuming the plaintiff signed the contract.

Mr. GRANTHAM said the printed conditions were at the back of the form he signed. The 11th section of the Act provided that the Company might, if required so to do by the owner or occupier of the premises, give and continue a supply of gas under such pressure in the main as might be prescribed; and that any one requiring a supply of gas should give notice to the Company, and enter into a written contract with them to receive the same.

Baron POLLOCK said the words of the application were: "Gentlemen, I request you to supply gas upon my premises, Burlington House, and to provide a meter for 14 lights, subject to the terms and conditions at the back of this application." He did not see why it was not a perfectly good contract.

Mr. GRANTHAM said that, being inconsistent with the section of the Gas-Works Clauses Act of 1871, it was consequently *ultra vires* and illegal.

Baron POLLOCK asked in what respect it was inconsistent.

Mr. GRANTHAM said one section of the General Act provided that, in case of any difference as to the quantity of gas consumed, application was to be made to the magistrates to settle the point; and not only so, but the meter was *prima facie* evidence of the quantity of gas consumed. The Company made a claim for gas, and because the plaintiff would not pay it they cut off his supply.

Baron POLLOCK remarked that it was rather a point of law.

Mr. GRANTHAM said no doubt it was. The defendants cut off the supply without taking the step which they ought to have taken when an objection was made to pay the amount claimed.

Baron POLLOCK asked which section gave the Company the power to cut off gas.

Mr. LYON said it was section 16 of the Company's Act.

Mr. JELF said the contract provided that all accounts should be paid quarterly, and that if not promptly paid the supply of gas would be discontinued.

Mr. GRANTHAM said the charge had been made according to the corresponding quarter.

Baron POLLOCK inquired whether there was any dispute as to the fact of the gas being burnt.

Mr. JELF said the plaintiff had not paid anything in respect of the gas consumed, nor had he tendered anything.

Mr. GRANTHAM said the state of the index of the meter was to be *prima facie* evidence of the quantity of gas consumed. The plaintiff admitted that the meter was wrong; but it was for the Company to show how much it was wrong, especially as they charged for the hire of it.

Baron POLLOCK: How do you get out of your contract? If the meter ceased to register, the payment was to be regulated by the quantity consumed in the corresponding period of the previous year, and it would not be fair to make a man pay according to the preceding quarter.

Mr. GRANTHAM said the defendants must adopt the course marked out by the Act of Parliament, which provided that the meter should be taken as *prima facie* evidence, and in case of its being disputed it was to be referred to the magistrates.

Baron POLLOCK pointed out that this was to be done in the absence of any contract.

Mr. GRANTHAM said his next point was that the Company had only a right to charge for the gas, and not for the rent of the meter which was of no use.

Baron POLLOCK: Where does this appear?

Mr. GRANTHAM said by their Act the Company were entitled to charge for the gas: "The charge will be regulated by that of the corresponding period," and in the corresponding period it was £3 17s. 5d. The Company had sent in a claim for £3 17s. 9d.; and, in addition, a sum for the hire of the meter.

Baron POLLOCK: If the Company are to provide a meter and keep it in repair, why are they not to charge for it?

Mr. GRANTHAM: Because it was of no use. By the 19th section of the Act they are not to charge, and by the contract we do not covenant to pay for a useless thing. The section provides that the Company shall, at their own expense, keep the meters in proper order; and, in default of their so doing, the consumer shall not be liable to pay rent for the same during such time of default.

Baron POLLOCK asked whether the plaintiff ever applied to the Company to put the meter in order.

Mr. GRANTHAM said he did not know what applications the plaintiff had made.

Baron POLLOCK asked whether it was a wet or a dry meter.

Mr. GRANTHAM: A wet meter.

Baron POLLOCK said the meter might have been in a place where the water became frozen, and consequently out of order.

Mr. GRANTHAM said by the 19th section of their Act the responsibility was thrown upon the Company of keeping the meter in order.

Baron POLLOCK: Suppose a meter is out of order for a day, and the consumer does not send the company notice.

Mr. GRANTHAM thought this would be a different thing; but in the present case it was not a temporary disarrangement, as the meter had not registered at all. This being so, the onus was upon the defendants, and the plaintiff could not be made to pay.

Baron POLLOCK said no doubt every one in the district where the plaintiff resided would be much obliged to him for keeping the Company in order, provided they wanted keeping in order, but what was passing through his mind was that the case would depend upon the construction of the contract and the Acts of Parliament.

Mr. JELF said the plaintiff, being a solicitor, must have known the contract into which he had entered.

Baron POLLOCK: I would suggest whether you could not take a Special Case to settle the point.

A consultation took place between the Counsel; after which

Mr. JELF stated that his clients represented a large number of shareholders, and they considered they had been brought to the Court to meet a most unfounded charge. The plaintiff had notice upon the document that all complaints were to be made in a particular way; but during the whole of the period of supply not a single complaint had been made by him. They were dealing with a gentleman who knew perfectly well what he was about.

Baron POLLOCK said he could not see that there could be any objection to the contract; it was clear they all contemplated a contract, and there was nothing with regard to private individuals which made it illegal for them to contract in a particular way.

Mr. GRANTHAM thought this would be a question of law, and therefore it would be desirable to get the evidence upon the notes.

Mr. JELF remarked that it would be a very odd thing if companies had not the power to make contracts for the supply of gas. The 15th section of the Gas-Works Clauses Act of 1847 provided that "the undertakers may from time to time enter into any contracts with persons for supplying gas." Was there, he asked, anything wrong, or unreasonable, in such a contract? Persons could not go on using gas without paying for it, and up to the present time no suggestion had been made that the charge was too high.

Baron POLLOCK said he supposed the defendants would not feel much difficulty in turning on the gas again.

Mr. JELF said they were quite ready to do so. Perhaps the next time the plaintiff entered into a contract he would take the trouble to read it, and not let Counsel come into Court and state that he had not read it.

Mr. KINGSFORD said the contention of the plaintiff was a double one—first, that the conditions were *ultra vires*, inasmuch as they contracted the defendants out of a statutory liability; and secondly, assuming they were *intra vires*, the question arose whether the conditions exempted the defendants from the statutory liability and disability placed upon them by sec. 19 of their Act of Parliament. He should submit that the condition as to the incorrect registration of the meter dealt directly with a different state of things from that provided for by the section. It did not refer to a default, but only to an accidental cause resulting in a temporary incorrect registration. The charge in the present case was not simply a defect, but an actual default on the part of the Company in not keeping the meter in a proper condition to register gas, although they were paid for so doing; and this being so, the plaintiff alleged he never became liable to pay anything whatever. With regard to the case of frost, which had been put by his Lordship, he should say there was no default on the part of the Company, and plaintiff would fail to prove the liability.

Baron POLLOCK said the charge for the meter was 2s. 3d. per quarter; so that supposing it was out of order for a week, through the default of the Company, there might be a reduction of 3d. Had the plaintiff, he asked, tendered anything in respect of the other period?

Mr. KINGSFORD replied that in the present case the meter registered nothing for the whole quarter; it was not a case of defective registration. They might just as well have put up an empty barrel in the place of the meter. He contended that the contract was *ultra vires*, and if not *ultra vires* that there had been a distinct default by the Company which was not covered by the conditions upon which they relied.

Mr. JELF pointed out that neither of the points relied upon had, in any shape or form, been raised by the Statement of Claim. It was alleged that there was a contract, and the terms of the contract were set forth.

Mr. KINGSFORD said this was not so.

Mr. JELF contended that the terms were set forth.

Baron POLLOCK said it was stated that "the defendants contracted to supply gas."

Mr. JELF reminded his Lordship that the plaintiff did not allege that when the meter was supplied it was not in perfect condition.

Baron POLLOCK thought they were really entering upon a matter of investigation which must occupy a long time, and end in a very refined point of law.

Mr. KINGSFORD said no doubt as to the contract being *ultra vires* it was not distinctly pleaded; but, if necessary, he would ask leave to amend upon this point. They did plead that the supply of gas had been wrongfully cut off.

Baron POLLOCK thought that it was not a question of pleading, and that the whole of the facts might have been put into a Special Case.

Mr. JELF was ready to try the point in any way that might be agreed upon.

Baron POLLOCK said they might agree as to the facts now, and take the finding of the jury, and then reserve the law for him to decide upon; and, if necessary, the parties could take the opinion of the Court of Appeal upon the finding.

Mr. JELF suggested that the case should be tried before his Lordship, without a jury.

Baron POLLOCK said he could not do this now. The jury would have to decide, upon the evidence, whether the meter was a proper meter or not, and this would involve a question of fact. Was the meter in court?

Mr. KINGSFORD said it was not, but carefully stored up on a shelf in the plaintiff's house. He would suggest that they should take the evidence by admission.

Mr. JELF said his point was that the meter when supplied was a proper meter, properly tested by the Government Inspector, and properly stamped; and that it was a meter which did its work properly.

Baron POLLOCK wished to know whether the plaintiff would admit all this.

Mr. KINGSFORD said that at present he was not prepared to dispute it. Mr. JELF said the next thing he had to prove was that a meter of the particular kind in question would, from time to time, from causes over which no one had any control, get out of order, and that in the quarter ending Christmas, 1879, it was out of repair, and so prevented from registering.

Baron POLLOCK: Not from any inherent defect.

Mr. JELF: Certainly not. The meter was not exactly out of repair; it had merely become tilted, the result being that although the gas passed through it, it did not register.

Baron POLLOCK said this was all very intelligible, but would the plaintiff admit it?

Mr. KINGSFORD thought that if the meter only wanted putting straight it could easily have been rectified.

Mr. JELF replied that the Company could not go into every house in the district and examine the meters to see whether or not they were tilted. The plaintiff had notice of the way in which to complain; and, if he had given notice, the Company for their own sake would have put the meter straight. But no such complaint was made, and at the end of the quarter they found nothing put down to their credit, although gas had been used the whole quarter.

Baron POLLOCK asked what sum the plaintiff tendered in payment.

Mr. JELF replied that from Michaelmas, 1879, the plaintiff had not paid one halfpenny for gas, or for meter hire.

Mr. KINGSFORD said that plaintiff had offered to submit to any impartial person the question as to what was a reasonable sum to pay.

Mr. JELF: That we dispute.

Mr. KINGSFORD thought it was assumed that section 19 of the Company's Act required the consumer to ascertain whether the meter was out of order, and to give notice to the Company to correct any deficiency; but how could a consumer tell whether the meter registered correctly or incorrectly? Of course he could tell if it did not register at all; but, in point of fact, the plaintiff's attention was not directed to it, and moreover the Company were bound to keep it in order.

Baron POLLOCK: This will be one of the questions to be tried.

Mr. JELF said they could not go poking into people's places to see whether the meters were out of order, but directly they had notice that this meter was out of order they removed it, and put in a new one. The question of 2s. 3d. per quarter for the hire of the meter had never been a bone of contention between them; the contention was that the plaintiff, according to the contract, was not to pay by the corresponding quarter.

Baron POLLOCK said that, as the parties could not agree, the evidence had better be gone into.

Mr. G. J. Graham, a builder at Barnes, was then called to prove that at the time the gas was first laid on, the pipes in plaintiff's house were in proper order; and that towards the end of 1879, upon his attention being called by the plaintiff to the bad quality of the gas, he inspected the pipes to see whether water was inside. He found there was not any. Before the gas was laid on he fetched from the Company's office the usual form, and having taken it to the plaintiff, it was signed by him, and forwarded to the Company.

Mr. T. N. Sheffield, examined by Mr. KINGSFORD, said: I am the plaintiff in this action, and reside at Burlington House, Upper Tooting. Towards the end of 1879 I noticed that the supply of gas was very defective. I am in the habit of leaving the gas alight in the hall and in some of the bed-rooms at night.

Mr. KINGSFORD: Did you notice that the quality of the gas was not very good?

Baron POLLOCK said they had not now to try the question of whether the gas was or was not good.

Examination continued: The first demand by the Company for payment of their account of £3 17s. 5d. was made on the 25th of January last year. In February I received a further notice, and on the 7th of March a final application. I then looked at the meter, and found that it had not registered anything since the previous quarter. On the 11th of March the gas was cut off. Up to this time no application had been made to inspect the meter. A week after the supply had been cut off I was served with two summonses to appear before the district Magistrate.

Baron POLLOCK did not think this question was at issue.

Mr. JELF said it was not; the Company had allowed the summonses to stand over, so that the decision should not prejudice the trial of the present action.

Examination continued: In the corresponding quarter of 1878 the amount charged for gas was £3 17s. 5d.

Baron POLLOCK: So there is really a difference of 4d. between you.

Cross-examined by Mr. JELF: I have been in practice as a solicitor for 20 years. I did not know that the document which I signed previous to being supplied with gas was a contract. [The document was read to the witness.] I did not think that the words "the terms and conditions annexed," had any meaning. I thought I was not entering into any special contract.

Baron POLLOCK: Did you read the document?

Witness: I did not. It was brought to me by my builder, and I signed it as a matter of form.

Mr. JELF: Do I understand you to say that without reading it, and without knowing whether it contravened an Act of Parliament, you signed it; or that, having looked at it, you thought it was *ultra vires*, and therefore signed it, knowing that it could not bind you?

Witness: I considered it was what they were authorized to claim. I was under the impression that I had merely signed a form of application. I thought, and still think, that the Company are bound to supply gas without any contract other than the one provided by Act of Parliament.

Cross-examination continued: From 1877 I dare say I received every quarter a paper showing the quantity of gas consumed, and demanding payment. I notice on the paper you now hand to me there are the words, "All complaints should be addressed to the Engineer at the works, North Street, Wandsworth," but I do not think I ever sent any complaint to the Engineer; I should write to the Secretary. I have sent post-cards to the Secretary, complaining of the supply. These would have been sent in November. Interrogatories have been administered to me in this case.

[The following question and answer from the interrogatories was then read to the witness:—"Q. Is it not the fact that you never made any complaints to the defendants as to the quality of gas supplied by them; if you

say you did make such complaints, state when and to whom the complaints were made, and whether they were in writing?—A. I state I did make complaints to the officers of the Company, whenever they called at my house, as to the quality of the gas supplied; I do not know when they were made, or what was said, except that I made the complaints."]

Witness, upon being pressed, said that when he gave this answer upon oath he must have forgotten that he had written to the Secretary. He did not know that in December, 1879, the Company sent and took away his meter and put up another.

Mr. JELF: Do you say that the meter which is in the house now does not register anything?

Witness: Certainly I do, as the gas is cut off.

Had it not registered from the 29th of December, 1879—the date of its being put in—until the time the gas was cut off?—I have been told by my servant that the meter was put in after they cut off the gas.

Baron POLLOCK: Do you think they would bring a new meter after they had cut your gas off?

Witness: I thought that the meter at my house was the old meter.

Cross-examination continued: My attention was not directed to the notices requesting payment. I had been away at Brighton, and I found them upon my return. My servant told me that the gas-man had said it was the Company's fault, and that they would see to it. Until the 11th of March last year I did not know there was any idea of cutting the gas off. I did not seriously suppose that they would cut off the supply to a person in my position. I knew they had threatened to do so, but I thought it was too foolish to carry out such a threat. Before the action was brought I never complained that I had been charged 4d. too much. I have not paid for the gas supplied since Michaelmas, 1879.

[Witness having stated that the meter had not been taken away, a letter written by him to the Company in which he referred to the "late meter" and the meter which had been "removed" was read; but he was unable to give any explanation, except that he must have forgotten. He also stated that he had refused to give up the meter now in his house to the defendant Company.]

Baron POLLOCK said if this was so, he had rendered himself liable to the claim made by the defendants in their counter-claim. Addressing the plaintiff's Counsel, his Lordship asked whether the matter was not really a question of feeling, and said it must not be forgotten that there was the question of costs to be considered. He would not say more, but he really did begin to feel seriously the errors of memory on the part of the plaintiff.

Mr. JELF said the Company had the most perfect answer to give to every single portion of the plaintiff's case; and, over and above this, they had a counter-claim.

A consultation again took place between the learned Counsel, and then Mr. KINGSFORD said, on behalf of the plaintiff, he was quite willing to leave the matter to his Lordship.

Baron POLLOCK said he would rather the parties settled it for themselves.

Mr. JELF remarked that his Lordship did not at present know what a complete answer the Company had to the case.

Mr. KINGSFORD said that unless his friend would give way a little he must leave the case to be decided by the jury.

Mr. JELF said he had given way to a certain extent.

Mr. KINGSFORD thought if Counsel could have a few words with his Lordship in his private room they might perhaps be able to come to some arrangement.

The Counsel having conferred with his Lordship,

Mr. JELF stated he was happy to be able to announce that the parties had, with the assistance of his Lordship, arrived at a result satisfactory to both parties.

Baron POLLOCK said that whatever might be the true construction of the Act of Parliament, he thought an end had been made of the case which was not only creditable to both parties, but beneficial to the individual interests of each. He would not undertake to say what might have been the result of the case if the matter had been argued out, though he was sure that after a great deal of money had been spent upon it no better result to the parties would have been arrived at.

A verdict was then taken for the defendant Company on the plaintiff's claim; and also for the defendant Company on the counter-claim for £8 19s., the amount of the unpaid gas bills, and for £7 10s. (to be reduced to 1s. on return of the meter). The plaintiff also to pay a certain sum by way of costs. It was further arranged that the proceedings in the Police Court should be dropped, both parties to pay their own costs.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns—furnished to him by the London Water Companies—of the average daily quantity of water supplied to the Metropolis during last month. From them it will be seen that 143,706,516 gallons, or 652,925 cubic metres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 237 gallons (107·7 decalitres), rather more than a *ton* by weight, to each house, and 35·4 gallons (15·2 decalitres) to each person, against 32·9 gallons during April, 1880:—

COMPANIES.	Number of Houses, &c., supplied in April, 1880. April, 1881.		Aver. Daily Supply of Water in Gallons* during April, 1880. April, 1881.	
	April, 1880.	April, 1881.	April, 1880.	April, 1881.
TOTAL SUPPLY	581,017	605,501	135,710,884	143,706,516
From Thames	278,690	291,228	69,665,251	71,728,460
„ Lea and other Sources	302,327	314,273	66,045,633	71,978,056
THAMES.				
Chelsea	30,071	30,585	8,530,100	8,875,700
West Middlesex	54,062	56,965	10,882,750	11,156,844
Southwark and Vauxhall	89,409	93,416	23,098,920	22,409,560
Grand Junction	41,352	43,443	12,376,272	13,243,056
Lambeth	63,706	66,819	14,777,200	16,043,300
LEA AND OTHER SOURCES.				
New River	130,121	133,055	26,808,000	27,949,000
East London	122,746	128,980	30,989,900	35,420,800
Kent	49,460	52,238	8,247,733	8,608,256

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for April, 1881, as compared with that for the corresponding month of 1880, shows an increase of 24,484 houses, and of 7,995,632 gallons of water supplied daily.

FROM accounts presented at the last meeting of the Barnsley Town Council, it appears that the revenue from the water supply for the past twelve months was £10,938 15s. 3d., and the expenditure £10,390 16s. 4d.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS
AND MANAGERS.

QUARTERLY MEETING AT IPSWICH.

Favoured by genial weather, and by the kindly hospitality of Messrs. Goddard—father and son—the members of this Association had a most enjoyable meeting at Ipswich last Thursday. A start was made (from the Liverpool Street Station of the Great Eastern Railway) at ten o'clock, Ipswich being reached at noon. Here the party was met by Mr. E. Goddard, sen., and Mr. D. Ford Goddard, and by them accompanied, in waggons, to the works of the Ipswich Gaslight Company. Light refreshments were served in Mr. D. F. Goddard's house, adjoining the works, after which the members went on a tour of inspection.

The retort-houses were first visited. Here West's stoking apparatus has been in most successful operation for a considerable time past, and the drawing and charging of a series of retorts was witnessed. In the purifying-house and elsewhere some extensive additions have recently been carried out by Messrs. S. Cutler and Sons. These include the iron roofs for both the new retort-houses, the fitting up of all the ironwork to the retorts in one of them, the extensive condenser which is erected along the side of the coal store; and, notably, the entire re-arrangement of the purifiers and their connections. Two new purifiers have been added, making a total of eight, which are divided into two sets of four, and can be worked in any number, order, or direction that the Engineer may at any time desire. This has been accomplished by the adoption of Cutler's patent water-valves throughout, all the old arrangement of valves having been removed. The working of these new valves of Messrs. Cutler and Sons is most simple and easy, and all the details and fittings have been designed and carried out with great care; so much so that, as Mr. Goddard remarked, he himself was quite able to perform the operation of putting purifiers in and out of action, all that is required being the actuation of a short lever controlling the water supply. Not only is the whole arrangement most complete, but these valves, as was remarked, cannot leak. They are, of course, being water-valves, perfect in this respect; and the visitors appeared to be greatly pleased with the entire arrangement. Mr. Cutler, who was among the visitors, incidentally remarked that his firm are now fitting up with these patent valves 16 purifiers, 32 feet square, for the Manchester Corporation Gas-Works.

Besides, however, the foregoing, Messrs. Cutler and Sons have erected a new telescopic gasholder, 122 feet diameter and 32 feet deep each lift, which works in a tank constructed wholly of wrought iron, and standing almost entirely above the level of the works, owing to the nature of the site being such that excavation would have been very costly. This tank is a most successful illustration of the suitability of wrought iron for large tanks. The guide framing of the holder is also of wrought iron, the standards being handsome specimens of wrought lattice-work, and are braced together with two tiers of wrought-iron girders, and a system of diagonal ties, the whole forming a very prominent object from the surrounding neighbourhood.

Afterwards a move was made for the sulphate of ammonia plant, described in the paper read by Mr. D. F. Goddard at the meeting of the Association last November. Perhaps the most interesting part of the inspection, however, was the sight afforded of Hislop's process for the revivification of spent lime. The plant for this purpose is the first erected in England to carry out Mr. Hislop's invention; and from the following particulars, given by Mr. Goddard, it would appear to be singularly successful; in fact, he expressed his unqualified satisfaction with the process:—

Statement showing Cost of Lime treated by Hislop's Patented Process at Ipswich.

Production per man per day = 23 cwt. of quick lime.

	s.	d.
Cost.—Fuel	4	6·7 per ton.
Wages	3	5·7 "
Interest and maintenance	0	8·2 "
Royalty	2	0·3 "
Total (including slaking).	10	8·9 per ton.
Less—cost of slaking, as usually done in retort-house.	1	6·6 "
Net cost per ton	9	2·3 per ton.
As against cost of lime as bought from lime burners	18	4·0 "

The members shortly afterwards assembled in the room appointed for the meeting, and the chair was taken by the President of the Association (Mr. W. H. Broadberry, of Tottenham), who was supported by the Secretary (Mr. J. L. Chapman, of Harrow), and Messrs. E. and D. F. Goddard.

Mr. C. GANDON (Crystal Palace District Gas Company) read the following paper:—

LETTING GAS-STOVES ON HIRE.

The advantages of cooking and heating by gas have been so frequently and ably set forth, that it is unnecessary, at a meeting like the present, to do more than point out that such advantages are to the benefit of gas companies as well as of gas consumers. Without in any way considering that our occupation as furnishers of artificial light has been, or will be prejudiced by electric lighting, I think it is the duty of every gas manager to promote the use of gas by all means in his power; for, as economy in the manufacture increases with the quantity made, and, with increased consumption, the selling price can be reduced, it appears to me that the position of a company will be materially improved, and its permanent success be rendered more secure, as its business is enlarged.

During the last few years the use of gas for cooking and heating purposes has been enormously developed. The public are becoming more and more convinced of the convenience and cleanliness, if not of the economy attending its use; and the makers of gas-stoves have considerably improved the apparatus they supply, to which also public attention has been largely attracted by the frequent exhibitions which have taken place; so that, although perfection may not have been attained in such stoves, it cannot be denied that those now produced by good makers are very efficient in their action.

Seeing that the advantages of cooking and heating by gas are becoming so generally recognized, it may perhaps be a matter for surprise that it is not more extensively used for these purposes. This appears to be in part due to certain obstacles which I think it may be said the gas companies have power to remove. It may be safely asserted that the cheaper gas is, the more it will be used for all purposes, including cooking and heating, and that with its extended use the price may be reduced. The complaints made of the excessive consumption by gas-stoves are mainly owing to the gas being used wastefully; for it is no uncommon occurrence to find the gas left burning when there is no need for its use, and it is very desirable to impress upon all consumers the necessity of a strict supervision, especially in the case of servants, if economy is to be studied, and this is more particularly needed where gas is used for cooking and heating purposes.

No doubt coals or other fuels are wasted in a similar way, but not to so great an extent, for a coal fire, when once lighted, must be kept going whether required or not, while the gas should be turned off directly it is

not being used. For my own part, I doubt very much whether, for its heating power, gas can be expected to compete favourably with solid fuel in respect of cost. It is only in the fact of its being lighted when required and turned off directly it is not wanted that it can be economically used, and it is the frequent disregard of this that causes so many persons to find its use expensive.

The great drawback, however, to the more general use of gas-stoves is the heavy outlay required for the purchase of an efficient stove. A small burner for heating water, or for similar purposes, may be obtained for a few shillings, and by means of a flexible tube it can be fixed to any existing gas-bracket without the aid of a gas-fitter. There are few houses into which gas has been introduced where some such appliance is not to be found, although these stoves are frequently removed during the winter time, while a kitchen fire has to be kept lighted, on account of the tendency to use the gas, even when the other fire is available. When, however, a gas-stove is required capable of cooking the meals for a family, and the purchase of such a stove involves an outlay of perhaps £5 or more, there are comparatively few people inclined to incur so large an expense for what, in many instances, they regard as an experiment. This is more especially the case where consumers are only tenants, and not owners of the houses they occupy. We most of us know how frequently the cost of purchasing gas-fittings deters persons from using gas for lighting purposes, and there is still greater reluctance to incurring an outlay for stoves, which are generally regarded as landlords' fittings.

A remedy may be found for this by gas companies providing consumers with stoves on hire at a moderate rental, for many persons are willing to pay a small quarterly sum for the hire of a stove, who would not spend several pounds in the purchase of one. This course has been followed for some years by the Crystal Palace District Gas Company, and the results obtained have fully proved its advantages to the Company, and indirectly to the consumers. There are also many other Companies who have adopted the plan, and, in all cases where I have made inquiries, favourable results have been reported. At Sydenham there were last month 187 heating and 416 cooking stoves out on hire. The proportion of heating to cooking stoves varies with the seasons; during the winter months considerably more heating stoves are supplied, many of them being returned during the summer months, to be again hired out in the following cold season. During the winter months, when kitchen fires are required, the cooking-stoves are not so much in demand; but the greater part of these, when once fixed, are used, more or less, throughout the year.

As these stoves are not generally supplied from a separate meter, no accurate estimate can be given of their consumption; but it may be fairly assumed that the average consumption of such cooking-stoves as are supplied on hire will not be less than 30,000 cubic feet per annum, and of a heating-stove perhaps half this amount, which for the before-given total of 603 stoves, would represent a consumption of 15,285,000 cubic feet per annum, or about 3½ per cent. of the total gas sold. This calculation is, however, perhaps too low, for others have informed me that they consider a gas-stove is equivalent to an additional consumer; and, regarded from this basis, the 603 stoves would represent over 6½ per cent. of the total gas sold. I have also received details from one company, with a gas-rental of £84,000 per annum, where there are 650 gas-stoves on hire; and of another company, with a rental of about £7000, having 200 on hire; and both these cases would seem to indicate still more favourable results obtained from the hire system.

In the Crystal Palace District Gas Company's area it must also not be supposed that the figures quoted represent the total consumption of gas for cooking and heating purposes, as there are numerous consumers who provide their own stoves. The number of these is not known, but it will probably be quite equal to, if it does not exceed the number on hire. The Company supply only the larger and more expensive descriptions of stoves, and many persons prefer to purchase smaller and cheaper ones. The number of gas-fires is also very considerable, and any one who has had experience of these will know that they are valuable contributors to the revenue of a gas company.

The charges made at Sydenham for the hire of stoves are a rent of 1s. 6d. and 1s. a quarter respectively for cooking and heating stoves, with a delivery charge of 2s. for cooking, and 1s. for heating stoves, and similar sums for returning them to the works. These conditions are perhaps open to criticism, and if I were about to introduce the hire system into a place for the first time, I should be disposed to make some alterations in them. In the first place, although it may not be expedient to make a profit on the hire of the stoves, but rather to make the terms as easy as possible, with a view to increasing the consumption of gas, yet it is questionable policy to make charges resulting in a loss to the company; and 1s. 6d. per quarter, or 6s. per annum, is certainly not sufficient to pay a moderate interest on the capital invested, and provide for repairs and renewals, on cooking-stoves costing £4 to £5 each. On £4 it represents less than 8 per cent., and assuming interest at 5 per cent., less than 3 per cent. is left for depreciation, which is far too low, as the average life of such stoves cannot be taken at more than 10 years, however solidly they may be constructed, particularly as it must be borne in mind that they will, in many cases, be subjected to rough and careless usage at the hands of persons who are only hirers of them.

Many persons also object to the charge of 2s. for delivery, and still more to that of 2s. for returning the stoves; in fact, at times the latter charge cannot be recovered. One object of this charge is to deter people from returning a stove after having hired it for a few months, to save the rental during a time when it is not required for use. Other companies make a charge of 2s. 6d. per quarter for the hire of a cooking-stove, without any charge for delivery or return; but the minimum rent charged is for one year. In other instances a rental varying from 10 to 15 per cent. on the net cost of the stove is made, and this latter plan seems the most equitable; but farther on I shall refer to the inconvenience of keeping a variety of stoves for hire, and a differential rental charge complicates the accounts considerably.

So far as heating-stoves are concerned, as their cost is small compared with cooking-stoves, and they are not exposed to such rough usage, the charge of 1s. per quarter would be sufficient to cover expenses if they were constantly at rental; but there is a great tendency to hire them during the winter months only, and some precautions are necessary to prevent them being returned as dead and unremunerative stock during a great part of the year.

The Crystal Palace District Gas Company do not undertake the fixing of stoves let out on hire, and the policy of this course will be questioned by many, as it may be regarded as opposing obstacles, instead of offering facilities for the extended use of these appliances. This may be true, but I have always been of opinion that a gas company should avoid, as far as possible, any interference with internal gas-fittings. It is argued with much reason that it is the duty of a gas company to exercise a supervision over the internal gas-fittings of consumers' houses, especially on account of the defective manner in which such fittings are very frequently carried out, and, so far as giving advice on the subject goes, I fully agree with this; but my experience has been that a great risk is incurred if any active assistance is rendered. The oft-quoted case of the Liverpool

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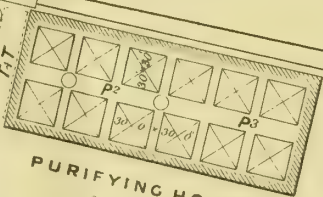
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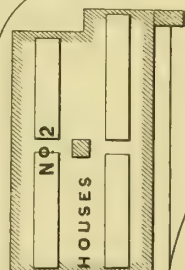
MIDLAND RAILWAY COMPANY'S LAND

M I D L A N D



PURIFYING HOUSE
235' 0" x 90' 0"

SPACE
FOR COAL AND COKE



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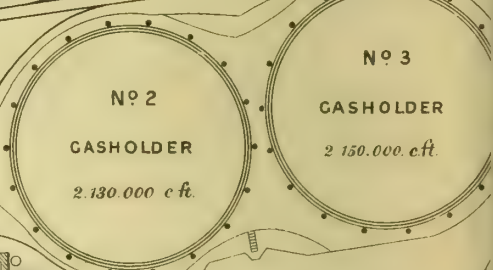
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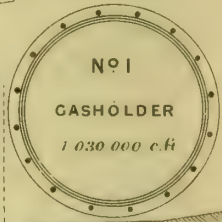
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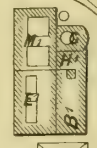


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CASHOLDER
2,130,000 c.ft.

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N°1
CASHOLDER
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LIME SHED

OXIDE MIXING SHED

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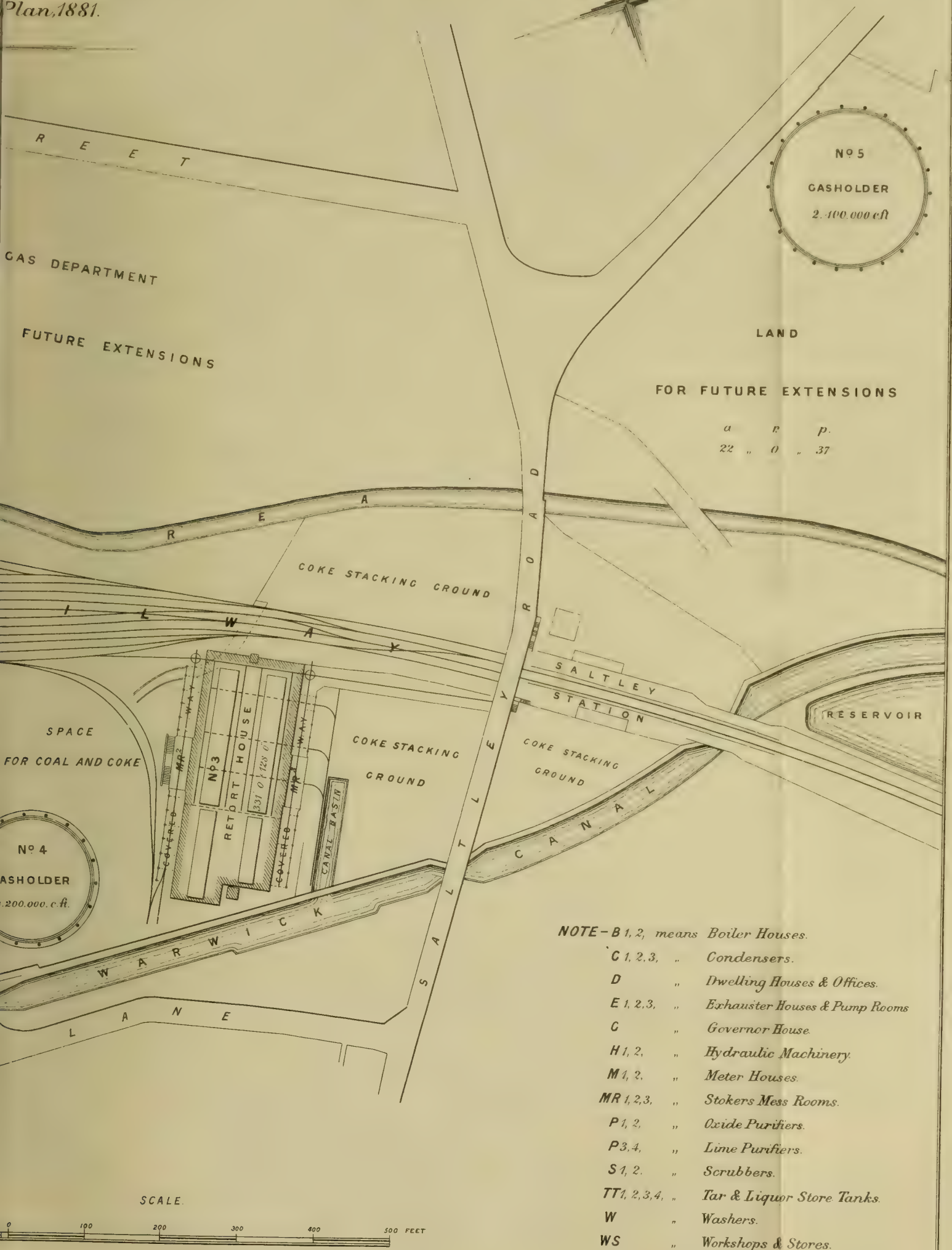
A D D E R L E Y R O A D



TION GAS DEPARTMENT.

WORKS.

Plan, 1881.



HENRY HACK, ENGINEER.

SOUTHERN DIST

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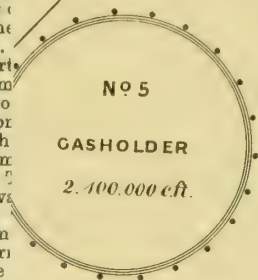
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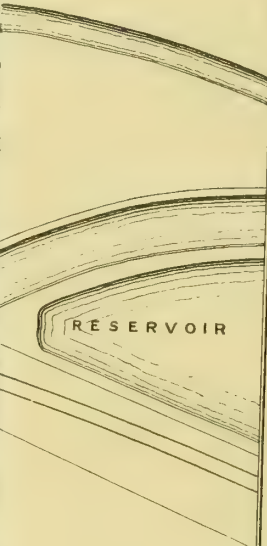
ENGINEER.



EXTENSIONS

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landing-stage is an instance of this. It is not alone on account of the risk of heavy liability in case of accidents, but also the frequent and vexatious claims for reductions from gas accounts for alleged loss of gas by escapes, real or imaginary, that in my opinion renders it advisable to avoid, as far as possible, interfering with fittings beyond the meter. It may be said that a gas company should take measures to employ such workmen as to render accidents or defective workmanship impossible; but a perfect gas-fitter has yet to be created, and even if he could be called into existence, I doubt whether the public could be convinced of his infallibility. For my own part, I make a point of giving to consumers all possible information and assistance, in examining their fittings and in testing their soundness; but there I feel inclined to stop. I may be accused of being an "obstructionist," but I argue from a considerable experience of the trouble and loss consequent upon a gas company assuming any responsibility for internal fittings.

When gas-stoves are kept for hire to consumers, it is somewhat difficult to decide what description of stoves should be offered. If a large assortment is kept, much inconvenience will be experienced; for makers are constantly improving or altering their stoves, and consumers have a tendency to be constantly changing to try each one, and every time a fresh one is supplied they seem to consider that it should be a perfectly new one. For this reason it is desirable to fix upon one or two makes and sizes which may appear likely to be most required, and to decline to supply others on rental. Of course this will, at times, give rise to complaints and insinuations that the company only hire out stoves that will consume the most gas, and so on; but reasonable people may generally be convinced that it is not to the interest of a gas company to do this.

In the selection of stoves for hiring, care should be taken to adopt only those of a substantial make, having, as a rule, cast-iron frames and parts that will admit of easy renewal, instead of the stove becoming useless by reason of one part becoming damaged. The impetus given to the gas-stove trade of late years has been very considerable, and so great a competition has sprung up, that it is not surprising if, in the desire to produce a cheap article, durability is sometimes disregarded. I have seen stoves that, after 18 months' use, have been completely worn out; and it is evident that such stoves, however cheap they may be in the first instance, cannot be remunerative to hire out at 1s. 6d. or even 2s. 6d. per quarter. I do not wish to imply that the generality of stove-makers sacrifice durability to cheapness, for there are many makers who produce stoves that are all that can be desired on the score of solidity.

For hiring purposes, it appears to me that the description of cooking-stove most likely to be required should be neither too large nor too small—in fact, one suitable for the cooking for a moderate-sized family will be most in requisition. Those who may require smaller and cheaper stoves may be induced to purchase them, and it would not suit a company to hire out very expensive ones, unless a differential rate of rental is charged according to the cost of the stoves; besides, I have found that where large and expensive ones are supplied on rental, they are frequently returned, and as there are few persons who require them, they may lie useless for a considerable time, deteriorating and producing no income, either for rental or gas consumed. The chief demand is for stoves of a moderate size, and if a variety of sizes are to be kept for hire, even at differential rates, the capital employed will be materially increased without producing any corresponding advantages. For these reasons I think that the most suitable stoves for hire will be found to be such as cost from £4 to £5 each, upon which a yearly charge of from 8s. to 10s. can be made without resulting in a loss to the company. With heating-stoves the requirements are not so varied, as they are chiefly needed for shops, halls, and small rooms; and two or three sizes and designs will furnish all that is required.

In connection with the stove-hire question, some companies have also endeavoured to promote the use of stoves by offering them for sale on the deferred or three-years purchase system, and if this would operate as favourably as the hire system, it would certainly be more advantageous for gas companies; but I think comparatively few persons will be found willing to purchase on any terms (except in the case of small and cheap stoves) if they can be hired at moderate rates, and inquiries I have made of some companies, where the deferred purchase system has been established, confirm this view.

On the question of gas companies selling stoves except for deferred payments, I hold opinions from which many will differ. If such stoves are to be sold at the ordinary selling prices, consumers may as well purchase from gas-fitters or stove-makers, and if sold below such prices it interferes with the business of such tradespeople in a manner that appears to me unnecessary. It is different with the hiring of stoves, or even selling them on the deferred payment system, because gas-fitters or stove-makers cannot, as a rule, undertake business upon these terms, and by gas companies doing so, facilities are offered to persons who would not otherwise employ gas-stoves at all. I know that many objections may be raised to this argument, but, while fully recognizing the desirability of employing every means for promoting and increasing the use of gas, I think it is not desirable to interfere more than is absolutely necessary with private trading.

Some few years ago, when the Leeds Corporation Gas Committee had it under consideration to introduce the stove-hire system at Leeds, a doubt was raised as to whether it could legally be done under their Act of Parliament, and counsel's opinion, taken on the question, was against the legality of so doing; the argument being that, although there was power to do so with ordinary "gas-fittings," yet a gas-stove could not be regarded as a "gas-fitting." This reasoning was questioned by many, and I confess I cannot see why a gas-stove used for burning gas should be excluded from the category of gas-fittings. The question has never been put to the test, nor did the opinion clearly state whether the argument applied only to a corporation supplying gas, or whether it was to be considered applicable also to gas companies.

Before concluding, it may not be out of place to offer some few considerations on the economy of heating and cooking by gas, as compared with solid fuel. As before stated, I do not think that coal gas will compare favourably with solid fuel where a continuous supply of heat is needed. It is true that our open English fires are the most wasteful and extravagant means of heating that could well be devised. How much heat escapes unutilized I will not attempt to estimate; but, however extravagant such fires may be, and however clearly it may be proved that the murkiness of the atmosphere in the Metropolis and other large towns is mainly due to such means of heating our houses, I think it will be long before the generality of Englishmen will be persuaded to give up the cheerful blaze of a good coal fire. Still there is plenty of room for the use of gas for heating and cooking purposes, and there are plenty of cases where it may be economically and conveniently applied. A good kitchen fire may be very necessary and agreeable in winter, but there are few servants who would not be glad to avoid the trouble and heat of it for many months in the year.

Again, an asbestos fire in an ordinary fire-place is perhaps the most expensive mode of using gas for heating purposes; but, properly arranged, it produces the nearest approach to a coal fire. Such a gas-fire, used for ten hours per day, will consume about 500 cubic feet of gas, costing, say,

1s. 6d., while an equally efficient fire could be maintained with coals for less than one-half that amount, but, if such a fire is required for only one or two hours per day, or at intervals, the gas will become more economical than coals, to say nothing of the labour and dirt that will be avoided; and there are, in every house, rooms where a fire is needed only for a short time, or at intervals, every day. It may be argued that neither gas nor coal should be consumed in such an extravagant way as in open fire-places. I am not prepared to defend the practice, except as an insular prejudice, in which I confess I participate. In all other countries except England closed stoves are used, and they are undoubtedly more economical than the open fire-places of this country, but there are few who will admit that an ugly square box stuck in the corner, or perhaps in the middle of a room, is so comfortable in appearance as a cheerful coal fire such as is to be seen in most English houses. Even our Continental neighbours, although formerly satisfied with stoves, have shown a decided preference to open fires where they are obtainable. There are, of course, means between the two plans, and a just medium may perhaps be adopted with advantage. Dr. C. W. Siemens has introduced a fire in which solid and gaseous fuels are combined, and which is doubtless more economical than when gas alone is used; and I think it may be taken for granted that the larger proportion of solid fuel that is used, the more economical will the fire become.

These remarks apply to fires in which a large portion of the heat is allowed to escape unutilized. The extreme opposite of this may be taken to be a gas-stove burning in a room without any flue for the escape of the products of combustion. In this case the whole of the heat is retained, but the atmosphere is vitiated to an extent that would not be tolerated by most people, although I have used some gas-stoves in this manner without being able to detect any inconvenience; still, except for halls, passages, and such places, gas-heating stoves should, as a rule, be provided with a flue, and, if the unsightliness of such a stove and flue is not an objection, it may be easily arranged so that but little of the heat is lost.

The foregoing remarks refer to heating by gas. Let us now, for a few minutes, consider cooking by the same means. If the burners on a gas-cooking stove are kept constantly lighted, as a coal or coke fire must almost of necessity be, the gas-stove will, as a rule, be found the most expensive, and I believe also it would be found to be more expensive if continuous cooking is required; but if it becomes a question of lighting either a coal fire or a gas-stove for cooking a single chop or making a cup of tea, it is equally evident that the gas must be the most economical. Where the advantage of the one over the other ceases, is somewhat difficult to determine, as it may vary from so many circumstances, and comparative estimates of the two modes of cooking are, for this reason, liable to be misleading. If carefully used, I have no doubt that gas will, in most cases, be found the cheaper, but the necessity for exercising a strict supervision should be pointed out to users of gas-cooking stoves, if economy is an object. I have myself frequently seen instances where there has been a good kitchen fire burning, and a gas-stove lighted to boil a kettle or cook some small article; and then such consumers afterwards complain that their gas accounts have increased enormously, without any reduction in their coal merchants' bills.

It is sometimes claimed that there is less waste in weight in cooking a joint by gas than with a coal fire; but I have never been able to satisfy myself that this is the case, or that there is any reason why it should be so, except that it may depend upon the mode of cooking in each case. If a joint is put down to roast before a newly-lighted coal fire, and the first part of the process consists rather of warming than of roasting, it is conceivable that some unnecessary loss may occur; but, given a proper heat in both cases, I am disposed to think that the results would be much the same with regard to loss of weight. We know that a chop or a steak may be spoiled instead of broiled by putting it over a slow fire, and, for avoiding this, gas has the immense advantage that it is fit for use directly it is lighted.

Complaints are frequently made that so much smell arises from cooking by gas, not only from the burning of the gas, but from the articles cooked; and this must be the case if the cooking-stove is fixed in a kitchen or other room, without any provision for carrying off the fumes from it, as is very frequently done. With an ordinary coal range these fumes, to a great extent, pass up the chimney, and, if a gas-cooking stove cannot be placed in an open fire-place, it should be surmounted by a ventilating hood, or placed in some outbuilding where the smell will not cause inconvenience. The neglect of this obvious precaution causes many persons to discontinue cooking by gas. Very recently I heard of a good cook having left her place because the mistress insisted upon cooking with gas, and the cook said it made her ill. On inquiry, I found that a large gas-stove was used in the kitchen, without any provision for the escape of the fumes; and it is easy to imagine that when frying operations were being carried on, the atmosphere of the kitchen was none of the clearest.

Some gas managers object to the introduction of gas-stoves, because they consider they will necessitate an increased day pressure in the district supplied. This I think is an unfounded objection, for a properly constructed gas-stove, with fittings of suitable dimensions, will act perfectly well with 7-10ths of an inch pressure, and I think no district should be kept with a lower pressure than this. If a stove does not burn satisfactorily with such a pressure, it must be from some defect in the stove, or insufficiency in the size of the supply-pipe, which should be easily remedied. Even if a slight increase of day pressure has to be given to accommodate gas-stoves, it should be remembered that the gas is consumed by them to a great extent during the daytime, when the outdoor plant would be otherwise idle, and also that the summer consumption may be materially increased by their use, so that the disproportion between the demands of the varying times of the day and year will be diminished, and consequently more gas can be produced and sold with the same plant. This being the case, it appears to me that the system of letting gas-stoves on hire must be in every way beneficial to the interests of gas companies.

I must apologize for the superficial manner in which the subject has been treated in this paper. Other duties have prevented my devoting so much time to it as I could have wished, and as its importance merits; but I trust the few details given may elicit further evidence of the sound policy of endeavouring to extend the use of gas for cooking and heating purposes.

Discussion.

The PRESIDENT having invited the members to discuss the paper, Mr. MITCHELL (Hornsey) said he had 70 or 80 gas-stoves in use in his district. These were let on hire by his Company at a rental of 1s. each for the heating, and 1s. 6d. each for the cooking stoves. He found that the consumption of gas in the latter averaged 30,000 feet annually.

Mr. GODDARD, sen., remarked that he had had as long an experience as any one in this matter; for he had many, many years since introduced the system of letting gas-stoves and fittings on hire. He commenced the plan by giving a practical exhibition of the utility of gas for cooking and heating. He delivered a lecture on the subject, and cooked a large joint of

times put the question of the treatment of the ammoniacal liquor to Mr. Scott, who had always informed them that he could not find any ammonia in the liquor. If there was no ammonia in the ammoniacal liquor, they could not obtain any sulphate of ammonia. They would, however, put the point very strongly to their new Manager; and as he (the Chairman) believed sulphate of ammonia was being manufactured in the Australian gas-works, he saw no reason why they should not probably be able to do it at Bombay. He hoped that if their condensing power and their washing power were not sufficient, the new Manager would be able to advise them on the point, and put them in such a position that they would be able to do it.

Mr. WILDE asked what candle gas the Company supplied.

The CHAIRMAN replied 14-candle. At a previous meeting he pointed out to the Shareholders that although, in his opinion, the state of the Company was not exceedingly rosy, yet that he did not think—as did some of the Shareholders at the time—they were approaching to the position of lowering their dividend. He still thought so. He believed they might perhaps say they were rather closely run for their dividend, but still he saw no prospect at present—matters remaining as they were—that there was any chance of the dividend being lowered. The satisfactory point was that which had been mentioned by Mr. Penny—that they had now (at least on the 31st of December last) £3600 to the good towards the exchange. Since then this had become a debit of about £900, because £23,000 had been brought over; but this £23,000 was sufficient for the present dividend, and probably would go a great way towards the payment of the next; and of course the profit and loss would be charged against for the exchange next half year. He therefore looked forward to their being able to maintain their dividend certainly for the next half year, if not for considerably longer, present circumstances continuing; but he did hope and believe that under their new Manager there would be a considerable increase in the consumption of gas, and this was what they had to look forward to to put them in a good, strong, and healthy position.

The motion was carried unanimously.

Major GORDON next moved the re-election of Mr. Stephenson as a Director.

Mr. PENNY seconded the motion, and it was carried unanimously.

The CHAIRMAN having expressed his acknowledgments, the retiring Auditors were re-elected.

A vote of thanks was then passed to the Chairman and Directors, which was acknowledged by the CHAIRMAN, and the proceedings terminated.

CHRISTCHURCH (NEW ZEALAND) GAS COMPANY, LIMITED.

The Sixteenth Annual General Meeting of this Company was held on Tuesday, March 1—Mr. E. G. WRIGHT in the chair.

The SECRETARY (Mr. C. W. Bishop) having read the notice convening the meeting, the following report was presented:—

Your Directors have much pleasure in submitting the accounts for the past year, and congratulate you upon the continued prosperity of the Company.

The large additions to the works which have been in progress during the past two years are now nearly completed, giving you 31½ miles of mains, and a plant capable of manufacturing and distributing about 75 million feet of gas per annum, or more than double the consumption of 1880, and this, it is estimated, will meet all the requirements of the district for the next seven or eight years. The No. 4 gasholder, which has been erected during the year at a cost of £7597, has a capacity of 300,000 feet, and contrasts favourably as to cost with those previously constructed.

The increased consumption of gas during 1880 has been much below the proportionate increase of former years, and if you deduct the consumption that is due entirely to the extension of the mains to Papanui, Opaia, and other places, it will be found that there has been no increase whatever within the limits of the mains as they existed prior to May, 1879.

Your Directors have decided upon lowering the price of gas by allowing a further discount of 10d. per 1000 feet.

The amount to credit of profit and loss, including the balance from last year, is £8392 0s. 11d.; of which £3360 was paid as an interim dividend, and your Directors propose that a sum of £4320 be paid as a further dividend, leaving a balance of £712 0s. 11d. to be carried forward.

The retiring Directors are Messrs. Gould, Stevens, and Anderson, who offer themselves for re-election.

DR.	Balance-Sheet, Dec. 31, 1880.		CR.		
Capital	£80,000	0 0	Freehold property and build- ings	£10,386	5 7
Less amount not called up	32,000	0 0	Working plant, mains, meters, &c.	71,670	16 3
	£48,000	0 0	Office furniture	116	10 7
Loan from A.M.P. Society	15,000	0 0	Shares in the P.I. and L. Association	190	0 0
Interest on do. to Dec 31	225	0 0	Debts due to the Company	3,666	4 4
Deposits at interest	10,675	0 0	Stock on hand, coals, &c.	2,431	9 5
Interest accrued thereon	319	14 1	Cash at Bank of New South Wales	440	15 1
Bills payable	1,530	11 7	Cash in hand	216	11 8
Debts due by the Company	283	16 7			
Insurance fund	331	3 8			
Reserve fund	7,808	16 10			
Balance	4,924	10 2			
	£89,118	12 11		£89,118	12 11

Revenue Account, for the Year ending Dec. 31, 1880.

Stock of coal, &c., Jan. 1, 1880	£1,493 10 4	Sale of gas and rent of meters	£26,612 3 7
Purchases of ditto during the year	8,392 0 4	Less discounts allowed	2,262 3 9
	£9,885 10 8	Sale of coke, tar, and sundries	2,720 14 3
Stock on hand, Dec. 31, 1880	2,431 9 5	Transfer fees	2 17 0
	£7,454 1 3		
Wages—			
Carbonization	1,231 2 6		
Purification	121 11 3		
Repairs, coke weighing, &c.	503 18 2		
Lamplighters, &c.	1,064 14 1		
Salaries—			
Secretary, Manager, &c.	1,772 19 4		
Directors' and Auditors' fees	421 0 0		
Rent, taxes, and insurances	316 6 11		
Tools, materials, &c.	407 6 3		
Stationery, &c.	137 12 3		
Miscellaneous	470 0 6		
Interest account	2,226 12 1		
Amounts written off	147 14 7		
Reserve fund	2,880 0 0		
Balance	7,918 11 9		
	£27,073 11 1		£27,073 11 1

The CHAIRMAN, in moving the adoption of the report, said the very large extension of the mains and works that had been carried out would prevent any considerable expenditure under these heads for several years to come. Taking the increase in the consumption of gas at 10½ per cent. per annum, the Company had now enough mains, &c., to meet the supply for the next seven or eight years. As regarded the extension of the mains to Papanui and the suburbs, the Directors had perhaps studied the convenience of the consumers somewhat too much, as experience had proved that, so far at

least, the consumption was not so large as might have been expected. However, there was this fact, that the suburban districts were rapidly increasing, and no doubt in time the Company would reap the reward of their enterprise. As the Shareholders would see by the report, the Directors recommended that a further reduction should be made in the price of gas. The reduction recommended would amount to about 4 per cent. on the capital of the Company, being something like £1750. He trusted the result of the proposed reduction would be an increase in consumption, and that in this way the Company would be recouped.

Mr. J. LEWIS seconded the motion, and it was carried.

On the motion of Mr. J. GOULD, seconded by Mr. M. HARRIS, the amount to be appropriated to the payment of dividend, as recommended in the report, was agreed to.

The retiring Directors were then re-elected; and Messrs. H. E. Alport and E. S. Harley were appointed Auditors.

Mr. GRAHAM moved—"That the debts of the Company be liquidated as speedily as possible by calling up the necessary amount from the uncalled capital of the Company, and that any further amount required for work be raised in a similar manner until the uncalled capital is exhausted."

Mr. J. GOULD seconded the motion; but after a discussion, the resolution was amended as follows:—"That the money on deposit be paid off as speedily as possible, by calling up the necessary amount from the uncalled capital of the Company." In this form it was put and carried unanimously, and a vote of thanks having been passed to the Directors, the proceedings terminated.

ROCHDALE CORPORATION GAS SUPPLY.

The report of the Gas Committee of the Rochdale Corporation for the year ending the 25th of March last, which has just been issued, states that during the twelve months ending at that date there had been an increase of 12,332,000 cubic feet in the consumption of gas, against an increase of 3,800,000 cubic feet in the previous year. Notwithstanding the reduction made in the price of gas during the last quarter of the year—which was considered by the Committee to be equivalent to £1000 taken from the receipts—the surplus profits exceeded those of any previous year, amounting to £11,331 8s. 4d., after deducting 1-75th part of the debt, interest, and all other liabilities. The Committee attribute the increase in the profits mainly to the increase of 5 per cent. which, during the year reported upon, had taken place in the consumption of gas, and to certain reductions which had been made in the working expenses. With regard to residuals, the report states that the contract for tar and ammoniacal liquor will expire in the course of the present year, and the Committee are making arrangements for the erection of plant for the manufacture of sulphate of ammonia, by which they hope to realize a much larger amount than by selling their ammoniacal liquor in a raw state. The net amount produced by the gas sold during the year covered by the report was £44,319, as against £43,396 in the previous year, showing an increase of £923. The surplus profits were £8886 in the latter year, and £11,331 in 1880-81, showing an increase of £2445. The number of services laid on March 25 last was 22,166, being 263 more than on the corresponding date in 1880. The meters in use on the former date reached a total of 19,210. The quantity of gas consumed in each quarter was as follows:—Quarter ending June, 27,419,000 cubic feet; September, 30,365,700 cubic feet; December, 96,848,000 cubic feet; March, 80,520,300 cubic feet. The average illuminating power of the gas supplied during the year was 18.18 candles, and the quantity of sulphur in other forms than sulphuretted hydrogen averaged 29.17 grains; the latter impurity having been found in two instances only during the twelve months reported upon, while the tests for ammonia showed in every case a quantity below that allowed by the Metropolitan Gas Referees.

The following statistics in reference to the gas supply will be of interest:—

	March 25, 1879, to March 25, 1880.	March 25, 1880, to March 25, 1881.
Receipts.		
Gas sold to private consumers	£38,865 0 9	£40,148 10 2
Gas supplied to public lamps	4,391 10 0	4,070 15 1
Tar and ammoniacal liquor	3,082 17 1	3,320 8 4
Coke	2,184 16 5	2,719 13 10
Sundries	24 14 3	51 14 5
	£48,548 18 6	£50,310 18 10
Expenditure.		
Cannel and coal used	£15,980 1 4	£16,382 13 1
Salaries and wages	7,195 9 0	7,362 6 4
Expended on works, &c.	4,554 3 3	3,129 1 2
Printing and stationery	122 8 0	156 11 4
Interest of money	7,242 0 8	7,282 9 6
Rates and taxes	1,789 18 3	2,027 15 7
Rent of land	385 13 7	245 9 10
1-75th part of money borrowed paid to sinking and depreciation funds	2,393 3 8	2,393 3 8
	£39,662 17 9	£38,979 10 6
Profit this year	8,886 0 8	11,331 8 4
	£48,548 18 6	£50,310 18 10
Production.		
Cubic feet of gas sold to private consumers	207,604,500	219,488,500
Do. estimated to have been consumed by street-lamps	12,947,600	14,102,000
	220,552,100	233,590,500
Cubic feet of gas consumed on the works	2,263,900	1,557,500
Do. lost by leakage and condensation	26,983,000	30,588,000
	249,799,000	265,736,000
Loss per cent. by leakage and condensation	10.80	11.51
Tons of cannel used	4,258	3,630
Do. coal used	20,602	22,393
Gross average production of gas from each ton of cannel and coal used, in cubic feet	10,056	10,211
Average illuminating power, in candles	18.22	18.13
Average price of cannel per ton at works	19s. 7.61d.	19s. 4.79d.
Do. coal per ton at works	11s. 5.68d.	11s. 5.84d.
Cost of Gas.		
Net cost of gas per 1000 feet, reckoned on quantity sold, including 1-75th part of debt paid to sinking and depreciation funds	8s. 1.40d.	8s. 9.79d.
Net cost of gas per 1000 feet, reckoned on number of feet made, and excluding 1-75th part of debt paid to sinking and depreciation funds	8s. 6.72d.	8s. 3.54d.
Selling Price of Gas.		
Invoice price of gas per 1000 feet in the borough	£0 3 11	£0 3 8
Do. do. out of the borough	0 4 7	0 4 0
Street-lamps—price charged per lamp per ann.	2 10 0	2 6 0
Amount of discount allowed	2,385 13 1½	2,600 18 3
Number of service-pipes laid	20,162	20,391

Capital Account.

Total amount of money borrowed	£205,350 0 0	..	£205,350 0 0
Amount repaid in previous years	38,000 7 1	..	40,393 10 9
	£167,349 12 11	..	£164,956 9 3
Amount repaid this year	2,393 8 8	..	—
Present mortgage debt	£164,956 9 3	..	£164,956 9 3
Depreciation allowed out of revenue, 1872-3. .	£5,000 0 0	..	£5,000 0 0
Amount of old depreciation fund	9,063 2 11	..	9,063 2 11
Transferred from revenue to depreciation fund this year	—	..	1,735 1 3
	£11,063 2 11	..	£15,798 4 2
Total cost of works, as per last year's report .	£206,512 18 9½	..	£207,173 17 6½
Extensions during the year	660 18 9	..	464 6 4
	£207,173 17 6½	..	£207,638 3 10½
Total amount paid off.	40,393 10 9	..	40,393 10 9
Present value of works	£166,780 6 9½	..	£167,244 13 1½
Balance of debts and stocks on hand	21,125 6 1	..	24,841 8 7½
	£187,905 12 10½	..	£192,086 1 9
Deduct mortgage debt and depreciation fund .	179,019 12 2	..	180,754 13 5
Profits paid to Finance Committee this year .	£8,886 0 8½	..	£11,331 8 4
Do. previously paid	113,887 12 5	..	122,773 13 1½
Total paid to Finance Committee	£122,773 13 1½	..	£134,105 1 5½
<i>Sinking Fund.</i>			
Transferred from revenue this year	—	..	£658 2 5
<i>Town Lamps.</i>			
Number of lamps	1,766	..	1,777
Number of hours the lamps have been lighted .	1,965	..	2,123
<i>Main-Pipes.</i>			
Length of main-pipes laid this year, in yards .	1,129	..	800
Length previously laid	127,958	..	129,087
Total length laid to date	129,087	..	129,887

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

For reasons which may be good, indifferent, or bad, all matters, or nearly all, connected with gas affairs in Edinburgh, are transacted in a quiet, almost a secret way, and it is only by inference that one can sometimes reach the conclusion that beneath this quiet exterior there exists a current of troubled waters. In the JOURNAL for the 22nd of February mention was made, in these "Notes," that one of our Town Councillors had called attention to what he characterized as a fact—namely, that the Edinburgh Gaslight Company had been supplying gas, according to tests made on the 25th of January, of 23.50 candles, and he added that it was disgraceful that Edinburgh should be paying a high price for an article of such inferior quality. Struck with this charge, I made inquiries, and learned from a reliable source that, on the date referred to by the irate Councillor, the illuminating value of the gas was nearer 28 candles than 23.50. Now, at stated intervals, the City Analyst, Mr. Falconer King, submits a report on the quality of the gas supplied by both Companies to Edinburgh. The Leith Company, as a rule, show an illuminating power under that of their Edinburgh neighbour; but so far as the figures relate to them I have nothing to say at present. Mr. King's report, submitted to the Council on Tuesday, shows the illuminating power of the gas supplied by the Edinburgh Company to have been 25.30 candles as at the 26th of April, and 26.80 as at the 10th of May. The iron seems to have entered the soul of the Edinburgh Company by the publication of these figures, for yesterday a paragraph appeared in an Edinburgh paper which, without any comment, gives a list of analyses which have been made independent of Mr. King. This paragraph is here given in its entirety:—"Reports made by Dr. Stevenson Macadam to the Directors of the Edinburgh Gaslight Company, on the illuminating power of the gas supplied by that Company, as tested at Roxburgh Place, show the following results:—June 22, 1880, 28.16 candles; July 29, 28.32; Aug. 12, 28.82; Sept. 28, 28.46; Oct. 15, 28.87; Nov. 11, 29.16; Dec. 14, 28.76; Jan. 28, 1881, 28.76; Feb. 25, 29.18; March 10, 28.86; April 11, 28.14; May 12, 28.64." It is said that doctors differ, but surely with the analyses of gas there ought to be some explanation of how such a difference arises in two sets of tests of the same gas.

Through the resignation of Mr. Wm. Clazy, who has held the office of Gas Manager in the pretty little border town of Kelso for upwards of 40 years, the duty devolved upon the Directors of appointing a substitute. This week it has been announced that the appointment has been given to Mr. Frank Scott, Manager of the Tillicoultry Gas-Works, and that the salary has been fixed at £130 a year.

The Stonehaven Gas Company appear to be in a flourishing condition, judging from the report which, on Monday last, was submitted to the annual general meeting of Shareholders. Upon the transactions for the year there has been a gross profit of £552 10s. 8d., and from this fund it has been resolved to pay a dividend equal to 12½ per cent. on the £1 shares. Mr. Alexander Weir has been appointed Chairman of the Company, and Mr. James Wood Secretary and Treasurer.

A case, in itself not of much value, has been exciting some interest in gas circles north of Aberdeen. It has just been decided by Sheriff Comrie Thomson, one of the Sheriffs-Substitute of the county. The Police Commissioners, as managers of the gas-works in Peterhead, sued a Mrs. Kelman, residing in that town, for payment of £1 1s. 9d. as the value of gas used by her in her house at Longate. From the evidence it appeared that the gas had been regularly checked up to January, 1880, in the course of which month the meter had been taken away. The whole system of books kept for the Commissioners corroborated this; but a strange contradiction to the evidence was given by Mrs. Kelman, who, with some of her friends, deposed that the meter had been taken away in July, 1879, and that paraffin had subsequently been burned. Against these statements the Commissioners produced slips showing that payment of the account had been applied for subsequently to the autumn of 1879, and on one slip was a memorandum that the meter should be removed. The Sheriff-Substitute, in deciding the case, said that consumers were very much in the hands of purveyors of gas, because he supposed very few people read their own meters, and even if they were to read them they could not say that the register had been accurately transferred. But it was not to be assumed against a public company that it would transact its business in a dishonest way. The little slips and memoranda produced carried more weight in his mind than the beautifully got-up books upon which the skill of the accountant had been displayed, because they bore evidence upon them of what had transpired at the time, and they went a long way to modify, if not to contradict, the oral evidence given by the defender. In giving judgment for the Gas Commissioners, his Lordship observed that he trusted the defender was labouring under a mistake, and

that charitably one might be disposed to say she and her witnesses had mistaken a year.

From the fortnightly statement of the Edinburgh Water Supply which has been issued this week it appears that the total quantity of water in store was 2,157,496,000 gallons, or 89,985,000 gallons less than during the previous fortnight. The delivery in Edinburgh was at the rate of 12,028,000 gallons per day, equal to 38.74 gallons per head per day to a population of 310,000.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

Workmen are at present dismantling the old part of the Jedburgh Gas-Works with the view of important alterations and extensions being made. A local journal says that the public view the projected improvements with little interest, resting quietly in the belief that before long the electric light will render less dependence on the light hitherto used, and that the Gas Company will have to count with a new competitor. It is further stated that it has been resolved that at no distant date the electric light will be introduced into the town, and in such a form that it will be supplied to the public at large.

The annual general meeting of the Langbank Gas Company, Limited, was held a few days ago—Mr. Thomas B. Seath, Chairman, presiding. A report for the past year was submitted by the Directors, which showed that the affairs of the Company were in a very flourishing condition. In proposing the adoption of the report, the Chairman congratulated the Shareholders on the condition of the works, as he did not think they had ever been in a more satisfactory state, notwithstanding the fact that the Manager had not asked for any extra expenditure during the ensuing year. The balance showed that a dividend of 6½ per cent. might be paid on the year's profits, and that 2½ per cent. might be laid aside for a sinking fund, and a similar amount for deterioration and renewal of works. The recommendation of the Directors was approved of, and hearty votes of thanks were accorded to the Chairman, to Mr. Renfrew (the Manager), and Mr. Roy (the Secretary). The retiring Directors were re-elected.

At the last meeting of the Town Council of Kilmarnock the minutes of the Gas Committee were submitted, from which it was shown that the gas sold during the month of March, 1881, amounted to 3,362,250 cubic feet, equal to £846 2s. 9½d., as against 3,411,150 cubic feet, equal to £781 14s. 5½d., for the corresponding month of last year; and that the sales of gas over a period of ten months amounted to £7413 1s. 8d., as against £6970 15s. 1½d. in the corresponding ten months of 1879-80. The illuminating power of the gas delivered to the consumers was as follows:—Maximum, 28; minimum, 26½; average, 27.6 standard candles.

There is a good deal of floating talk amongst gas managers and other gas people in this part of the kingdom regarding an alleged serious breach of contract on the part of the Directors of a Gas Company, or their Manager, in not delivering their gas liquor of the strength agreed upon or required. I understand that the Gas Company offered to make some amends by expressing their willingness to accept of a reduced payment for the material obtained, and in this way they acknowledged that there was something "wrong;" but the firm of tar distillers who were "wronged" would not compound in the way proposed, and in consequence there is to be an arbitration on the matter in dispute, if not even a Sheriff Court case.

As there may be a good many gas managers visiting Glasgow within the next few weeks, I may mention that the presents which are to be handed over to Mr. William Mackenzie, of Dunfermline, in acknowledgment of his long and faithful services as Secretary of the North British Association of Gas Managers, on the occasion of the next annual meeting of that body in this city, are on view at 26, Argyle Street. They consist of a handsome dining-room timepiece in marble, and an elegant silver tea and coffee service. I hear that the prospects of the meeting as to matters of professional interest are very favourable.

The Glasgow pig iron warrant market has been dull and drooping this week, and a moderate amount of business has been done. The cash price touched 45s. yesterday, and the consequence was that some excitement took place. There had been considerable difference of opinion as to what would be the lowest quotation this week, many holding that prices would touch 45s., and freely backed their opinions, and when a sale was made at this figure near the close of the market, there was quite a display of exuberance. The closing quotation was 1½d. per ton over this sum, showing a decline of 8d. per ton over the week.

A very dull tone obtains throughout the coal trade of the West of Scotland. The demand for house coal is not brisk; indeed, it may be said to have already arrived at its normal summer state. Shipping coal is not in such good demand as was experienced lately, and there is also a limited demand for steam coal. The following are about the ruling prices:—Main coal, 5s. 9d. to 6s. 3d. per ton; ell coal, 6s. to 6s. 6d.; splint coal, 6s. 9d. to 7s. 8d.; steam coal, 7s. 6d. to 8s.—all f.o.b.

BIDEFORD GAS COMPANY, LIMITED.—The annual meeting of this Company was held on Wednesday last. The report, which was a highly satisfactory one, was presented, and showed a balance of £1208 19s. 8d. at the disposal of the Company. A dividend of 10 per cent. was declared, free of income-tax, leaving a balance of £593 19s. 8d. A sum of £143 3s. 8d. was added to the reserve fund, making it £500. A vote of thanks was passed to the Chairman (Mr. Dingle) and to the Directors and the Secretary (Mr. Joce) for their past services.

LIVERPOOL GAS FITTINGS COMPANY.—The fifth annual meeting of this Company was held last Tuesday—Mr. S. H. Thompson in the chair. The Directors in their report stated that the net profit for the year ending the 31st of March was £1306 17s. 11d., which, with £611 16s. 6d., the balance from the previous year, left the sum of £1918 14s. 6d. to the credit of profit and loss. They recommended a dividend for the year at the rate of 10 per cent., with a bonus of 1s. per share, free of income-tax, leaving a balance of £418 14s. 6d. to be carried to the next year's account. On the motion of the Chairman, seconded by Mr. J. A. Tinné, the report was unanimously adopted, and the dividend recommended was declared. Sir Thomas Earle and Mr. H. B. Gilmour were re-elected Directors, and Mr. D. Owen Bateson was re-appointed Auditor. Thanks were accorded to the Secretary (Mr. Samuel Haines) and principal officers for their attention to the interests of the Company; and the Chairman, in responding to a vote of thanks to himself and the Directors, expressed his gratification at the satisfactory condition of the Company's affairs.

APPLICATIONS FOR LETTERS PATENT.

2007.—WALKER, J. L., and JOWETT, J. W., Elland, Yorks. "Improvements in apparatus employed in the manufacture of illuminating gas." May 9, 1881.

2023.—ZWANZIGER, II., Vienna, "Improvements in or applicable to regulator gas-burners." A communication. (Complete specification.) May 9, 1881.

2085.—CHANDLER, S. and J., Newington Causeway, London, "An improved arrangement of projections for obtaining spaces used in the manufacture of gas." May 13, 1881.

2091.—KEITH, J., Edinburgh, "Improvements in the manufacture of illuminating, explosive, and heating gas, and the apparatus employed therefor." May 18, 1881.
2122.—DOUGILL, J., Manchester, "Improvements in gas motor engines, in the method of regulating the speed thereof, and of admitting combustible material into the cylinder, and allowing the escape of the exhausted products of combustion, applicable in part to other engines." May 16, 1881.
2147.—BARTHOLOMEW, W., Albert Embankment, London, "Improvements in water-waste preventers." May 17, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.
4819.—MÜLLER, H. L., and ADKINS, W., Birmingham, "Improvements in or additions to gas-engines." Nov. 20, 1880.
4833.—LIVEING, E. H. T., Cavendish Square, London, "Improvements in apparatus for detecting and measuring small quantities of inflammable gas present in coal mines and other localities." Nov. 22, 1880.
4881.—SIMON, L., and WERTENBRUCH, F., Nottingham, "Improvements in gas motor engines." Nov. 24, 1880.
4938.—WYMAN, W., Southgate Street, Gloucester, "A gas-stove for heating and ventilating purposes." Nov. 27, 1880.

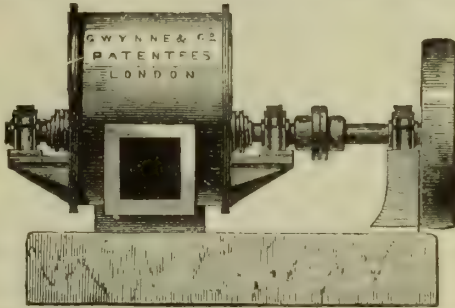
RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending May 18, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company .	Notting Hill	17.8	17.0	17.4	10.8	8.7	9.3	0.0	0.0	0.0	None.	In excess.
	Camden Town	17.4	16.7	17.0	13.3	10.4	11.9	0.2	0.0	0.0	"	"
	Dakston	17.3	16.8	17.1	14.9	10.4	12.4	0.0	0.0	0.0	"	"
	Bow	17.8	16.9	17.3	11.4	8.6	9.5	1.0	0.7	0.9	"	"
	Chelsea	17.0	16.5	16.8	14.3	11.3	12.7	0.2	0.0	0.1	"	"
	Kingsland Road	17.1	16.6	16.8	14.3	11.6	13.0	0.2	0.0	0.1	"	"
	Westminster (cannel gas)	21.7	20.9	21.3	8.1	6.1	7.2	0.0	0.0	0.0	"	"
South Metropolitan Gas Company .	Peckham	16.7	16.4	16.6	12.1	10.1	11.1	0.4	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.2	16.8	17.0	10.7	9.1	9.9	0.5	0.2	0.4	"	"
	St. George-in-the-East	17.5	16.9	17.1	9.2	6.9	7.7	0.1	0.3	0.4	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.
Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & BEALE'S PATENT EXHAUSTER.

GWYNNE & CO.

Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges' report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTERS,

INVENTED SPECIALLY TO REDUCE OSCILLATION, FRICTION, AND POWER.

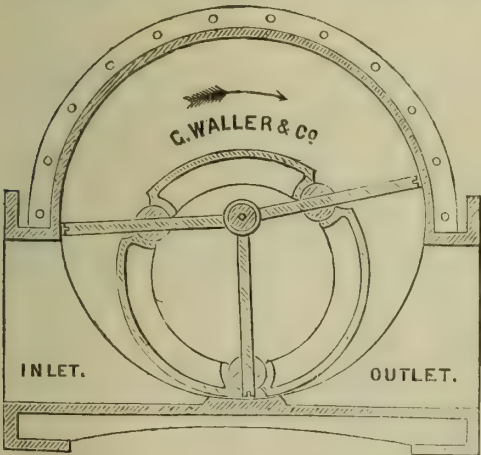
TO WORK BY BELT OR WITH

ENGINE COMBINED.

GEORGE WALLER & CO.,

MAKERS OF

BEALE'S EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, SELF-ACTING BYE-PASS VALVES, TAR, LIQUOR, & OTHER PUMPS, SCRUBBERS & PURIFIERS, CONDENSERS, BOILERS, &c.



Descriptive Catalogue of New Patent Gas Exhauster can be had on application.

SEE ALSO ADVERTISEMENT PAGE 906.

PHENIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc. M.I.C.E., Gas-Works, SYDENHAM.

WANTED, by a Practical Gas and Water Manager, a Re-engagement or Position of Trust in a large Works. Has had sole charge of extensive Works. Is fully acquainted with the Working of Machinery, and can carry out any alterations required. Is a good Accountant. Highest testimonials and references. Address No. 748, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES AND CORPORATIONS. WANTED, an Engagement as Engineer and MANAGER. The advertiser has had 20 years' practical experience in the above capacity, is a good draughtsman and designer of gas plant, correct accountant and good carbonizer; is well acquainted with the modern chemical and mechanical improvements introduced in the manufacture, purification, and distribution of gas, and its residual products; is energetic in promoting the gas interests confided to his charge, and would accept salary on the results of his management. No objection to go abroad. Speaks Spanish and Portuguese, with a slight knowledge of French and Italian. Satisfactory references and testimonials. Address L. S., care of J. C. Gough, 98, Maldon Road, Haverstock Hill, LONDON, N.W.

RETORT SETTERS.

WANTED, a few of the above. Must be first-class workmen. Apply with testimonial to J. and H. ROBES, LOWER SYDENHAM. By letter only.

WANTED immediately, a Competent Person to take charge of a small Gas-Works in the Country. Single-handed. Wages 21s. per week, house, coal, and gas free. Make half a million per annum. Applications, with references, &c., to be sent to WILLIAM OLDFIELD, Gas Manager, Purton, near Pontefract, YORKS.

CAST-IRON GASHOLDER TANK.

WANTED to Purchase, Second-hand, the Cast-Iron TANK of a 25,000 to 30,000 ft. Gasholder. Must be thoroughly sound. Price and particulars to be addressed to Mr. EDWARD BAKER, Engineer, Reading Gas-Works.

WANTED, Three Second-hand Mouthpieces, with rose-bars, Screws, Lids, &c., for 12 in. by 12 in. D-RETORTS; also two Furnace Doors and Frames, with Fire-brick Pocket; and two or three 3-in. Valves. Address W. H. BAUGHAN, CHARLBURY.

FOR SALE—An Annular Condenser, Tower Scrubber, Station-Meter, Beale's Exhauster two Boilers, and some Hydraulic Mains and Retorts. Apply at the Gas-Works, MAIDSTONE.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

FOR SALE—FOUR Purifiers, 18 ft. by 18 ft. by 6 ft. One Set of Condensers with Valves. One Centre Valve for four purifiers, by Cockey. Two ditto for one purifier each. One Exhauster (40,000 feet per hour) by Burton and Waller. All with 16-in. Connections. One District Governor by the Gas-Meter Company, Limited, with 12-in. Connections. The above are all in good condition, and have been removed and larger apparatus substituted. Apply to Mr. Robert Wilson, at the Gas-Works, Waddon, Croydon, Surrey.

By order of the Directors,
WILLIAM J. RUSSELL, Secretary.
Offices, Katharine Street, Croydon, May 10, 1881.

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned, R. MORLAND, Engineer.

GAS PLANT FOR SALE.

THE Gas Committee of the Corporation of Newbury having ceased to manufacture Gas at their Old Works, have the undermentioned APPARATUS for SALE:—
25 15-in. Circular Mouthpieces, Wrought-Iron Lids and Cross-Bars.
25 4-in. Bridge-Pipes.
25 4-in. Ascension-Pipes.
1 Wrought-Iron Riveted Hydraulic Main, 36 ft. long, and pierced for settings of 5 Retorts.
5 Furnace Frames and Doors.
1 6-in. Double Vertical Condenser, with Tar Boxes, &c., complete.
4 Purifiers, 6 ft. by 6 ft. by 4 ft. 6 in., with Covers, Lifting Gear, Hydraulic Centre Valve, and 6-in. Connections.
12 Brackets suitable for carrying a 12-in. Main Pipe.
1 6-in. Bye-Pass Valve and Connections.
5 6-in. Rack and Pinion Valves.
1 30-ft. Gasholder, with Cast-Iron Tank, 18 ft. deep, Columns, Girders, Syphons, and 8-in. Valves, in good condition.
1 Four-way 12-in. Bye-Pass Valve by Cockey, and a sundry lot of different Pipe Connections.
For further information, &c., apply to the undersigned, J. G. O'FARRELL, Engineer.

Important Sale of First-class Brass Gas-Fittings, Gas-liners, Brackets, and General Brass-Foundry, Brass Cocks, &c.

MR. SCAMELL will Sell by Auction, at No. 21, Old Bond Street, on Tuesday, June 14, and Two following days, commencing at One precisely, an Extensive Assortment of First-class Brass Gas-Fittings, Gas-liners and Brackets, in modern and artistic designs, Gas and Steam Valves, Bath, Bib, Ball Cocks, &c., and a variety of useful items. May be viewed on Monday, June 13, and catalogues had at No. 21, Old Bond Street, and of Mr. SCAMELL, 40 and 41, Upper Thames Street, LONDON.

STOCK OF THE BRISTOL UNITED GASLIGHT COMPANY.

MESSRS. H. R. FARGUS and CO. will Sell by Auction, in pursuance and under the provisions of the Bristol United Gaslight Company's Act, 1873, at their Sale-Room, 4, Clare Street, in the City of Bristol, on Thursday, June 9, 1881, at Two o'clock precisely, £20,000 CAPITAL STOCK, issued by them under the authority of the above-named Act. The Stock will be sold in lots of £100 each. For conditions of sale and any further particulars apply to the AUCTIONEERS, Clare Street, BRISTOL; to the SECRETARY of the Company, Canons' Marsh, BRISTOL; or to Messrs. BRITANS, LIVETT, and MILLER, Solicitors, Albion Chambers, BRISTOL.

THE Gravesend and Milton Gas Company have FOR SALE, Four 12 ft. square PURIFIERS, 4 ft. deep, with 12-in. Connections and eighteen 12 in. Donkin's VALVES, together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 10-in. GOVERNOR, by A. Wright and Co., Westminster. One SCRUBBER, 26 ft. high, 8 ft. diameter. For further particulars apply to the undersigned, S. Sowood, Manager.

GASHOLDER FOR SALE.

THE Directors of the Sleaford Gas Company, Limited, invite TENDERS for GASHOLDER, 22 ft. diameter, 14 ft. deep, including Inlet and Outlet Pipes and Syphons, Valves, and Stone Coping of Tank. The whole in good condition, and as the room is wanted at once no reasonable offer will be refused. For further particulars, apply to HARRY WIMBURST, Engineer and Manager, Gas-Works, Sleaford, Lincs.

THE Tunbridge Wells Gas Company having ceased to Manufacture Gas at their Old Works, have the undermentioned PLANT and APPARATUS FOR DISPOSAL:—

Iron Roof for Retort-house, 75 ft. long by 50 ft. wide, Cast-Iron Hydraulic Main, 138 ft. long, pierced for settings of five retorts.
Cast-Iron 12-in. D Pipe, 200 ft. long, with Man-holes and Lids. Three 10-in. Slide Valves and twenty-six Brackets for supporting same.
Twenty Furnace Doors and Frames, Brace Bars, and Sundries.
Eighty Mouthpieces for 21-in. by 15-in. D Retorts, with wrought-iron Covers, Cross Bars, and Screws.
Two 10-in. Jones's Exhausters, with Slide Valves complete.
One Horizontal and one Vertical 4-horse power Steam Engine.
Two Steam Boilers, 7 ft. 6 in. by 4 ft., with Fittings.
One Round Scrubber, 18 ft. high by 4 ft. diameter.
One Square do., 18 ft. high by 4 ft.
Three Cast-Iron Purifiers, 13 ft. 3 in. by 9 ft. 3 in., with four tiers of Wood Sieves, Covers, Lifting Apparatus, and Centre Valve complete.
Station-Meter, by Wright, with 8-in. Bye-pass Valve and Connections.
One 12-in. Station Governor, with Valves and Connections.
One 14-in. ditto ditto ditto
One 70-ft. Telescopic Gasholder, 20 ft. deep, with eight cast-iron Columns and Girders.
One Cast-iron Tank for ditto.
One 60-ft. Telescopic Gasholder, 18 ft. deep, with eight Cast-Iron Columns and Girders.
One Cast-Iron Tank for ditto.
And sundry other Gas Apparatus and Plant; of which, and the foregoing, detailed printed particulars can be had on application to the undersigned. JOHN READ, Secretary.

SUTTON-IN-ASHFIELD LOCAL BOARD—GAS DEPARTMENT.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Sutton-in-Ashfield Local Board are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR produced at their Works during the ensuing year.

Particulars may be obtained on application to the Manager at the Gas-Works, Sutton-in-Ashfield.
Tenders, stating price per ton of 20 cwt. at the Works, to be sent to me, the undersigned, so as to arrive not later than Saturday, the 28th inst.

By order,
G. H. HIBBERT, Clerk to the Committee.
Clerk's Office, Clerkson Street, Mansfield,
May 18, 1881.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Elsecar, Wentworth, and Hoyland Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL WATER for a term of Three or Five years, from the 1st of July, 1881. The Liquor and Tar to be delivered in the Contractor's tanks or casks, at the Company's siding at Elsecar, railway-weight. The strength of the Liquor to be tested by Twaddell's hydrometer. The tender to state price per ton per degree of strength from 4° to 8°. Tanks for the removal of the Tar and Liquor to be forwarded regularly in such numbers and at such times as may be required by the sellers. Probable quantity of Tar 100 tons, and of Liquor 200 tons, more or less.

Further particulars may be obtained of the Manager, Elsecar, or of the Secretary as to payment, &c.
Tenders to be sent in before Wednesday, June 8, addressed to the Secretary, 41, High Street, Rotherham.
The Directors do not pledge themselves to accept the highest or any tender.

By order,
THOS. WIGFIELD, Secretary.

NEW Work on Municipal Gas and Water Supply. Just published in one Volume, royal 8vo., 5s. 6d. (postage 5d.), cloth, "The Purchase of Gas and Water-Works, with the Latest Statistics of Municipal Gas and Water Supply." By ARTHUR SILVERTHORNE, Consulting Engineer.
CROSBY LOCKWOOD AND CO., 7, Stationers' Hall Court, LONDON, E.C.

ACCRINGTON GAS AND WATER WORKS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of this Company invite TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR which may be produced at their Accrington Works during One, Two, or Three years from the 1st of July next. Quantity of Coal carbonized about 9000 tons per annum.

Any further information can be obtained on application to the Secretary of the Company.

Sealed tenders, endorsed "Tar and Liquor," and addressed to the Chairman, General Offices, Gas-Works, Accrington, to be sent in not later than Friday, the 3rd of June.

By order,
CHARLES HARRISON, Secretary.

May 21, 1881.

ACCRINGTON GAS AND WATER WORKS COMPANY.

COAL CONTRACTS.

THE Directors of this Company invite TENDERS for the Supply of the GAS COAL and CANNEL they may require during One, Two, or Three years from the 1st of July next, to be delivered, free in trucks at the Railway Station, Accrington, at the Canal Wharf, Oakenshaw, and, if required, at the Railway Station, Great Harwood; in such quantities and at such times as the Directors or Secretary for the time being may require. The probable quantity per annum is: Coal 12,000 tons, Cannel 2000 tons.

Sealed tenders, endorsed "Tender for Coal," and addressed to the Chairman, General Offices, Gas-Works, Accrington, to be sent in not later than Friday, June 3.

Printed conditions of tender may be obtained on application to the Secretary of the Company.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
CHARLES HARRISON, Secretary.

May 21, 1881.

TO GASHOLDER MAKERS.

THE Directors of the Staines and Egham District Gas and Coke Company, Limited, invite TENDERS for the Supply and Erection of a Telescopic GASHOLDER, 60 ft. in diameter and 20 ft. deep each lift, upon their works at Egham.

Plans and specifications may be seen upon application to Mr. Thomas Webb, the Company's Manager, at the works; and from whom also any other information may be had.

The Directors do not pledge themselves to accept the lowest or any tender.

The tenders to be forwarded to me, the undersigned, on or before Wednesday, the 1st of June next, sealed and marked "Tender for Gasholder."

JOHN ANTHONY ENCALL, Solicitor and Secretary.

Staines, May 13, 1881.

RAMSGATE IMPROVEMENT COMMISSIONERS.

THE Gas and Water Committee invite TENDERS for the Supply (f.o.b. in Tyne or in carts on the Quay of Ramsgate Harbour) of the Best NEWCASTLE COAL, suitable for the MANUFACTURE of GAS, to be delivered in the following monthly quantities:—

	1881.	1882.
May	—	500 tons.
June	—	1,000 "
July	—	1,000 "
August	1000 tons.	1,000 "
September	1000 "	1,000 "
October	1000 "	1,000 "
November	1000 "	1,000 "
December	1000 "	1,000 "
	1882.	1883.
January	1000 "	1,000 "
February	1000 "	1,000 "
March	1000 "	500 "
April	1000 "	—

9000 tons. 10,000 tons.

Tenders to be sent in, not later than the 25th inst., addressed to the Chairman of the Gas and Water Committee, Gas-Works, Hardres Street, Ramsgate, and endorsed "Tender for Coals."

Full particulars and forms of tender on application to WILLIAM A. VALON, Engineer.

RAMSGATE IMPROVEMENT COMMISSIONERS.

THE Gas and Water Committee invite TENDERS for the FREIGHTAGE of COALS from the Tyne for One or Two years delivered (by steamboat or sailing vessels) free into carts on the Quay of Ramsgate Harbour, in the following monthly quantities:—

	1881.	1882.
May	—	500 tons.
June	—	1,000 "
July	—	1,000 "
August	1000 tons.	1,000 "
September	1000 "	1,000 "
October	1000 "	1,000 "
November	1000 "	1,000 "
December	1000 "	1,000 "
	1882.	1883.
January	1000 "	1,000 "
February	1000 "	1,000 "
March	1000 "	500 "
April	1000 "	—

9000 tons. 10,000 tons.

Tenders to be sent in, not later than the 25th inst., addressed to the Chairman of the Gas and Water Committee, Gas-Works, Hardres Street, Ramsgate, and endorsed "Tender for Freightage."

Full particulars and forms of tender on application to WILLIAM A. VALON, Engineer.

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SPECIAL NOTICE TO SUBSCRIBERS AND OTHERS.

In consequence of the WHITSUN HOLIDAYS, the next number of the JOURNAL will not be published until WEDNESDAY, the 8th of June.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

SUBSCRIBER.—Try two coats of slow-drying black varnish.
A. G. H.—Received too late to be looked into so as to give a definite answer in this week's issue.
W. F. C.—Thanks for what you have forwarded. They shall be noticed next week.
RECEIVED.—"A Practical Treatise on Mechanical Engineering: comprising metallurgy, moulding, casting, forging, tools, workshop machinery, mechanical manipulation, manufacture of the steam-engine, &c." By Francis Campin, C.E. London: Crosby Lockwood and Co., 1881.—"The Gas and Water Companies' Directory, 1881;" "Gas-Works Statistics, 1881;" "Water-Works Statistics, 1881." Edited by C. W. Hastings.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 31, 1881.

PARLIAMENT AND THE SLIDING SCALE.

THE precedent established on the 21st inst. by the House of Commons' Committee on the South Metropolitan Bill is of such importance, that we make no apology for again referring to it, especially in prospect of opposition in the House of Lords. Although we are by no means inclined to overlook the occasional fickleness of Parliament, in these days of heavy private business and sorely-tried Committees, we must also make allowance for the increasing disposition of Members of Parliament to cut their thankless labour short on all possible occasions by reference to an apposite precedent. We may therefore conclude with much reason that, during the past fortnight, the status of all Gas Companies working under recent legislation has assumed a consistency which has hitherto been wanting. Until now, the great innovation of 1875, whereby the first attempt was made to unite the inte-

rests of gas proprietors and gas consumers, has been in the experimental stage. That state of things is changed, and the broader consequences of the modern principle of gas administration will gradually come to the surface. The sliding scale has attained its majority—speedily, it is true, and helped by the force of circumstances, but not prematurely. We must not expect every one to immediately feel the importance of the late decision, so that its full benefits may be directly manifested; but it is sufficient now to know that good will come from it, in a way which we shall proceed to indicate. Let us first observe the strength of the precedent. Here we have a leading Metropolitan Company applying for additional capital, and desiring to raise it under the conditions of public sale, with the circumstance of an initial price for gas so much higher than the selling price, that the new stock may be instantly issued to bear a dividend two per cent. above the old standard. Let it be further borne in mind that the initial price was fixed at a period when the country had barely recovered from the stress of the coal famine. Coals were still at a good price, and the recurrence of high rates was an eventuality firmly believed in throughout the country—the general impression being that coal and iron would never touch the old minimum rates again. Contrast with this the existing state of trade, after five years' continuance of favourable times for Gas Companies, and with the Metropolitan Board of Works prepared to improve the occasion, and it will be seen, on the face of it, that the regulations of 1875, adopted by the South Metropolitan Company a year later, might be put to a sharp test. No period could be more favourable than the present to try whether the legislation inaugurated under such special circumstances is calculated to adjust itself to all occasions, or if it needs periodical correction. The verdict has been that the *status quo* must be maintained, and this being the case under existing circumstances, it will be infinitely more difficult at a future time to raise a similar issue.

It might have been expected that the immediate result of their defeat would have been to have caused the Metropolitan Board to examine the reasons for their discomfiture on the principal points of their petition. As a matter of fact, the Parliamentary Committee of the Board, who may be supposed to have watched the case more closely than their associates, appear to have felt the hopelessness of pressing further opposition on the question of the initial price; but considered it to be their duty to object, before the Lords' Committee, to the amount of capital sanctioned by the House of Commons. On the application of the Parliamentary Committee to the full Board on Friday last for sanction for this modified form of opposition to the Bill in its later stages, the whole subject was raked up again, and a resolution was passed striking out the self-restraining portion of the Committee's recommendation, and authorizing them to carry on the conflict as freely as before. We do not observe, in the published report of the meeting, that anything like argument was used to prove the necessity of this step, or any notice taken of the fact that the costs of the opposition were being incurred solely for the benefit of Counsel, no witnesses in support of the Board's contentions having been called before the House of Commons' Committee. Neither was there any attempt made to strengthen the case of the Board by bringing fresh sides of the question forward. In truth, it is even more difficult than ever to find out what the members of the Board really know and think about the points on which their own astute Counsel have lately been so utterly worsted. The Board have not the immediate fear of the ratepayers before their eyes; opposition to the Gas Companies is, moreover, a safe card to play for the amusement of the public, whether the merits of the dispute are on one side or the other; and so the fight is to go on. There cannot be a doubt as to the result, unless there should be a scarcely-to-be-expected sharpening of the weapons put into the hands of the legal gentlemen who are retained to represent the Board. If the almost inevitable issue should lead the majority of the Board to the understanding that henceforth their concern must be with the price at which gas can be obtained by the public, and not with the dividends received by gas proprietors, the experience will be of great value. We would desire every member of the Metropolitan Board—and of every Local Authority throughout the country, for that matter, wherever there is a Company carrying on the supply of gas under the influence of the sliding scale and auction clauses—to work out for himself the little sum set by Mr. George Livesey during the recent contest. Most of the gentlemen who employ themselves in the labour of local self-government are well accustomed

to deal with investments of various kinds, and know how to buy a twelve or ten per cent. stock to pay interest at the rate of six per cent. It will not take long to see that this six per cent. interest has to be paid by the consumer, somehow; it matters not how the dividend-bearing stock is classed. We do investors greater justice than the Counsel for the Metropolitan Board, and believe they look very sharply, when high-priced stock is offered them, into the means whereby the dividends at which they are invited to purchase can be maintained. What, then, is the reason why high dividend-bearing gas stock has hitherto not generally realized its full proportional value? Simply, as we are convinced, because of the uneasiness that has prevailed as to the security of the high rates from any interference on that account alone. Buyers appear to have argued to themselves that gas stock was always good for dividends of ten or seven and a half per cent., as the case might be; and that if it occasionally rose higher, the natural enemies of Gas Companies would prevent the improvement from being permanent. In short, the two classes of persons exerted an evil influence on each other. The investor in London Gas Companies' stock looked beyond the dividend at the Metropolitan Board, and the latter overlooked the reductions in the price of gas, while enviously regarding the investor's nominal dividends; and between them both, the consumer suffered from the falling-off of the amount of premium which should have helped him to pay the interest to the stockholder. Let us now hope for a change in all this.

The lesson to be learnt by all Local Authorities in their dealings with Gas Companies under modern legislation is simply the great policy of masterly inactivity. Their duty to the consumer, as regards the initial price, when once fixed, is to follow Lord Melbourne's oft-repeated advice, and let it alone. This does not mean abnegation from the control of the Companies' operations. On the contrary, when the initial price is to be imposed, let every care be taken that it is fairly determined, for an unfair price gained by false pretences is an abomination, and a source of danger to other undertakings by its evil repute; but, having settled this vital point, the machinery must be left to work by itself. Nothing was more marked in the conduct of the case of the Metropolitan Board against the South Metropolitan Company than the total absence of even the attempt at proof that it would be to the benefit of the consumers to have the initial price reduced; while no defence of the downright robbery of offering ten and a half per cent. to investors who, so recently as January last, bought stock on a twelve per cent. basis, was put forward. We are fully aware of the difficulty of educating the public in such matters, and it would be too much to expect every old member of a local board to be able to shake off his primeval prejudices and instantly appreciate the new order; likewise it would be wrong to suppose that every new member elected to a Town Council—possibly because he happens to be a sound Conservative or an ardent Radical, as the taste of the electors may incline—is deeply read in contemporary law as affecting gas undertakings. But we shall be satisfied if, when occasion serves, and some blatant disturber of a settled state of things wants to spend ratepayers' money in opposing a Gas Bill, with a view to raking up the question of price, he is sharply kept to the point, and, despite prejudice and feeling, made to disclose the motives of his action and the good he expects to do thereby. We have no desire to take any side in this matter other than that of right and justice to all parties, and if it can be shown that the Metropolitan Board were badly advised, and failed to put the best aspect of their case before the Commons' Committee, and that it would be better for proprietors and consumers that the adjusting portions of a Gas Bill should be themselves susceptible of adjustment, we will reconsider our opinion; but unless this can be done, we shall continue to hold that the last precedent is as equitable as it is strong, and that the greatest misfortune that could have happened to the Metropolitan Board, as representing gas consumers generally, would have been that success of their claims on the late occasion which was mercifully denied them, and which, it may be hoped, will again elude them, if the conflict is to be renewed in another place.

THE DUDLEY GAS BILL IN THE LORDS.

The Bill of the Dudley Gas Company has passed the Lords' Committee, in spite of the opposition of the Town Council. This was originally a simple money Bill, and as such it passed the Lower House by the operation of the now obsolete rule of the Court of Referees, to the effect that Local Authorities should not be permitted to appear against such Bills. It must be owned that the Company were under considerable

disadvantage in respect of their capital account. They had been indulging in the old practice, more honoured in the breach than in the observance, of making extensions out of revenue; and the discovery of this fact seems to have led the opposition to the belief that Parliament might be induced to order the reserve fund to be filled up out of the new capital intended to be raised under the present Bill. It was consequently argued, on behalf of the Town Council, that as the Company had made revenue do the work of capital in the past, it would only be fair to make capital answer the purpose of revenue in the future. Fortunately, however, for the Company, it was shown that in acting as they had done, although in error, they had not flagrantly misappropriated their revenue by dividing it among themselves; the surplus profits had all gone into the concern, and were so far making a profitable return. In 1853 the Company, on applying to Parliament with a similar confession, were allowed to capitalize the difference, and to actually increase the nominal value of their shares by a corresponding amount. This experience seems to have influenced them to go wrong again. This time, however, they have been better advised than to ask to have the unauthorized outlay returned to the existing Shareholders; it will therefore remain like premium capital, bearing no interest. This result is of itself sufficient to deter them from ever following the same course again, in addition to which, as the new capital will be sold by auction, there will be no inducement to nurse the concern as before. There was a small fight on the question of the testing station, which is to be in the town, as desired by the Council, and the Sedgley Local Board are to have their independent rights respected; so that all parties have obtained something, and the settlement cannot thus be considered as unsatisfactory.

A RETURN RELATING TO GAS COMPANIES.

In the House of Commons on Friday last, Mr. E. Ashley, Parliamentary Secretary to the Board of Trade, asked for and obtained an order for a return, which may be expected to throw a certain amount of labour upon, and to exercise the minds of the Secretaries of Gas Companies throughout England and Wales. As is announced in detail in our "Parliamentary Intelligence," the return is to embrace only such gas undertakings as are not under the control of Corporations and Local Authorities, but the dealings with capital of such Companies as are working under the sliding scale and auction clauses are intended to be prominently shown. We would suggest, however, that the return in its existing form only provides for showing the action of the clauses named upon the new capital actually issued under these conditions, and does not contemplate the case of transfers of old capital having been made with the necessary attendant condition of sliding-scale dividends. Without the record of these transactions, the account of the operation of the sliding scale, confined as it will be to the new issues of stock or shares, will be worthless as an indication of the influence of modern legislation on the value of gas property. The Board of Trade should amend their application on the understanding that when the sliding scale is applied to a Gas Company all the ordinary capital, old and new, is equally affected by it, otherwise the return will be misleading. We are, of course, quite in the dark as to the use to which the information required by the Government is to be applied, and are not likely to be enlightened before next session, when—unless the business should be "obstructed" because Ireland is not mentioned—it is probable that the President of the Board of Trade may introduce some measure of general interest to those engaged in the business of gas supply.

ANOTHER ELECTRICAL SPECULATION.

A PARTIAL revival of excitement in the world of investors who believe in the eventual use of electric force for every kind of work under the sun is anticipated by a contemporary, which hastens to warn off those who might otherwise be victims of the astute financiers who have addressed themselves to the task of raising money, ostensibly for the purpose of working M. Faure's patents for the storage of electricity. M. Philippart, of European celebrity in connection with banking operations—which, however, came to grief some time since—is said to be receiving much support in France for a Company formed for the purpose of supplying portable electricity for lighting, motive power, &c. A peculiarity of this enterprise lies in the proposal to devote some of the enormous profits anticipated to be made in the electrical business to the relief of the ruined shareholders of the enthusiastic promoter's defunct bank. It is, perhaps, hardly to be feared that M. Philippart, or any of his

followers, will achieve much success in this country if the experiment should be tried; but it is well to remark, as we are likely to hear loud things said of M. Faure's battery for storing electricity, that there is no commercial advantage to be expected from its use over what may be derived from the continuous current. We know what the electrical and magnetic power companies are doing, and should these even succeed in widely extending their business, the profit to be gained by the use of storage batteries would still have to be proved. It is known that gas can be supplied through pipes with perfect success, as electric energy can be transmitted through continuous conductors; but the Portable Gaslight Company found that they could not send out gas in carts and make a good return, and the same fate would certainly overtake an undertaking to distribute bottled magnetism while the regular article, in bulk, is not yet established in the market.

THE BRITISH ASSOCIATION MEETING AT BIRMINGHAM.

THE detailed programme of the proceedings of the forthcoming annual general meeting of the members of the British Association of Gas Managers at Birmingham, commencing on the 14th prox., has been issued, and shows that visitors to the Midland capital will not be able to complain of time hanging heavily on their hands during the second week in June. We have already announced the order in which the four days of the meeting are to be divided; but it is necessary that we should now explain the arrangements in fuller detail. It appears that Dr. C. W. Siemens, F.R.S., will occupy the earlier portion of the evening meeting of the first day with a paper on "Gas Supply both for Heating and Illuminating Purposes," as to which considerable interest will be felt, to learn what fresh applications and novel means of using gas the illustrious practical philosopher intends to speak of. Mr. G. E. Stevenson will follow Dr. Siemens, who is expected to take part also in the discussion of the second paper. At the subsequent meetings the communications will be received. Mr. H. Woodall, of Leeds, will discourse on some particulars of economical gas management; and none could deal with such a subject better than the man who first in this country sent out gas at cost price. Mr. W. J. Warner, of South Shields, promises a paper on the "Incidence of Commercial Charges in the Selling Prices of Gas;" which may be trusted to be clearer in substance than in title. Mr. T. Travers, of Cork, is to the fore again with a communication on "Industrial Co-partnership"—a subject on which much has been heard lately, but not in close connection with gas-works. Mr. C. Gandon, of Lower Sydenham, will contribute his experience of "Anti-dips," some one or more of the various and manifold forms of which have perplexed most gas managers in turn. This communication may touch somewhat closely the domain of Mr. D. F. Goddard, of Ipswich, who will introduce an old friend, or rather enemy, in dealing with stopped ascension-pipes. Mr. R. P. Spice will attempt to satisfy curiosity on the subject of the St. John apparatus; and "Brick Retorts" will form the subject of a paper by Mr. J. R. Frith, of Runcorn. Joints in mains, with regard to the question of leakage, as dealt with by Mr. A. C. Fraser, may or may not appear as a prelude to Mr. W. Richards's remarks on the subject of explosions; but Mr. F. W. Hartley, and Dr. Adams, both taking up the subject of the heating power of coal gas, will scarcely bear separation. The last is a most important matter, and if more than two investigators had decided to open it up, we should not have complained; though it may be granted that no other two observers could be named whose opinions and labours in this field of research are likely to be more fruitful. We have already referred to the excursions arranged up to the present, and have only to add that no less than twenty-six leading manufacturing firms in the district have kindly consented to allow members to inspect their show-rooms and workshops; and many other privileges, conducing to the comfort and entertainment of the visitors, have been secured for them during their stay in Birmingham. We hope the members will show their appreciation of the labours of those who have busied themselves in the arrangements, with so much promise of ultimate success, by assembling in full strength to greet Mr. Hunt when he rises on the 14th to deliver his second Presidential Address.

We have received a copy of Messrs. Tangye Bros. and Holman's new illustrated list of specialities for gas-works, which is exceedingly well got up, and should prove useful to those to whom it has been or is about to be sent. The many manufactures of this firm are so thoroughly known as not to need mention here; and besides, those who will be attending the meeting next month of the British Association of Gas Managers will have an opportunity of inspecting the works of the allied firm—Messrs. Tangye Bros., of Smethwick.

Water and Sanitary Affairs.

THE half-yearly report of the Lambeth Water-Works Company, presented at the meeting of the Proprietors last Tuesday, may properly excite a feeling of regret among the opponents of Sir Richard Cross and Mr. E. J. Smith. It is easy to disparage the bargain offered to the Metropolis a year ago, but nothing can alter the facts of the case. Events may show that Mr. Smith was better aware of the value of the water undertakings of the Metropolis than were those who differed from him. The progress of the Metropolitan Water Companies in the brief period since Mr. Smith made his arrangements clearly proves that he was right in estimating the prospective value of their property. Thus we see in the case of the Lambeth Company a remarkable instance of the development which was to be expected. During the last half year more than 1300 houses and other establishments have been connected with the Company's works, making an estimated increase of £3212 in the annual water-rental. In the corresponding half year of 1880 the addition was about a hundred less in the number of houses, and £243 less in annual revenue. Yet this smaller increase was "greatly in excess" of that which occurred in any former corresponding period. The bond debt is undergoing rapid reduction, and when it is quite extinguished a further issue of £92,000 of share capital can be made to the Proprietors. Since the beginning of February, more than £32,000 has been paid in advance by the Proprietors to meet future calls, the payments thus made carrying interest at three and a half per cent. The revenue account shows an increase of nearly £5000 in the water-rents over the six months ending March 31, 1880. Compared with the same period, the increase in the expenditure is about £2300. An accumulation of heavy paving bills from Newington Parish, and the expense connected with the severe frost in January and February, make the expenditure for the half year abnormally large. The dividend for the half year is at the rate of seven per cent. per annum, less income-tax. Extensive works, in progress during the last three years, are now practically finished, securing an excellent quality of water, and providing for an extended supply. It is a curious fact with regard to the water controversy, that while it has been asserted that great pecuniary advantage would be secured to the consumers by transferring the supply to a public Water Authority, it has been overlooked that this is one of the leading elements of value. The enormous benefit which has been talked about seems to shrink into nothing when it has to be paid for.

"A Puzzle for the Water Scientists" has lately been propounded in one of the Liverpool papers. "A Vicar" having taken up his residence in the country, was greatly alarmed to find the population resorting to the ditches to eke out their supply of drinking water. The luxury of spring water was unattainable, and the only resource was rain water stored in tanks or caught in tubs, supplemented by the friendly ditch, from whence the people were content to drink, not only when the water looked tolerably fair to the eye, but sometimes when it was positively green. Contrary to all that "A Vicar" had been led to expect under such circumstances, the people were healthy and long-lived. "The deaths of children," he found, "were not six in a thousand." The reverend gentleman was therefore constrained to write as follows:—"Whatever may be said in explanation, the case is this: The water drunk by the inhabitants of this locality is rain water and ditch-water, and yet there are many very old persons, and very few deaths and very little disease." Mr. Alfred Smetham, F.C.S., a member of the Society of Public Analysts, considers the statement of "A Vicar" to be one which is "calculated to mislead." The point raised by the clergyman was this: That, according to the usual theory, the people must have "good, wholesome water," or sickness and death would prevail. Was ditch-water good and wholesome? Mr. Smetham bases the quality of the water on the presence or absence of "disease germs," and says that the "green matter" in the ditch-water may be no more injurious than an equal quantity of watercress. "Water from a well-kept ditch," he observes, "is safer than water taken from a well in close proximity to a cesspool." No doubt Mr. Smetham is so far right. But if a "well-kept ditch" is to be tolerated, what does Mr. Smetham think of the Thames at Hampton, and the character of the water supply which has been drawn through the London filter-beds? If the persistent healthfulness of the population referred to by "A Vicar" is consistent with the drinking of green ditch-water, there is surely a pretty good prospect for the inhabitants of the Metropolis.

If the London Water Companies were to supply ditch-water on the particular day in the month when Dr. Frankland takes his samples, we might look for an analytical report which would almost frighten the Metropolis into a fever. We believe it very often happens that people who are extremely fastidious about the London water supply, will gulp down almost anything that looks like a decent glass of water when they are in the country. The proverb which speaks of the gnat and the camel is not wholly inapplicable in these cases.

At the meeting of the Metropolitan Board last Friday, the tender of Messrs. Mowlem and Co. for the construction of a large sewer from Deptford Broadway to Lee Bridge was accepted after some opposition, a division being taken in which twenty-three voted for the tender and nine against it. The necessity for something being done to prevent the recurrence of the mischievous floods at Lewisham and Lee cannot be denied, and this new sewer is the remedy proposed by the Board. The estimated cost was £30,000, and the sum for which the work is to be done is £27,396. The Greenwich District Board are opposed to the scheme, and we believe threaten legal proceedings, on the ground that the new sewer will lead to a discharge of sewage into Deptford Creek. But the intention of the Board is for the sewage to travel on from the pumping-station at Deptford to the outfall works at Crossness. The question with regard to this sewer is virtually but one part of the broad and difficult subject of river conservancy. Although it is designated a sewer, the real design of the undertaking is to carry off the flood waters of the Lee Valley, though at the same time doubtless assisting the general drainage of the district. The plans of the Board include also a storm overflow at Deptford, estimated to cost £10,000. Extensive works in the shape of supplementary sewers have been resolved upon by the Board, in order to prevent flooding from the influx of storm-water in various parts of the Metropolitan area, the more important being a storm relief line for the Ranelagh and King's Scholars' Pond sewers, estimated to cost £196,000, and an intercepting sewer from Putney to Clapham, to cost £170,000. The total estimated cost of all the works exceeds £700,000. Power was obtained last session to borrow £300,000 in the course of the present year, towards the execution of these works. This addition to the main drainage system of the Metropolis is rendered necessary by the great extension of house property, which both increases the amount of sewage to be carried off, and prevents that absorption of the rainfall into the subsoil which mitigates the severity of the land floods.

The Dublin sewer inquiry, conducted by Mr. C. P. Cotton, C.E., one of the Inspectors of the Irish Local Government Board, under circumstances recently referred to in these columns, has reached a conclusion after three days occupied in receiving evidence and hearing the speeches of Counsel, in addition to a preliminary day when the inquiry was adjourned owing to the absence on that occasion of Mr. E. D. Gray, M.P., the Chairman of the Public Health Committee. The affair presents a very singular aspect, and illustrates the strong feeling which commonly actuates the Irish labouring class when their nationality is in any way affected. There was a contract for the construction of seventeen miles of sewers, comprising 260 branches, in the city of Dublin, and this was obtained by Mr. John Stanfield, on a tender for over £26,000. Unfortunately Mr. Stanfield was a Scotchman, and although he employed Irish workmen, he reserved to himself the right of having a Scotch foreman. The work was pressed on at a considerable pace, in order to meet the wishes of the Corporation that as much employment as possible should be immediately given, there being considerable distress among the working population. When the contract was finished, or very nearly so, complaints were raised by men who had been engaged on the works, that there were serious defects in the carrying out of the scheme. Levels were said to be wrong, and many things done which were fatal to the character of the undertaking. The Corporation in the first instance employed a civil engineer of eminence, Mr. James Bell, to examine the works and report thereon. Mr. Bell's report showed that in some respects the work was defective, but in other particulars his conclusion was a favourable one. The Corporation, in order to satisfy the ratepayers, then decided to ask the Irish Local Government Board to conduct an independent inquiry. Although the Board somewhat limited the scope of the inquiry, the evidence taken is apparently sufficient for all practical purposes. We are not aware of any report having yet been received from the Board, but the evidence certainly seems to fail in showing anything very serious. The most extraordinary part of the affair is

that the parties who by their allegations caused the investigation to be made, were openly accused by some of the learned Counsel engaged in the proceedings, with having themselves played certain tricks while in the service of the contractor, in order that they might afterwards be able to allege that the work was badly done. Some of the evidence bearing on this point was very remarkable, and led to strong denunciations from the Counsel engaged on behalf of the Corporation officers, as well as from the Counsel for the contractor. Following the inquiry, a meeting was held by the men, at which sundry resolutions were passed, condemning the manner in which the Local Government investigation was conducted, and "the unwarranted slanders heaped on the tradesmen of "Dublin" by Mr. Gray and two of the learned Counsel. It is satisfactory to know that whatever is wrong with the sewers will now be put right; but it is a hard case for a contractor, if he really has men in his employ who are not only watching for an occasion to find fault, but are actually laying traps in his path.

THE BIRMINGHAM CORPORATION GAS UNDERTAKING.

WITH this week's number of the JOURNAL is given the companion plate to that issued last week—a lithograph showing the Windsor Street Gas-Works of the Birmingham Corporation, with the old existing plant, the new plant recently erected, and that in course of erection distinctively marked.

The history of the Windsor Street works, at which are in progress the extensions that will form the subject of succeeding notices, is a curious and instructive one. They were designed by the late Mr. Alexander Smith, and date as far back as 1846—in the infancy of railway development, and when all the coal consumed in Birmingham was brought in by canal from the South Staffordshire coal-fields. These were "palmy" days for the Old Company, as they were called. They occupied what at the time was justly held to be a most excellent position for manufacturing purposes—a very compact and rapidly improving district—and commanded a ready sale for coke (the produce of a coal peculiar to the locality, and known by the name of "Heathen") at prices that must almost, if not entirely, have covered the cost of the coal. Well might they lull themselves into fancied security, regardless of the apparently fruitless efforts of their less favoured but more vigorous rivals. The Old Company held the lead, and kept it for many years; but evil times were in store for them. The advent of railways changed the conditions of successful competition; and their virtual monopoly in the sale of coke was broken through. Gas-producing coal of a superior quality to that of South Staffordshire was introduced into Birmingham by the Midland Railway; and the Birmingham and Staffordshire Company were not slow in adapting themselves to the altered circumstances. They established themselves at Saltley; and from this period dates the downward career of the Old Company, culminating in the disastrous discovery of Harrison's defalcations in 1871. Although repeatedly urged by their responsible advisers to take the same step which had already proved advantageous to their opponents, the Directors of the Company allowed opportunity after opportunity to slip past them; and instead of availing themselves, upon a new site, of the advantages of railway communication, their resolution, each time the matter was debated, took the form of adherence to old traditions, and a determination to somehow or other make the old works last a little longer. At last it became apparent as to whose were the insidious counsels that had so fatally prevailed. Harrison, their Secretary, disappeared, leaving behind, as a legacy, an impoverished exchequer and works almost in the last stage of dilapidation. To restore them into a more healthy condition, and to reinstate the Company into some degree at least of their former prosperity, was the difficult task of a new administration. To recall the past was impossible; but at least some of its errors might be retrieved. Mr. Hunt—who succeeded the late Mr. E. White, as Chief Engineer, in 1872—renewed the recommendation that on several previous occasions had been made to the Directors by various engineers of eminence—viz., that no time should be lost in transferring the manufacture to a site more adapted to modern requirements. It was urged, with manifest reason, that the original conception of the works did not admit of economical development, to say nothing of the effect of the piecemeal policy that had since prevailed; and that the only hope of future prosperity lay in migration to a more favoured locality, where the narrow traditions of the past need not be permitted to follow. Steps were at once taken to give effect to this advice. A site for new works was secured; and a Bill for obtaining the necessary powers was lodged in Parliament. The further progress of it was, however, arrested by the sale of the whole undertaking to the Corporation. In the meantime energetic measures were adopted for restoring the works to a condition of efficiency for meeting immediate requirements; and with such effect that, down to the time of the transfer, a largely increased consumption of gas had been provided for, without by any means exhausting the productive capacity of the works. This had, in fact, been increased during a period of three years—without adding one foot to the retort-house space—by no less than 30 per cent.

It was apparent, however, that no amount of improvement in the retort-house could compensate for the much-coveted railway communication; and therefore curtailment of the manufacture was inevitable, if not the ultimate abandonment of the works. At this juncture the enterprise of the London and North-Western Railway

Company, as previously explained, gave a new turn to affairs, and justified the development of the works to the utmost available extent.

At the time of the transfer the area occupied by the works was about 9 acres, and this has since been increased to 26. Upon the added portion, as will be seen by a reference to the plan, the extensions in progress are of a most comprehensive character; comprising works which, when fully equipped, will be capable of producing not less than 7,200,000 cubic feet of gas per diem. It is, of course, unnecessary to point out that these will not all at once be brought into active use for the purpose of providing for a corresponding increase in the consumption; the object being (so far as the retort-house is concerned) to transfer to it the whole of the manufacture now carried on in the old works, and at the same time to provide a margin for increase. The existing houses will then for a time be reserved for the exigencies for the busy season, as the consumption progresses. In designing the new works, concentration of the various operations has been kept in view as far as possible; and likewise the ultimate, though gradual, displacement of the existing plant in favour of the new arrangement.

A NEW ROTARY EXHAUSTER.

WE illustrate by the accompanying transverse and longitudinal section drawings a gas exhauster recently patented by Messrs. G. Waller and Co., of the Phoenix Engineering Works, Southwark. As will be observed, this machine is of the rotary type, but, like the new exhauster of Messrs. Donkin at the South Metropolitan Gas-Works—which it does not otherwise resemble—the internal rotating parts are supported on a fixed pin placed concentrically with the outer cylinder (fig. 1). The method by which the exhaustion is performed is ingenious. On the fixed pin already mentioned are hinged three flaps of equal breadth, which, being radial to the outer cylinder, sweep its internal surface completely. These flaps are kept equidistant from each other by being passed through guides, shown in the cross section (fig. 2) half imbedded in the eccentric cylinder, which, as usual, is set at the bottom of the outer cylinder. The eccentric is rotated by means of the external shaft, there being only one stuffing-box on the driving line. The eccentric does not actually rest on the bottom of the case, but has a shoulder at each

end fitting into recesses made in the ends of the outer cylinder (fig. 1). As the shaft revolves, the flaps already mentioned as being attached to the central pin are successively made to sweep the large internal space over the top of the eccentric; and there being three of them, for a medium-sized exhauster, instead of two as usual, there is a delivery of one-third more gas for every revolution than with the customary double-bladed exhausters driven at the same rate of speed. This result is due to the fact, obvious on inspection of the figure, that the machine exerts its maximum effect three times instead of twice during every revolution of the shaft. A very important collateral effect of this arrangement is the reduction of the oscillation of the current of gas, consequent on there being less time during which the exhauster is practically inert.

For small exhausters Messrs. Waller and Co. contemplate the retention of the form of two-blades, hinged, of course, in the same way; and for large machines, capable of exhausting 60,000 cubic feet of gas and upwards per hour, they will make use of four blades, which will still further increase the amount delivered at every revolution, in comparison with the three-bladed pattern (but only by about 10 or 12 per cent.), and also help to reduce oscillation. The present arrangement, as in the figures, works—as far as may be judged from experimental running—remarkably well, the strength of the draught being constant, and the friction much less than in the older pattern exhausters. This is an advantage in respect of economy of power, and is due to the support for the heavy flaps being transferred from the revolving cylinder to the fixed pin. It should be stated that this pin is made hollow, so that lubrication is efficiently provided for by means of an injecting feeder. The perfect balance of all the working parts may be inferred from the fact that for experimental running the machine has not been bolted down, a light band from an overhead drum being sufficient to run it at from 70 to 80 revolutions per minute, without rocking to any extent.

The accompanying illustrations bear particular reference to an exhauster, the first of the new pattern, just made for the Exeter Gas-Works. It is intended to pass 40,000 cubic feet per hour, being designed to be used for the summer production at these works; and the outer cylinder is 2 ft. 2 in. diameter, and of equal length internally. The apparatus can, of course, be worked to pass gas in either direction, and, as far as can be seen, is calculated to answer its purpose admirably.

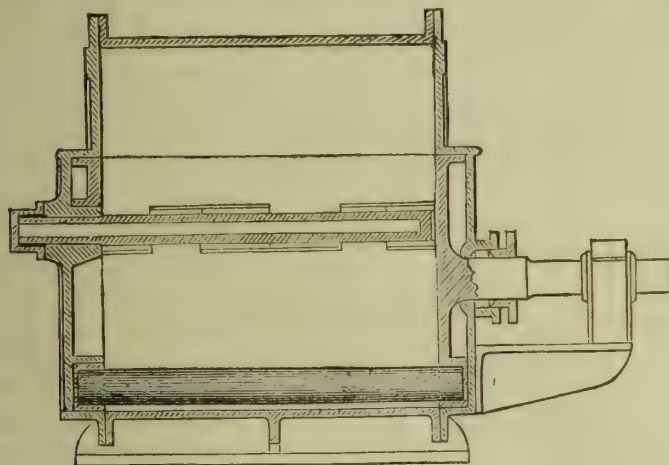


FIG. 1.

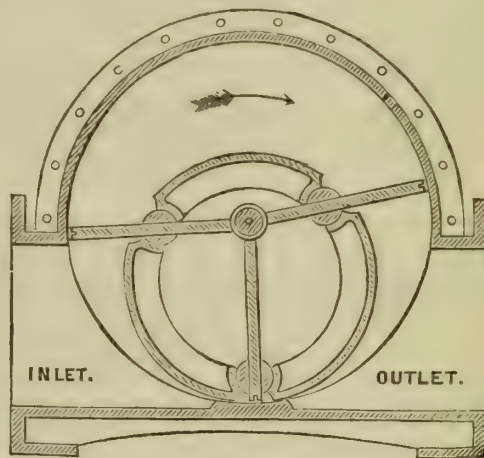


FIG. 2.

THE ACQUISITION OF GAS AND WATER UNDERTAKINGS BY MUNICIPALITIES.

MR. ARTHUR SILVERTHORNE is known to be an advocate of the transfer of the undertakings of gas companies to local authorities, and his latest publication* gives ample proof that he is becoming more confirmed than ever in his opinions on this subject. We would not, however, raise a prejudice against Mr. Silverthorne's work in the minds of any obstinate individuals who may disagree with the author's conclusions on matters of policy, by disseminating the idea that this volume is composed entirely, or even principally, of Mr. Silverthorne's opinions. It is chiefly made up of tabulated statistics of the gas and water undertakings of the country which are now under the control of local authorities, to which is added, as being of exceptional importance, similar information concerning the proprietary metropolitan works of gas and water supply. Beginning with gas-works transfers, we find a list of all such transactions, commencing with the example of the Dundee undertaking, transferred in 1868, and terminating with the Newtownards (Ireland) case, dated last year. The transfers which took place prior to the passing of the Borough Funds Act, 1872, are separated from those subsequently recorded, and in every instance, when practicable, the date, name of company, annual consumption of gas, selling price, annuities or purchase-money paid upon companies' paid-up capital, annual value of annuities, interest, and amount of the annuities and interest per 1000 cubic feet of gas sold, are given in separate columns. These figures help Mr. Silverthorne to some comments, with which we shall deal presently. After this we have the working and personal statistics of 60 corporation gas undertakings brought down to the date of the latest published accounts. For the accuracy of these details the compiler must be held responsible, as he claims in some instances to have been entrusted with special information.

* "The Purchase of Gas and Water Works, with the Latest Statistics of Municipal Gas and Water Supply." By Arthur Silverthorne. London: Crosby Lockwood and Co.

We will now proceed to examine Mr. Silverthorne's comments on these statistics, with a view to elucidate his ideas, and to test the accuracy of the deductions by which they are here supported. It must be conceded at the outset of our criticism, which may not be altogether favourable to Mr. Silverthorne's opinions, that such a possible disagreement appears regrettable even to ourselves, since Mr. Silverthorne himself is most appreciative of every one with whom he appears to have been brought in contact. His compliments are bestowed most liberally all round, and the fear of being unable to respond at all times in a similar tone is most distressing. It is, however, incumbent upon us to be just, where Mr. Silverthorne may feel at liberty to be generous, and so it happens that this overflowing amiability of his leads him into a statement, in the first page of his work, to which we are constrained to give a most unqualified denial. We are here told that "the unpaid bodies"—i.e., the municipal authorities who have the control of gas undertakings—"have achieved far superior results to those obtained under the directorate of public companies." Where, or in what respect, does Mr. Silverthorne find his warrant for this sweeping statement? We cannot find any evidences in support of it sufficient even to justify such a belief in the mind of an ardent admirer of Bumbledom, still less to convert a sceptic. There are companies which sell gas as cheaply as corporations; and corporations which are just as niggardly and narrow-minded as the worst specimens of an unreformed company. We grant that corporate bodies can borrow money cheaper than the companies can raise capital, and are thus able to make a better show, but beyond this we cannot go. Even if the grounds for such a statement as Mr. Silverthorne makes had any existence, it would still be too early to claim the actual formation of a school of corporation management distinct from the companies; for it must not be forgotten that the leading officials of the former are drawn from the latter.

To pass on to more important matters, Mr. Silverthorne soon leaves complimenting local boards and Mr. Gladstone, with whom he once had a brief correspondence, and plunges into an earnest, if somewhat blundering defence of the practice of drawing upon gas consumers for relief of the rates. Mr. Silverthorne considers this proceeding thoroughly righteous, and, of course, justifiable. He cites the annually increasing expense of cemeteries, paving, drainage, and sewage farming, as particularly suitable to be borne by gas consumers. We are told that the incidence of local taxation is so heavy that Imperial aid has been extended to relieve the rates at the expense of the taxpayer; but Mr. Silverthorne considers this to be less a real relief than a rearrangement, and suggests the development of local undertakings as a better resource. This argument is peculiar. It is as much as to say that there is only adjustment of burdens, but not real relief, when the contributions of the many from whom the Imperial revenue is taken, whether by taxation, customs, excise, &c., are drawn upon for the benefit of the minority of ratepayers; but that there is positive relief in making a minority of gas consumers pay more for their gas than is necessary, in order that the majority of ratepayers may be spared. We will leave Mr. Silverthorne to explain the apparent inconsistency of this reasoning. He has brought forward the parallel; it is not our fault if it bears another use to that which he intended. It is, moreover, difficult to find the relevancy of other illustrations used by Mr. Silverthorne, presumably to prove that municipal management is always just, beneficent, and profitable. His ideas are not very clear on the point of what constitutes cheapness and its opposite in gas supply. We should say that these are relative terms; but as Mr. Silverthorne finds it necessary, in order to sustain the policy of some of his model local committees, to deprecate an undue cheapening of the price of gas, on the plea that such a course encourages waste, whereas thrift ought to be fostered, it might be imagined that he holds to a minimum price below which gas should never be sold. For example, he challenges our admiration for towns where, although the largest sums have been taken from gas consumers in relief of rates, the charge is "as low as 2s. 9d. per 1000 cubic feet for 16-candle gas." Are we to infer that this, or perhaps a penny or so lower, is Mr. Silverthorne's minimum? If so, what would be his arguments in favour of the transfer to local authorities of gas undertakings where the charge for gas is already far below this figure? One of these arguments usually is that the consumers immediately benefit by reduced charges consequent on the superior management of the local authorities, who, as we are also told, frequently succeed in making a gas concern pay 17 per cent. as against the companies' average of 8½ per cent. But, of course, if the gas is already being sold too cheaply, the authorities should raise instead of lower the price. We know very well that Mr. Silverthorne does not really hold all the opinions which his arguments may be made to bear out, but it is well to show the false construction that might be put upon them.

With respect to the terms on which transfers of gas property from companies to local boards have been usually arranged, Mr. Silverthorne is of opinion that the operation of the Borough Funds Act, 1872, which forbids the use of municipal revenues for the promotion of competing new works Bills, is to be deplored. He looks back with fond regret to the days anterior to that measure of restraint, and grieves that since then corporations have been bereft of the "competing works" weapon for battering gas companies. Few thoughtful men will join in this complaint, and indeed the grievance amounts to very little when looked into. According to Mr. Silverthorne's own tables, only fifteen transfers are recorded to the close of 1872, and the average price paid in annuities and interest per 1000 cubic feet of gas sold for these undertakings was 13·89d. This is the author's favourite way of reckoning the value of such property, as will presently be seen. Since that epoch more than double the number of undertakings have changed hands, and the price paid has averaged 14·83d., or not quite 1d. per 1000 cubic feet more, although there have been no competing Bills to swell the actual though unrecorded costs as in the prior time. We have referred to Mr. Silverthorne's favourite method of valuation. He asserts that maximum dividends should not be regarded as the basis of valuation *because some companies may be overweighted with capital*, and formulates the doctrine that any efficient works to be transferred would be dear, if the purchase-money and interest on loan capital work out to more than 13d. per 1000 cubic feet of gas sold. If this be so, then the skirmishing times before 1872 were not very productive of cheap victories for the municipalities; for while the average price paid was nearly 1d. per 1000 cubic feet above Mr. Silverthorne's maximum, in one case so much as 26·85d. was paid, or far in excess of anything agreed upon since the combative powers of municipalities, so valuable in Mr. Silverthorne's eyes, have been restrained. We will not follow our author further in his attempts to lay down a hard-and-fast rule for the proper value of gas-works in all cases, except to observe that gas proprietors will always expect to be bought out with regard, not to what any ingenious grouper of statistics may think proper in all cases, but to their own peculiar circumstances. The cost of supplying a district with gas must always be considered to be best shown in the amount of capital required to work the concern, and this must necessarily vary. It is one thing to strike an average, and quite another to show the justice of the mean so arrived at, when compulsorily applied to the extremes.

Mr. Silverthorne has a few words to say on the subject of the sliding scale, as affecting the value of gas property from the point of view of the appraiser of the same for transfer to local authorities, especially with reference to the London Companies. He is of opinion that in any such eventuality it should be desired that the basis of

purchase should be the 10 per cent. maximum dividend, as of old, irrespective of the increased dividends which the sliding scale might enable the Companies to distribute. On this matter we are not disposed to say anything, feeling that it has not yet "entered into the scope of practical politics." When the time comes there will be enough discussion on this and other points; but we protest against the gratuitous assumption that the London Gas Companies will "claim to sell upon 14 or 15 per cent. dividends at the very least." We do not know what dividends the Companies may be able to pay when the event anticipated by Mr. Silverthorne is ripe; for the sliding scale may as well have operated in both ways as in one before London obtains a municipal government—whenever that may be. If dividends should be low, we opine that the purchasers would be as little inclined to allow the Companies the benefit of maximum dividends, as in better times the Companies would be to give up any of their profit.

The purchase of water-works is not usually such an exciting affair as a gas transfer, and Mr. Silverthorne has consequently been able to do little more than gather some useful statistics with reference to recent acquisitions by corporations of works of water supply. These are sufficiently interesting in themselves, and they have afforded to the compiler the opportunity of handling his data picturesquely. It must be conceded that Mr. Silverthorne has a capacity for dealing with masses of figures, and his calculations, as a rule, are carefully made. We would cordially recommend the present work to all who may need information on the subjects of which it treats, assured that no one will examine the statements given without forming some opinion as to their bearing; but whether such opinion would always bear out Mr. Silverthorne's own, formed on the same fact, we must crave leave to doubt. We have only to add a word of thanks to the author for having omitted all mention of the electric light. The work is well got up, and provided with a copious index.

Notes.

A "FIND" OF COAL TAR.

There are many natural gas-wells in different parts of the world, chiefly, however, in the petroleum districts of Pennsylvania, U.S.; but a natural tar-well has hitherto been unknown. It is now announced by a local newspaper that a well of liquid, very like coal tar, has been discovered in the neighbourhood of Foxburg, Pennsylvania. The oil is probably a dense kind of petroleum, much of which, upon first issuing from the earth, is very dirty, and has a peculiarly pungent odour, but the newly-found liquid is said to possess distinctive features, never before observed in a native hydrocarbon. It is jet-black, and has a strong odour like that of "spirits of tar." In its natural state the oil burns, as might be expected, with a dense black smoke, and it is locally proposed to make lamp-black from it, or we are told it is thought that it may be available in the manufacture of aniline dyes. It is, however, not likely that, in a country where common coal tar is not yet much used for this purpose, there will be great readiness to undertake a possibly costly series of experiments on an unknown product, which may or may not be more suitable for the extraction of aniline, &c. The oil from the particular well in question is said to differ in every respect from that procured from the other wells in the vicinity. It is found at a depth of 270 feet, in a stratum of slate in which many other wells are sunk to a greater or less depth in the immediate neighbourhood, but these produce only the usual crude oil, without affording any clue to the origin of the curious "strike" here recorded. Mineral oil is only a result of the gradual decomposition of the hydrocarbon constituents of coal, by means of which common bituminous coal becomes in time converted into anthracite, which is therefore really a natural coke. The ammonia must also go somewhere, and it would not much surprise us, after having heard that the tar has been found, if it were announced from the same region that a more than usually acute citizen of the States had struck a fine deposit of sulphate, requiring only quarrying to be fit for the market.

THE STORAGE OF ELECTRICITY.

Our contemporary *Engineering* devoted a considerable amount of space in its issue of the 21st inst. to observations on M. Faure's secondary battery, intended to store electricity for transit, or for keeping over any required period. It points out the true place of the Faure battery in an electrical distributing system to be very different from that of a reservoir or gasholder in the case of water or gas supply, to which it may unthinkingly be likened. In reality, the electric energy in this battery is stored up precisely as power is stored in a coiled spring or a reservoir of compressed air. This fact is, of course, very remarkable, and may be useful in its way; but it is not storage as implied in the sense of the reservoir of water or the gasholder respectively—i.e., an arrangement of a superfluous portion of the thing employed, so as to be instantly available to compensate for irregularities of consumption. It is, as pointed out by our contemporary, more analogous to the storage of water in a cart for carriage from one place to another as a substitute for delivering it through pipes. M. Hospitalier, in a communication to *L'Electricien*, also demonstrates that the useful effect of the Faure battery cannot be so much as is claimed for it. This able critic maintains that not more than 52·5 per cent. of the power spent in charging it can ever be obtained again in actual work. Meanwhile, it is unfortunate that the merits of M. Faure's invention are likely to be obscured in a haze of speculation which has already arisen

around it. Financiers have obtained a hold of it, and are promulgating the wildest calculations respecting the amount of business and profits to be derived from the use of stored electricity for lighting and supplying power to the residents of Paris. Our scientific contemporary does good service by exposing the fallacy of these calculations, and points out that even if M. Reynier's laboratory experiments can be always and everywhere repeated, small power could be obtained by the use of a gas-engine, at three-sevenths the cost of the Faure battery and of the electric motor necessary to transform its current into power. In regard to lighting the disadvantage is still more apparent. To obtain, say, 1000-candle power for ten hours, not less than 1650 lbs. weight of batteries would be required, even if the whole energy of the battery could be utilized; but as the strength of the current falls very rapidly after about two-thirds of the stock has been exhausted, a large additional weight of batteries would have to be provided. Assuming that, from these considerations, one ton of batteries would be required to give out the light of 1000 candles for ten hours, this weight of apparatus would have to be charged, delivered, and the empties collected every day. And if the price paid by the consumer for all this service exceeded 3d. per hour, it would be hopelessly out of competition with the current systems of electric lighting. It will thus be seen how little chance of success the *Compagnie Anonyme de la Force et la Lumière*, which is formed to work the Faure battery system, possesses.

CRANSTON'S DEEP ROCK BORING MACHINE.

We have received some further particulars in regard to this apparatus, noticed in the *JOURNAL* for April 5 (*ante*, p. 564). The patentee—Mr. J. G. Cranston, of Newcastle-on-Tyne—last week had a letter from Mr. T. Trewhitt, Secretary of the Hartlepool Gas and Water Company, stating that they have now completed the first bore-hole in their search for an additional water supply for their district. The machine has worked to their entire satisfaction. The bore-hole is 6 inches in diameter, and has been completed in 35 days, having been bored principally through hard magnesian limestone to a depth of 103 feet. The total cost has not exceeded £170, including machine, boring-rods and tools, erecting and removing, also fixing and removing steam and water pipes, together with repairs and materials used. The cost for labour, oil and tallow, &c., was £105. The greatest depth bored in one day was 9 ft. 11 in. Mr. Trewhitt further states: "The work could not have been done by hand labour for four times the amount." The usefulness and economy of the machine in its application for sinking artesian wells and boring for water and minerals to great depths is thus abundantly proved. Mr. Cranston's "pneumatic" rock drills, which have been in successful operation for some time past at the celebrated St. John del Rey Gold Mines, were on a recent occasion inspected by the Emperor and Empress of Brazil. They both entered the tunnel and witnessed the drills in practical operation at the tunnel forebreast, and expressed themselves highly pleased with all they saw.

THE CORROSION OF IRON AND STEEL.

According to Mr. W. Parker, Chief Engineer-Surveyor of Lloyd's—who has made an important series of experiments to test the relative liability to corrosion of various descriptions of iron and steel, more especially to illustrate the value of these materials for use in boilers, but also in respect of general endurance—Bowling iron and Messrs. Brown's steel both lost more weight by corrosion in a stated time than Lowmoor iron when exposed to salt or brackish water. When exposed to air, however, Brown's steel and all other kinds of steel lost considerably more than any kind of iron. In the presence of strong corrosive influences it appears almost proved by many of Mr. Parker's experiments that extra purity of the metal is followed by greater liability to damage. It is certain that in some cases Skerne common iron wasted less than any other brand, while Lowmoor iron, which is so frequently specified for the interior of boilers, corrodes about 20 per cent. faster than the ordinary irons. With so-called black iron and steel Mr. Parker has observed that the presence of scale appears to injuriously affect the patches of exposed iron in its immediate neighbourhood. In the atmosphere of London there is not much difference between the relative corrosion of black and bright plates of either iron or steel exposed to the air; but when salt water is applied to the specimens the case is different. It then appears as though the scale and the metal, with the conjunction of the salt water, sets up a galvanic action at the expense of the metal; but this point is not conclusively proved. Mr. Parker claims to have shown that, as far as his confessedly limited experiments go, steel is no more liable to be affected by corrosion than iron to an extent likely to interfere with its general use, or with the preference accorded to it on the ground of its superior strength; although, on the whole, mild steel is perhaps slightly more corrodible than the best iron.

ENTERTAINMENT TO GAS-WORKS EMPLOYÉS AT MANCHESTER.—On Saturday evening, the 21st inst., a concert was given in the Hulme Town Hall to the workmen employed at the Gathorne station of the Manchester Corporation Gas-Works. The principal vocalists were Miss Patti Standen, Miss Marian Hawes, Mr. S. Barratt, the Station Manager, and Mr. W. Burns, with Mr. Herbert Walker as solo pianoforte and accompanist. Two readings were also given by the Rev. J. G. Dennison, of Withington. A large audience showed their appreciation by recalling each of the vocalists, their efforts being received with much applause. At the conclusion of the concert, Mr. John West, Chief Engineer of the Gas Department, proposed a vote of thanks to the ladies and gentlemen and to Mr. Barratt, remarking that his zeal in arranging the evening's entertainment was deserving of the warmest praise; and he hoped that it would be the first of a number of such gatherings in the future. The singing of the National Anthem brought the meeting to a close.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE ST. JOHN APPARATUS.

SIR,—Observing your remarks in to-day's *JOURNAL*, relative to the working of St. John's apparatus at Rochdale, and your desire for some information respecting it, I beg to inform you that the working accounts for four years have been furnished to me, and that upon the facts they afford I have promised to prepare and read a paper at the forthcoming meeting of the British Association of Gas Managers at Birmingham.

Our confrères in Paris having also asked me to prepare a paper to be read at their meeting on the same subject, and on the same day, I have engaged to do so.

R. P. SPICE.

21, Parliament Street, Westminster, S.W., May 24, 1881.

THE GLASGOW PHILOSOPHICAL SOCIETY'S EXHIBITION OF GAS LIGHTING APPARATUS, ETC.

SIR,—I have observed that, although you have printed in your *JOURNAL* of the 10th inst. the report of the Jurors in Section III., on "Gas-Meters, Governors, &c.," which, whilst freed from certain of the errors published in the former report in your pages on the 29th of March last, is made by the note at the end to appear as if approved and adopted without protest by the Executive Committee.

As the member of the Executive Committee who first directed the attention of the President of the Philosophical Society, and through him to Dr. Wallace, the very serious character of some of the errors and statements in the original report, whereby, had they not been expunged so far as they have been, I felt that the honour and status of the Philosophical Society of Glasgow could not but sustain a serious loss of prestige, I deem it right to state publicly, through your columns, that the note appended to the report as published by you is untrue. I especially entered my protest against the report, and the Secretary was instructed to record my protest in the minutes of the meeting at which the revised report came up for consideration. I also pointed out to that meeting the grounds upon which my protest was recorded, as I felt as sure then as I do now that a report of such a character as this is will not be allowed to rest as it stands, and I at least, for one, will not consent to the honour of the Philosophical Society being stained by it.

As a proof of my charge that the report is still very far from being freed of error, I may refer you to Dr. Wallace's own admission of a most obvious correction pointed out by a correspondent of yours, and published in your last issue. This is so far satisfactory; but, whilst not a little humiliating, sets up a prospect of Dr. Wallace still being shown and assenting to further corrections.

I may possibly have occasion to address you again on this matter; but shall feel obliged by your publishing this in your next issue.

ST. JOHN V. DAY,

M. Inst. M.E., Assoc. Inst. C.E., F.R.S.E., &c.,
and Member of the Executive Committee.

Glasgow, May 27, 1881.

[We may state that the report, as we published it on the 10th inst., was revised by the Secretary to the Society, so that the omission to which our correspondent refers was not due to an oversight on our part.—ED. J.G.L.]

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

LINCOLN'S INN.—WEDNESDAY, MAY 25.

(Before the MASTER OF THE ROLLS and Lords Justices JAMES and LUSH.)
THE ATTORNEY-GENERAL v. THE GUARDIANS OF THE POOR OF THE UNION OF DORKING.

This was an action originally brought by the Attorney-General, at the relation of Mr. J. C. Deverell, the owner of a house near Dorking, and by Mr. Deverell, claiming an injunction to restrain the defendants, who were the Rural Sanitary Authority, from permitting the sewage of the town of Dorking to flow into a brook, called the Pipp Brook, so as to create a nuisance. On the 24th of January last Vice-Chancellor Hall (as reported in the *JOURNAL* for Feb. 1, p. 178) dismissed the action with costs. The plaintiffs gave notice of appeal, and after this a Local Board was, by an Order of the Local Government Board (made under the Public Health Act of 1875), substituted for the defendants. The plaintiffs on the 11th inst. obtained from the Court of Appeal an *ex parte* order to add the Local Board as defendants, and to continue the action as against them. The Board now applied to have this order discharged.

Mr. VAUGHAN HAWKINS appeared for the Board; Mr. W. LATHAM for the plaintiffs.

Their LORDSHIPS discharged the order, observing that the case was really governed by the decision of the Court on the 18th inst. in the case of *The Attorney-General v. The Birmingham, Tame, and Rea District Drainage Board* (reported in the last number of the *JOURNAL*, p. 883), that though the rights and liabilities of the defendants, under the Act of 1875, had, by force of section 275, vested in the Local Board, this did not render the Board liable to an injunction in respect of a wrongful act of their predecessors. If the plaintiffs had any ground for complaint of any acts of the Board, they could commence a new action against them.

A CONTEMPORARY likens the present *furor* about electricity to the excitement about asphalt which prevailed a few years ago. It was then thought that asphalt was to supersede granite and every other description of road paving, and numerous companies were formed to make skating rinks of all the highways in our large towns. Since then asphalt has in its turn been pretty well superseded by wood, and most of the companies have gone the way of all flesh.

SOVERBY BRIDGE LOCAL BOARD GAS SUPPLY.—At the last meeting of the Soverby Bridge Local Board—Mr. J. Greenwood in the chair—the minutes of the Gas Committee, which contained a recommendation that the price of gas be reduced 5d. per 1000 cubic feet, were presented, and approved. A lengthy discussion then took place on the subject of the appropriation of the gas profits, and it was finally resolved that £650 should be appropriated to the lighting of the streets and for sanitary purposes.

GAS UNDERTAKINGS (ENGLAND AND WALES).

On the motion of Mr. ASHLEY, a return was ordered, "relating to all authorized gas undertakings in England and Wales," showing the name of Company; number of consumers at date of return; total share capital authorized at Dec. 31, 1880; total share capital paid up at Dec. 31, 1880; maximum dividend authorized; total loan capital authorized; total loan capital issued at Dec. 31, 1880; maximum interest authorized; maximum price of gas authorized; actual price charged at date of return, stating discount (if any); illuminating power, number of candles; whether sliding scale clauses are authorized; initial price for sliding scale; whether auction clauses are authorized; amount of capital sold under auction clauses; amount of premium realized by sales of shares under auction clauses; number of tons of coals used during 1880; number of cubic feet of gas made during 1880; number of cubic feet of gas sold during 1880; number of public lamps lighted during 1880.

HOUSE OF COMMONS COMMITTEE.

THURSDAY, MAY 19.

(Before Mr. F. W. KNIGHT, Chairman; Mr. JACOB BRIGHT, Mr. FREMANTLE, and Mr. HAMAR BASS; Sir JOHN DUCKWORTH, Referee.)

SOUTH METROPOLITAN GAS BILL.

(Continued from p. 883.)

Mr. LIVESSEY recalled, and further cross-examined by Mr. LEDGARD. At the commencement of the present year a quantity of the South Metropolitan Company's stock was sold by auction, under the provisions of their last Act of Parliament, and the conditions of sale set forth that "the dividends payable on the ordinary stock are regulated by the price at which gas is sold by the Company;" that the standard price of gas was 3s. 6d. per 1000 feet, but that when it was sold for 2s. 10d. per 1000 feet the purchasers of the stock would be entitled to 12 per cent. dividend. On the faith of these representations the public bought the stock at premiums in some cases so high that £100 worth of stock realized £200, but the average was about £193 for the 12 per cent. stock. If the standard price were to be altered, these people would not have the 12 per cent. they were told to expect, and in such case we should have received money under false pretences, and ought in common honesty to return it to the buyers.

Mr. LEDGARD: Is that your only argument for the contention that the standard price was fixed for all time in 1875, or in your case 1876, and that the public have bought their shares upon the faith of the standard price being for ever maintained?

Witness: It is my main argument.

In your judgment, is not the time rapidly approaching when, owing to improvement in the manufacture of gas, and the increasing value of the residuals therefrom, the cost to the Company of producing gas will be very much less than it is at the present time?—I do not see how it can be very much less. I hope it will be so; but we are so near the margin of absolute cost, that I do not think there is a chance of a much greater reduction.

A MEMBER OF THE COMMITTEE: Do you suppose coal is likely to go up or down in the next ten years?

Witness: The coalowners expect it to go up. At the time of the coal famine a number of new pits were opened, and the production was so largely increased that it kept the price down; but if there should be a great spurt in the iron trade, coal would in all probability rise very considerably. It depends so much upon the iron trade.

Cross-examination resumed: Iron is now cheaper than I have ever known it. There is a general desire on the part of gas companies to engage in manufacturing their own residuals in the future, and several of them have done so. I may instance the case of The Gaslight and Coke Company, who have erected works at Beckton for the manufacture of residual products. In the manufacture of ammonia they do not get very much more per ton of coal than we do; but taking the last half year, by manufacturing their own tar, they obtained about 50 per cent. more than we did.

Mr. LEDGARD: I do not mean manufacturing residuals for the purpose of sale, but carrying on commercial undertakings in which those residuals are used, as is done now by private enterprise.

Witness: That is altogether a mistake in our Bill. I do not know of any case but one where a gas company has taken powers to purchase residuals belonging to other gas companies.

I do not mean that. Is there not a feeling on the part of many of the gas companies and gas corporations that the time is quickly coming when it will be to their advantage, instead of selling their residuals, to obtain, if possible, parliamentary powers to manufacture them, in competition with the manufacturers of chemicals and other productions which use these residuals?—I say that several have done so already.

A MEMBER OF THE COMMITTEE: I thought you said only one company?

Witness: Only one company has obtained power to purchase residuals from other companies, but several companies have obtained powers for working up their own residuals. The Crystal Palace District Gas Company have no water communication, and it is more to their interest to work up their ammoniacal liquor, and make sulphate of ammonia themselves, than to sell the liquor, owing to the great cost of conveying the bulky material to the ammonia works.

Cross-examination resumed: I am not aware that there is a feeling on the part of the companies, in the immediate future, to engage in commercial undertakings, if Parliament gives them the power. My own view, however, is against it. I think it is quite enough to do the best with our own residuals, and leave these intricate chemical operations to the proper manufacturers.

Mr. LEDGARD: Have you heard it suggested recently that at Leeds they have the expectation of making so much profit out of their residuals as to be able to supply their gas at practically nothing?

Witness: Not by a sane person.

Have you not yourself entertained the idea that the supply of gas to the Metropolis could be furnished at a rate much below what it is now, owing to the increased profit in the manufacture of residuals?—Not very much lower. But I would point out that the only object a gas company might have—or that the Leeds Corporation might have—in working up their residuals is to enable them to reduce the price of gas, and so to serve their customers better. We would not be bothered by working up residuals but for this idea.

Cross-examination continued: The total reserve fund of the South Metropolitan Company in 1876 was a little over £20,000, but when we amalgamated with the Surrey Consumers' Company the fund was increased by about £25,000, making it something over £50,000. We were allowed by the Board of Trade to add the Surrey Consumers' reserve fund to our own reserve fund. At the date of the amalgamation the total reserve fund of the three companies was about £180,000, and since then there has been added about £6000 or £8000 of interest for the year. This £180,000 was owing to the Phoenix Company bringing in a reserve of something like £120,000 which they had accumulated. At present the reserve fund is added to by interest only; it is invested at 3½ or 4 per cent., so that it brings in from £6000 to £7000 a year.

A MEMBER OF THE COMMITTEE: You say it is added to by interest only. Do you mean to say that your earnings amount to exactly the dividends you pay?

Witness: We do not add anything to the reserve fund from our earnings unless we forego the dividend.

Supposing you pay 12 or 12½ per cent., you do not mean to say you earn this exact sum, but you earn either more or less?—We carry forward a balance—we are allowed to do so by Act of Parliament; but our dividend is absolutely restricted by the price at which we sell the gas, and the undivided balance of profit, as it is called, is carried forward from half year to half year. At present this balance is only about £5000.

Mr. LEDGARD: Is there in your Acts of Parliament anything which limits the amount of the undivided profits?

Witness: No; the only limitation is self-interest. We should certainly prefer to reduce the price, and so increase our dividend.

Is there anything to prevent your accumulating a large amount in the way of undivided profits, and then, when it is so accumulated, reducing the price of your gas, and increasing the dividend payable so as to absorb it?—No; but then the public would get the benefit of it. Supposing we accumulated £200,000 of undivided profits, and reduced the price of gas considerably—take it, for instance, that we reduce the price of gas 6d. per 1000 cubic feet—at this reduction we could not earn our proper dividend, but should perhaps be £50,000 or £80,000 short. The public would get the benefit of this £50,000 or £80,000, which would be taken out of the undivided balance, and we should get perhaps one quarter of it.

Cross-examination continued: The South Metropolitan Company have not added anything to their reserve for many years, because the fund was full 15 years ago. I am not quite so conversant with the accounts of the other Companies as with our own; but additions were made by them nearly up to the date of the amalgamations. The Phoenix made their last addition in 1879, amounting to something like £6000 or £7000. They were not under the sliding scale at the time, but were under the Act of 1860, and were allowed to add to the reserve fund out of profits until the fund amounted to 10 per cent. upon their nominal capital. I cannot satisfactorily answer the question what has been the average annual expenditure of capital for the last five years by the three Companies. The South Metropolitan Company had power to raise an additional capital of £250,000 in 1869, and this was all called up within ten years. The Phoenix and Surrey Consumers' Companies did not add to their capital quite in the same ratio, for they had none. They were obliged to make extensions to some extent out of revenue, and this is one thing which accounted for the price of 3s. 9d. per 1000 feet charged in the Surrey Consumers' district. This, however, shows the advantage of amalgamation, because a reduction of price followed. In the first half of the year 1880 there was £37,500 expended out of capital by the amalgamated Company, and in the second half £41,300, making in round numbers £80,000. Next year a great deal more will be expended. I cannot give the figures for 1879, because the Surrey Consumers' Company were amalgamated in the middle of that year. I must protest against the capital expenditure of the Phoenix and Surrey Consumers' Companies before the amalgamation being taken as in any sense giving an accurate idea of what the expenditure will be. They really had no capital to expend. They made their extensions out of the current revenue of the year. The Phoenix Company laid new mains, which they charged to revenue account, and they possibly might have a charge of £50,000 for the repair of works, made up of an innumerable number of items. Under the Bill now before the Committee we sought for power to raise one million nominal capital, which was supposed to produce nearly two millions under the auction clauses. Lord Redesdale would not allow it to be inserted in this way, and it was therefore altered to a million and a half as the total amount to be raised, including the premiums.

The REFEREE: Supposing the premium to be what it has been before, nearly cent. per cent.?

Mr. MICHAEL: Then it would be £750,000 bearing dividend, and £750,000 bearing no dividend. I admit there is a great deal of difficulty in carrying it out, but the Company are made to do it, according to Lord Redesdale, in this way: They want to have, say, a million of money, and they calculate that if they get cent. per cent. it will be sufficient for them to put upon the market half a million of money to raise the million. If it comes to more, then the next issue must be less; if it comes to less, then the next issue must be more; so that they must stop the auction accordingly.

Mr. LEDGARD: Have you made any estimate of your probable capital expenditure when you remove to Greenwich.

Witness: I have made a guess that it will not be less than £150,000 a year, but probably it will be more than this the first year or so. I expect the increase of consumption will go on in compound ratio, and therefore the increase of expenditure will be in compound ratio also.

For how many years do you think the capital you propose to raise will carry you on?—About 12 or 15 years, I should think, or perhaps a little more. We shall try to make it carry us on as long as possible.

You do not want to come to Parliament oftener than you can help?—No; and there is another reason. We do not want to overload the concern with capital, because the more capital there is the higher the price of gas, necessarily.

Do you consider it is advisable, in the interests of the public, that every one should be precluded from inquiring into the management of your affairs for the next 14 or 15 years?—I think that, under the new system, it is not advisable, in the interests of the public, that there should be these expensive inquiries, because it is made to the direct interest of the gas companies to serve the public in the best possible manner. It is our interest in every way to reduce the price of gas. Under the old system the companies had no such inducement to do so, and periodical revision was an absolute necessity for the protection of the public.

Cross-examination continued: If I am to have the management of the spending of the new capital, I think I shall endeavour to eke it out for 15 years, because we are really trying to make our money go as far as possible. As an instance, I may mention that since we have come under the provisions of the auction clauses and the sliding scale we have been building a large gasholder in the Old Kent Road, and are adopting a somewhat novel principle in its construction. This gasholder will be constructed at a cost of less than £9 for every 1000 cubic feet of capacity, whereas the last one we built cost £18 for each 1000 cubic feet of capacity; but by increasing the size and altering the principle of construction we reduce the cost by one-half—viz., £47,000—whereas on the old principle it would have cost £94,000, and therefore we save an expenditure of capital. According to the provisions under which we work the public are protected in every way. There are official gas examiners appointed by the Metropolitan Board of Works to test the gas every day, and send the returns to the Chief Gas Examiner. The public are also protected in the matter of price. It is to our direct interest to be as economical as possible in our expenditure for the management of our works, and also in the expenditure of capital; so that it is a self-acting thing now, which will tend to the benefit of the public if we are left alone. As we get our new works in operation we shall discontinue a portion of the manufacture at the more

crowded stations, but we still intend to keep all our old works in our own hands, and the land too; it would be a fearful sacrifice of money to do away with them. During the present year we shall use 400,000 tons of coal, and I believe in ten years we shall be using 800,000 tons, and at least 400,000 of this will have to be used at the new works. Taking the ordinary ratio of £5 of capital for every ton of coal used, the 400,000 tons of coal that we shall be using ten years hence at the new works would involve an expenditure of two millions of capital, but I hope to manage with less than this. We are now supplying gas outside the metropolitan limit, as defined by the Act of 1860, but under the old Acts of the Company we were allowed to supply in various parishes all round London. By the Act of 1860 our limits were fixed, so far as they were bounded by the districts of other companies. For instance, part of the Crystal Palace Gas Company's district is within the metropolitan area; but, owing to its being already occupied by a gas company, our boundary had to be governed by the boundary of that company. With regard to fixing the standard price, the Phoenix and Surrey Consumers' Companies were very angry about the matter in 1875, and they did not accept the 3s. 9d. They were at the time allowed to go as high as 4s. 6d. without any interference, or 5s. 6d. on application to the Secretary of State, if they could show it was necessary to enable them to pay full dividends, and they therefore said, "We object to being cut down to 3s. 9d. as a limit."

Mr. LEDGARD: Is not this the first time the Metropolitan Board of Works have had an opportunity of considering the effect of the amalgamations?

Witness: Not quite. When the amalgamation was agreed upon between the South Metropolitan and the other Companies, they had, of course, to inform the Board of Trade. An advertisement was inserted in the *Gazette*, and the Metropolitan Board or other parties interested were allowed, or had the right, to make any representation they chose to the Board of Trade, who adjudicated in the matter.

Mr. MICHAEL: Which they did. I appeared there.

Mr. LEDGARD: Was not the real reason that the Metropolitan Board took little or no part in the schemes before the Board of Trade, because they were advised that the Board of Trade had no power to deal with the question of standard price?

Witness: The Board of Trade have no such power. If they had there would most certainly have been no amalgamation.

As a matter of fact, you express yourself that the amalgamation has resulted very favourably to your Company, and also to the Phoenix and Surrey Consumers' Companies, who have benefited enormously by the transaction?—They have increased their dividend. This half year it will be 1½ per cent.

Being limited by their own Act to 10 per cent. in respect of some of their capital, to 7½ per cent. in respect of other portions, and to 5 per cent. on the remainder?—But you do not suppose that the Board of Trade sanctioned their getting 10 per cent. upon a 5 per cent. capital.

Whatever the Board of Trade might have sanctioned, this is the fact, I believe, that they have obtained an increase, upon their respective dividends of 10, 7½, and 5 per cent., of 1½ per cent.—I must answer that in this way: The Board of Trade, having a great objection to numerous classes of capital, said, in regard to the Phoenix, that their 5 per cent. and 7½ per cent. capital was to be converted into an equivalent amount of 10 per cent. stock. For instance, £360,000 7½ per cent. stock was converted into £270,000 10 per cent. stock, and £144,000 5 per cent. stock into £72,000 10 per cent. stock.

Mr. LEDGARD: But this was taken merely as the basis of operations.

Mr. MICHAEL: The Board of Trade had to criticize the whole of the amalgamations in the interests of the Metropolis.

The CHAIRMAN said the story about amalgamation might be very interesting, but he did not see that it was exactly what was then before the Committee.

Mr. MICHAEL: Besides which, it is entirely outside my friend's petition.

Mr. LEDGARD: It is not only not outside our petition, but under the recent Standing Order we are entitled to go into every matter.

Mr. MICHAEL: You are taking up the time of the Committee on a matter that really cannot affect their decision.

The REFEREE asked Mr. Ledgard if he contended that the effect of the new Standing Order was that he was entitled to go into anything which was not mentioned in the petition.

Mr. LEDGARD said his point was that, not having heretofore had an opportunity of considering whether the standard price of 3s. 6d. claimed under the present Bill in respect of the amalgamated Company was right or not, his clients were endeavouring to show that the Company stood in such a favourable position with regard to the cost of manufacture, and the benefits they had derived under the amalgamation, in comparison with the position in which they stood before, that they ought not any longer to retain the initial price of 3s. 6d. If they failed in proving such a change of circumstances as would induce the Committee to alter the standard price, that was another thing; but he was endeavouring to show that the effects of the amalgamations were so unusually favourable to the united Company, that the whole circumstances of the initial price ought to be gone into and considered.

Mr. MICHAEL said if that really were the point, he thought he could set it at rest in a very few words. The two objects with which the Metropolitan Board of Works came before the Committee in 1875, by a Bill which they themselves introduced, were, by means of amalgamation, to secure the whole of the north being served by one company, and the whole of the south by another company. The second point, growing out of this, was that there should be a uniformity of price (urged by the Metropolitan Board of Works, and supported by the Board of Trade) over the whole of the Metropolis, including the whole of these companies, of 3s. 9d. per 1000 cubic feet. If his learned friend said that 3s. 6d. was less favourable to the people whom he represented than 3s. 9d., then the promoters were willing to put 3s. 9d. in the Bill.

Mr. LEDGARD said this was the first time the question had ever been properly raised. Power to amalgamate was given by an Act of Parliament, but the terms of amalgamation and the application of the sliding scale were settled by a scheme before the Board of Trade, when the standard price was taken at 3s. 6d., and there were no means of inquiring into it. Was Parliament to be precluded from inquiring into the question of whether or not a sliding scale which had not been sanctioned by Parliament, but only by the Board of Trade, who had no power to revise it, was a right or a wrong one? His learned friend, Mr. Michael, seemed to be trying to show that Parliament was precluded from going into the matter because a certain standard price had been allowed to another Company.

Witness, in reply to the Committee, said the standard price north of the Thames, all over the area supplied by the Chartered Company, was 3s. 9d. per 1000 feet. The charge for gas last year was 3s. 4d., and the Company were entitled to divide 1½ per cent. The principle of the sliding scale applied to all the Metropolitan Companies except the London Company. The auction clauses were applied generally under the Standing Orders of the House, and many places outside the Metropolis had adopted the sliding scale principle.

A MEMBER OF THE COMMITTEE (to Mr. Ledgard): I do not quite under-

stand one thing. You said the price was fixed by the Board of Trade, but not by Parliament. How have the Board of Trade any power to fix it?

Mr. LEDGARD: What I meant to say was that the standard price had been fixed by Parliament in 1876 in respect of the South Metropolitan Gas Company, who then obtained power to amalgamate with the other two Companies, who had no sliding scale at all by Act of Parliament. They thus, under the scheme, obtained power to apply the sliding scale to those amalgamated Companies.

Witness: The matter went before the Board of Trade, who heard both sides. The Surrey Consumers' Company and the Phoenix Company were told that the amalgamations could be effected upon the conditions set before the Board of Trade. The Board considered it would be advantageous to the public to assent to the amalgamations, and it was upon these terms they assented to them.

Mr. LEDGARD: But it is not the fact that, so far as regards the Phoenix and the Surrey Consumers' Companies, now amalgamated with your Company, this is the first time that Parliament has had an opportunity of inquiring into the question of standard price with regard to the amalgamated Company?

Witness: Yes. We never expected there would be any inquiry into the price.

Cross-examined by Mr. DRYDEN: I suppose I must say there is some nuisance from gas-works, but we have already agreed with the Greenwich Board of Works that we will place the purifying plant, which is what creates the nuisance, at the northern point of the land, farthest from the property of your clients, which we do not propose to take; and a clause to this effect will be inserted in the Bill. I have examined extensively the banks of the river, and I find the proposed site is the best place for gas-works. It will be without prejudice to the neighbourhood, because it is removed as far as possible from the residents. The land in the vicinity is occupied largely by offensive manufactories, such as chemical works, guano works, cement works, and all that sort of thing. It is very flat land, many feet below high-water mark; but there is a high river wall, which protects it from the overflow of the tide. If the Government were not in possession of Plumstead Marshes, it would be a suitable place for gas-works, but it would have this objection—that it would be a very long way from where the gas is wanted; it would also entail a much greater expense for conveying the gas to the consumers, and there would be no market for the coke, which would have to be sold at the lowest rates to contractors, who would take it away in barges. From our Vauxhall works we are obliged to sell a portion of our coke by barge, and we are getting from 3s. to 4s. a ton less when it is sold in this way than for coke sold in the neighbourhood.

[The witness was cross-examined at some length with reference to the land proposed to be taken by the Bill.]

Re-examined by Mr. MICHAEL: By the City of London Gas Act of 1868, which was promoted by the City of London, power was given to amalgamate the Metropolitan Gas Companies; and subsequently a like power was given to the South Metropolitan Company. The Metropolitan Board of Works, whenever they have appeared, have urged upon every subsequent Committee who have sat upon these matters the desirability of amalgamation.

Mr. MICHAEL: Am I right in saying that they advocated an amalgamation of all the companies upon the north, and also an amalgamation of all those on the south of London, with a view of diminishing the price of gas to the consumer?

Witness: Yes; and the recent amalgamations have resulted in great reductions of price, especially in the southern district.

Re-examination continued: Before the auction clauses and sliding scale were introduced, the companies had power to raise capital which, according to the provisions of the Gas-Works Clauses Act of 1847, was limited to a dividend of 10 per cent., with a maximum price. A reserve fund was also authorized, in order to equalize the dividends, or to make up any loss in any subsequent year, and to meet accidents or unforeseen emergencies which might arise. When this reserve fund was filled, we were theoretically bound to reduce the price, but there was no Government Auditor, nor any means whatever for compelling the companies to do so. In addition, we had this advantage, that if by the price of 3s. 6d. we were unable to earn our dividend, the revision clauses authorized the Commissioners to revise the price, and to make it as much higher as the Companies might show to be necessary to enable them to pay their full dividends. In 1874 the Chartered Company proved to the Commissioners that it was necessary they should raise their price from 3s. 9d. to 5s., and this power was granted, but it is now entirely gone. So far as the companies are concerned, and also as regards the interests of the consumers, the amalgamations have proved an unmitigated benefit. We are obliged to supply 16-candle gas over the whole district, while the limit of the other two companies was only 12 candles, although they actually supplied more.

Mr. MICHAEL: It ought to be stated that the object of the Metropolitan Board was to have an equal illuminating power of gas over the whole Metropolis; and of course we acknowledge the desirability of this. With respect to the new capital which it is proposed to raise, supposing the contention of the Metropolitan Board to be accurate, and there were a reduction of the standard price in respect of new capital—which would be an entirely novel thing, and one which has never yet been done—viz., making the new capital which is being raised at another standard price from the old capital—would it eventuate to the benefit of the gas consumers?

Witness: It may sound like a paradox to say so, but it would not eventuate to their benefit. Supposing the new capital to be sold with a standard price of 3s. 6d., it would, at the price now in force, be entitled to a dividend of 12 per cent.—that is to say, the £1,500,000 to be raised would be obtained by selling £750,000 worth of stock at 12 per cent., which I think is fair. The £750,000 capital, at 12 per cent., would entail an annual charge of £90,000; but supposing the standard price in reference to the new capital were reduced from 3s. 6d. to 3s., it would then only be entitled, at our present price, to a dividend of 10½ per cent., and would not therefore realize so high a premium in the market. There is also another view in which it would be detrimental to the consumer to lower the initial price. Suppose, for example, we reduce the price of gas 4d. per 1000 cubic feet—viz., to 2s. 6d.—this would entitle the Shareholders to a further 1 per cent., making the 12 per cent. 13 per cent. Well, 13 per cent. on £750,000—that is, the capital raised at the higher initial price—amounts to £97,500; but an additional 1 per cent. on the capital raised at the 3s. initial price amounts to £98,571; because in the one case the 1 per cent. is calculated on £750,000, and in the other case the 1 per cent. is calculated on £857,000.

I may put it shortly in this way: The larger the amount of capital bearing dividend, the longer you delay the reduction of price to the consumer; whereas the larger the amount of capital in the shape of premium going into the capital, and bearing no dividend, the sooner must come the reduction to the consumer, because in the one case you have a large sum bearing dividend, and in the other a small sum bearing dividend?—Yes.

There is one point I wish the Committee to understand. The old reserve fund, under the Gas-Works Clauses Act, 1847, was strictly limited,

either by that Act, or by provisions in the special Act, and therefore it was money absolutely taken out of the pockets of the consumers, but it was limited in order to ensure a reduction in the price of gas as soon as the amount fixed by Parliament had been obtained?—Yes. If we had earned 11 per cent. in one year, we could pay 10 per cent., and put the remaining 1 per cent. to reserve until it amounted to the stipulated amount.

The moment the reserve fund was full, the earning of the 1 per cent. over the 10 per cent. eventuated in the compulsory reduction of the price of gas?—That was the contemplation of the law, but it was not carried out.

A MEMBER OF THE COMMITTEE: Is it within the power of your Company to add to their capital account by any profits?

Witness: We are supervised by an Auditor appointed by the Board of Trade. Perhaps I may be allowed to make one remark about the amount of capital. The Board of Trade are very anxious that the whole of the London supply of gas should come under these regulations, and I am informed that they have been urging upon the Companies concerned to effect an amalgamation with the London Gas Company. The Chartered Company have made overtures for the purpose of amalgamation; but the London Company have a considerable portion of their supply on the south of the Thames, and the Board of Trade say it is a *sine quâ non* that the Chartered Company shall not cross the river with their 3s. 9d. price. Therefore, if an amalgamation is carried out, we shall have to purchase, at what it may be worth, the London Company's district south of the Thames, and for this purpose a large sum will have to be paid, which would take a portion of the new capital.

Mr. LEDGARD: Why do you mention now for the first time the proposed amalgamation with the London Gas Company?

Witness: It only occurred to me because you were complaining about the large amount of capital. This purchase will be forced upon us if the Chartered Company succeed in effecting the proposed amalgamation.

How much out of your new capital will be applicable towards this object?—Only the value of the district. I may tell you that we shall take very good care that we do not pay more for it than its value; but I have not gone into the question.

By the REFEREE: The Board of Trade have been most anxious to get the whole of the London Companies under one uniform system of regulation. They want the consumers to have the advantage of 16-candle gas, and to have that gas tested for purity, and they also want other restrictions applied in the interests of the public—certainly not in the interests of the companies. They do not object at all to the gas passing across the river; and I think it is an advantage to have communication between the mains of the different companies. For instance, an accident might happen to one company, and it would be advantageous to be able to open the valves and get a supply of gas from a neighbouring company, so as not to put a district in darkness. This is one advantage of amalgamation, that we unite all the works.

Mr. Corbet Woodall, examined by Mr. MICHAEL.

I have been for 25 years engaged in the construction and management of gas-works, and was Chief Engineer to the Phoenix Gas Company before the amalgamation with the South Metropolitan Company. The proportion of rental borne by the Phoenix Company to the present amalgamated Company was just about one-half. The increase of consumption of the Phoenix Company during the last ten years amounted to very nearly 90 per cent. We had three stations—at Vauxhall, Bankside, and Greenwich—all of which were at the waterside. Before the amalgamation we had very nearly reached the limit of our possible manufacturing power. At Vauxhall we were able, in the year preceding the amalgamation, to erect a new retort-house, and at Greenwich there was room for some slight increase also; but these increases were made at so much inconvenience, and so much cost to the Company, that they had determined, before the amalgamation took place, to look elsewhere for a new site. We had been obliged from time to time to pull down old works and reconstruct them in order to meet the demand, which was a very expensive and inconvenient process. In 1864 or 1866 we bought a large portion of land, which is now occupied by the Vauxhall works, and which was very costly indeed, because we had to buy it with the buildings erected upon it. Before the amalgamation took place the Phoenix Company had felt it necessary to look for more room, and they went down the river below Greenwich, where they found a plot of land of some 86 acres, and entered into a provisional contract for its purchase. This site commended itself to us because it was the property of one owner, and consequently, as we thought, it would be more easy to purchase; but it had the disadvantage of being a little nearer to the residential property about East Greenwich than the site proposed by this Bill. Difficulties, however, arose, and the arrangement was not carried out. As to the site now before before the Committee, I say it is in every sense an admirable one for the construction of gas-works. My conviction is that the effect upon the surrounding property will be to materially increase its value, instead of to diminish it. There is nothing to prevent the owners of the adjoining property from erecting gas-works themselves, or selling their land to manufacturers for business purposes. The advantage of having a site on the river side is very considerable; it is much more convenient than dragging a long string of barges up from Blackwall, where the coal ships are now discharged, to those up-river stations. The inconvenience at present is so great that to increase it would be a very serious thing; and therefore, to be able to discharge them away from the traffic round the bridges would be an advantage. The ships would be discharged straight into the works, instead of into barges, and out of the barges into the works, as is the case for the up-river stations, and the saving would certainly not amount to less than £10,000 a year, assuming the work could be done upon the site proposed. Upon the question of capital, I would put it this way: The present capital of the Company is over £2,000,000, and this has been pretty nearly expended in doing their present work. If in ten years the business doubles, then either the extension of the works must be done more economically, or another two millions will be required. I believe, judging especially by the proceedings of the South Metropolitan Company, that the work will be done more economically, and that consequently the sum proposed, which I think amounts to about £1,750,000, is likely to carry them on for ten years, and possibly even a little longer. The capital expended by the Phoenix Company down to the year 1878 was £1,244,000.

The CHAIRMAN: Are you sure you are enabling us to come to a decision by all this?

Mr. MICHAEL: I do not see it has anything to do with the case, but I do not want to keep anything back. My learned friend asked for the information, and here is the Engineer of the Phoenix Company.

Mr. BIDDER said the promoters asked for capital to provide for a certain number of years in advance, for the extension of their district, and the question was how much they required per annum for this purpose, in order that they might judge from the past of what it would be in the future.

Witness: I think a reference to the annual expenditure is a very inconvenient thing, unless you go over a number of years and then strike an average, because in some years a very large extension of plant is

necessary, while in other years you are working up the money that has been spent *en bloc* previously.

Mr. MICHAEL: In the conduct of a gas company, you cannot regulate your capital so that it will meet the requirements of any particular year, and therefore what I venture to call dead capital must, under any circumstances, be from time to time expended. You cannot make half a gas-holder, and you cannot divide a clerk in half?

Witness: Quite so.

Judging from your experience, do you think the amount of money asked is at all excessive, having due regard to the probable wants of the Company for the next 10 or 15 years?—No; I do not.

Supposing it were five millions, is there, under the present law, any possible temptation to a gas company to expend capital unnecessarily?—None whatever. I entirely agree with Mr. Livesey's evidence on this point, and think it is not to the interest either of the company or of the consumer that too much capital should be raised.

Examination continued: Referring to the question of capital, I should say that, while it is not easy to guess at what the expenditure of the Company from year to year either has been or should be, without going back through a number of years and taking the average, it does work out during the past seven or eight years to very nearly £5 per ton of coal, as Mr. Livesey put it; and consequently, in looking to the future, you should provide at some such rate as this, not a sum per annum, but a sum commensurate with the business of the Company. In the first year or so there will be the necessity for spending an excessive portion of capital in the purchase of land or otherwise, so that during this time the expenditure would be at a higher rate per ton of coals than I have stated. I did not give evidence on the South Metropolitan Bill when the price was reduced to 3s. 6d.; but my evidence in 1875, when instructed by my Company, was in opposition to the principle of the sliding scale, our main reason being that we felt satisfied the objections so constantly raised by the Metropolitan Board to the action of the companies was not to the price of gas, but to the amount of dividends received; and, inasmuch as 10 per cent. was constantly pointed out as an excessive dividend, we had no confidence that the Board would be content to see us dividing 12 per cent.

Mr. MICHAEL: Supposing the sliding scale had been adopted at an earlier period—say 1868 instead of 1876—what would then have been the effect upon the dividends of the companies?

Witness: If the sliding scale had been adopted in 1868, the dividends would have gone down, owing to the coal famine which followed almost immediately. It has, however, so happened that both these systems have operated to the advantage of the companies. The revision clauses were passed in 1868 and 1869, and were followed by the sliding scale, and several of the companies applied to the Board of Trade and had their price revised, and were enabled to increase their price so as to save their dividends; but if the sliding scale had been adopted then, the price of gas must have been raised all the same, but the dividend would have gone down. This seems to me to point to this peculiar position, that though I feel satisfied the Metropolitan Board would have been content when the price of gas was going up, because the dividends of the shareholders were going down, they cry out now, though the price of gas is going down, because the dividends of the shareholders are going up.

Is it not eventually clearly to the benefit of the gas consumers, by making it the interest of the gas companies, to use every possible economy, and so reduce the price of gas?—Yes.

Mr. BIDDER (in cross-examination): I am not suggesting that you have any temptation to expend capital improperly, but £1,500,000 is a pretty good amount of capital to ask for at once, is it not?

Witness: It is about the ordinary rule adopted by companies applying to Parliament.

There is, I think, another ordinary rule—not to give companies sufficient capital to keep them a long time out of the control of Parliament?—This was the case, and I think very rightly so before the introduction of the sliding scale.

You know it has been a constant struggle between companies trying to persuade Parliament to give them a large amount of capital, so that they need not apply again for 20 or 30 years, and consumers asking to have it restricted, so that the former shall be bound within a certain number of years to come to Parliament again; the advantage being that when they come to Parliament there is an opportunity for reviewing the position, and if anything has gone wrong in the interval, of putting it right?—That is the purpose of coming by the local authorities.

The South Metropolitan were in Parliament in 1876, and the opportunity was taken to impose upon them the sliding scale?—The Committee in that year, reluctantly as it appeared from their report, fixed the standard price at 3s. 6d., although they regretted they could not fix it at 3s. 9d.

What prevented them fixing it at 3s. 9d.?—The existence of 3s. 6d. already, in the Act of 1869, as the maximum price of the South Metropolitan Company.

The result has shown that the 3s. 6d. standard gives the Company something better than 10 per cent.?—At the time they applied they were supplying at 3s., and it was clearly seen by the Committee that they would immediately receive another 1½ per cent.

At that time the Committee had only the South Metropolitan Company to deal with, and powers were taken in the Bill, if I recollect rightly, for the South Metropolitan to amalgamate with the Phoenix and Surrey Consumers' Companies, but those two Companies were not before Parliament?—Distinct powers to amalgamate with those two Companies were not taken, but general amalgamating powers were given for the south of the Thames.

The amalgamations with the two Companies named were carried out by schemes which were scrutinized by, and received the approval of the Board of Trade?—Yes; the Board of Trade hearing any complaints upon them from the Metropolitan Board of Works.

The Board of Trade considered, and probably rightly so, that they had no power to go into the question of the sliding scale or the alteration of standard?—Not the alteration of the standard.

Therefore, at the time of the amalgamation of the two Companies which had been swallowed up by the South Metropolitan since 1876, there was no jurisdiction or authority, on the part of the Board of Trade or anybody else, to review the circumstances of the amalgamation, and consider how far it ought to affect the standard value of the sliding scale?—No; there was no such power. The Act fixed 3s. 6d. as the price, and gave the Companies liberty to amalgamate at this price.

Do you agree with the evidence given by Mr. Livesey, that, in point of fact, the Phoenix Company, before the amalgamation, being short of capital, executed capital works out of revenue?—I was a little surprised at so very broad a statement. The facts are that we did not increase our capital expenditure in proportion to our increase of business.

Which some people call punishing revenue?—Yes; but I am quite prepared to say that we could go through the capital expenditure of the last five years of the Phoenix Company, and not be at all ashamed of any of the items in it.

Mr. Livesey said, when I asked him what your capital expenditure had been, that it was difficult, if not impossible to say, because you had taken a great part of it out of revenue?—The Official Auditor is averse to a large

extension of capital. I am quite sure that none of the expenditure Mr. Livesey referred to was of a character which the Official Auditor would have objected to.

Can you tell us shortly what your expenditure was for capital purposes per annum?—Per annum I cannot, but the expenditure per ton of coals, and with an increase of, say, 9 per cent. per annum, would be about 5 per cent. per ton of coals.

Cross-examination continued: Drawing the line at two periods, with five years between each, our books show that in 1874 we had expended a capital of £1,057,000, and in 1879, £1,244,000, or an average of about £37,000 a year. If a longer period were taken, it would be found that the amount was larger, because about ten years ago we purchased a very expensive plot of land at Vauxhall. In the case of the Surrey Consumers' Company, the increase was only about £30,000 in the five years; but during the last four years I think it was nothing at all. Apart from the normal extension of business, there will be a special expenditure in providing the new works at Greenwich; but it has not fallen within my province to form an estimate of the cost. There certainly will, however, be £1,000,000 spent by the time the Company have doubled their business.

Mr. BIDDER: That is so far a loss, but a considerable recoupment will result by the sale of the old sites?

Witness: No; the Company say they have no idea of selling the old sites, or of discontinuing the making of gas on the present sites. It is simply an addition, the same as Beckton is, for supplementing the supply of the district.

I understood it was considered that, by going to Greenwich, there would be a saving of 1s. 6d. a ton upon all the coal used, and also that there would be great economies of management; and surely, if such is the case, the Company will not continue to manufacture on the old sites, where it is so much more expensive?—There are other points to be taken as a set-off against this, and Mr. Livesey referred to the sale of coke.

Cross-examination continued: I consider that great economy will result from going to Greenwich, and I put it at about 2d. per 1000 feet upon the gas sold. On a large site like this they would also be able to obtain a greater return from other residual products than coke in the way their Engineer has explained. The question of residual products, however, is one on which it would be very unwise to build absolutely. Mr. Livesey gave some illustrations of the fluctuations in the price of tar. The same thing has taken place in the value of sulphate of ammonia, the price of which very often goes up and down, and this is not a thing to count upon for many years. A discovery of a new deposit of guano, for instance, would materially alter the terms to the gas companies for their ammonia.

Mr. BIDDER: Your price this year is 2s. 10d. per 1000 cubic feet, and you expect to pay 12 per cent. Supposing your standard price were now reduced to 2s. 10d., of course your receipts this year would be the same, and you would obviously have more than sufficient to pay the 10 per cent., because you expect to pay 12 per cent.

Witness: Yes, our expectations being realized.

By the operation of the sliding scale, what dividend could you pay, supposing your initial price were lowered to 2s. 10d.?

The CHAIRMAN: You mean this very year?

Mr. BIDDER: The Committee will understand that the Company start with 3s. 6d. as the standard, and for every penny they come down in the price charged to the consumer, they may add 5s. per cent. to their dividend. As a matter of fact, they are supplying gas at 2s. 10d., and are entitled to 12 per cent., and therefore the question arises, how far down could they go below 2s. 10d., so as to get to the point where the two things meet. (To witness:) You see what I mean?

Witness: I do; you mean, supposing the Company are just able to pay 12 per cent. at 2s. 10d., and their initial price was reduced to 2s. 10d., what would be the fall in dividends at the reduced price.

What dividend would they pay?—They would, of course, only lose the 2 per cent. which they would otherwise have divided.

They would have the 2 per cent. to play with, so to speak?—I am sorry to say I do not know what 1 per cent. on the capital amounts to.

Mr. MICHAEL: About £18,000.

Mr. BIDDER: And 1d. per 1000 feet?

Mr. MICHAEL: £15,000.

Witness: They would be able to divide 10½ per cent., and it would give them a little balance over. They could reduce one penny—because you cannot split up pennies—which would take away £15,000, and add one-quarter per cent., which would cost £4500.

They would then have a considerable surplus?—They would have a surplus of £10,000.

Mr. BIDDER: Have you taken into consideration that a sum of about £17,000 paid in compensations on retirements is going to be removed from your working cost?

Witness: But you cannot take that into consideration, because it was an extra expense last year, when there was a higher price to meet it.

Mr. MICHAEL: You mean that it is already discounted in the 2s. 10d.?

Witness: In the reduction of 2d.

The CHAIRMAN (to Mr. Bidder): Is it your contention that the price should be reduced of the new amount, or of the whole of the stock?

Mr. BIDDER: Of the whole of the stock. I say you cannot separate them. (To witness:) This £17,000 was charged in the compensation for the half year ending June?

Witness: Yes.

And my point is that it will cease to be chargeable, and therefore you have so much additional profit available for dividend purposes in the reduction of price?—I really must take exception to that. It is quite true they have not this to meet; but neither, on the other hand, have they the money wherewith to meet it.

Mr. MICHAEL: Will you explain where it came from?

Witness: The price of gas last year was partly 3s., partly 3s. 4d. per 1000 feet. The lowest price was 3s., and at such price they could afford to do it, but with the object of getting 12 per cent. they have reduced it to 2s. 10d.

And you have also admitted the floating balances out of which the money was taken?—This £17,000 is charged here in revenue account. There was a reserve fund which was brought over by the Phoenix Company and by the Surrey Consumers' Company, which was there to meet these special charges.

Mr. BIDDER: Suppose, instead of 2s. 10d. being taken as the initial price, 3s. is taken, what dividend would you be able to pay now under such circumstances?

Witness: I suppose it would be 11 per cent.

Mr. MICHAEL: It would be 10½ per cent., with a surplus.

In cross-examination by Mr. DRYDEN, witness said he did not consider that gas-works need be a nuisance, and he did not think it possible to occupy in a less objectionable way the land proposed to be taken. He thought too much was made of the possible nuisance of gas-works. He had charge of the gas-works at Vauxhall Bridge for twelve years, and during the whole of the time he could not remember a distinct formal complaint of nuisance from any of the neighbours round about them. The district was closely built upon, and the inconvenience of carrying on

the works for the last few years had been excessive. He thought the proposed works would have a much less detrimental effect upon the neighbourhood than some of the works already existing there.

Mr. MICHAEL read several extracts from the evidence given by Mr. T. H. Farrer, one of the Secretaries to the Board of Trade, during the inquiry of 1876, and also from the report of the Committee, and (in re-examination) asked witness whether it had not been an established principle laid down by the Metropolitan Board of Works that the amalgamations on the south side of the river should be carried out on the same principle as those on the north side.

Witness, in reply, said this was the case.

Mr. LEDGARD contended that it was an inconvenient practice to introduce, on re-examination, a question which had been brought forward by the Board of Trade, without giving him any opportunity of cross-examining upon it.

Mr. MICHAEL said it was the first time that the question of the amalgamation of these Companies had been brought before Parliament; and he was endeavouring to show that the Board of Trade said, in effect, "Beware what you do, or you will force these Companies over to the north, and the price will be 3s. 9d. instead of 3s. 6d."

Mr. LEDGARD said the question had never been before Parliament in this shape at all.

Witness said perhaps he might be allowed to state that the question of amalgamation had been put forward for many years past, and had always been urged as a good thing in the interest of the consumers. The Phoenix Company had very nearly completed an amalgamation with the Chartered Company, which would have brought the price of 3s. 9d. on to the south side of the river, but from sundry circumstances the project fell through. He might also say that the reason given by the Metropolitan Board for favouring two Companies rather than one was that it kept up what was called a "competition of comparison." There were two companies who would always be trying which could do the best, and they would compare the results of one against the results of the other.

Mr. G. W. Stevenson, examined by Mr. MICHAEL.

I have had experience in the conduct of gas undertakings for more than 30 years, and have been very largely engaged in all the Metropolitan contests, generally as a witness for the Metropolitan Board of Works. I know the whole course of legislation from 1860 up to the present time, and also what has taken place with respect to the amalgamation of the three Companies in question. So far as the consumers are concerned, the results of the amalgamations have been in every way advantageous. I am fully acquainted with the working of the auction clauses, and also of the sliding scale, and up to the present time there has not, within my knowledge, been a single case in which a standard price has been fixed and an attempt made to alter it. Fixing a standard price, and giving permission to increase the price with a diminished rate of dividend, and to lower the price with an increasing rate of dividend, was a direct inducement to the Companies to exercise care and economy in the manufacture of gas.

The CHAIRMAN said this matter was thoroughly before the Committee.

Mr. MICHAEL said he had no new matter to introduce, and he might have stopped with his first witness. It was only adding to the weight of the evidence.

The CHAIRMAN: Your first witness was a most excellent one.

Mr. MICHAEL said he was the best witness that ever appeared in those rooms, and he might close his case by stating this. He had a host of witnesses in attendance, but had nothing new to put before the Committee.

The CHAIRMAN said his own opinion was that there was nothing left after Mr. Livesey's evidence, although, of course, there might be a counter case.

Mr. MICHAEL said he was prepared to call several other witnesses, but after the intimation he had received from the Chairman, with respect to Mr. Livesey's evidence, he should not do so.

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Mr. MICHAEL said he was prepared, if it would be any satisfaction to the Committee, to call Mr. Farrer from the Board of Trade to give evidence, and he also believed Mr. Forster would come if it were considered desirable.

Mr. BIDDER said he was sure that neither party would do anything unfair to each other or to the Committee. He did not dispute the fact that additional capital was required; but the particular issues raised before the Committee were the revision of the standard price and the limitation of the proposed capital. He said the promoters asked for too much. His learned friend's contention practically was summed up in saying that this was a bargain and a final arrangement; but he (Mr. Bidder) contended that it was nothing of the kind—that it was not to be a perpetual arrangement; but that it was a tentative arrangement which Parliament was expected to revise from time to time, and alter and amend if necessary.

The CHAIRMAN said he did not think the Committee would have to decide whether it was intended to be final or not. The question rather was, had there been a case of hardship shown sufficient to make a great change?

Mr. MICHAEL said the question he proposed to argue was—there being nothing at all in the Bill as to price—whether there were any circumstances which should induce the Committee to put that in the Bill which was not in, and to alter the standard price.

The CHAIRMAN said that a great many points had been laid before the Committee, but there was no use in going over and over again with an uncontradicted story.

Mr. G. W. Stevenson, recalled, and cross-examined by Mr. BIDDER.

A sliding scale was in operation previously to 1875 at Sheffield and West Ham, but it only worked one way. It gave the companies an increasing dividend with a reducing price up to 10 per cent., but not exceeding 10 per cent.

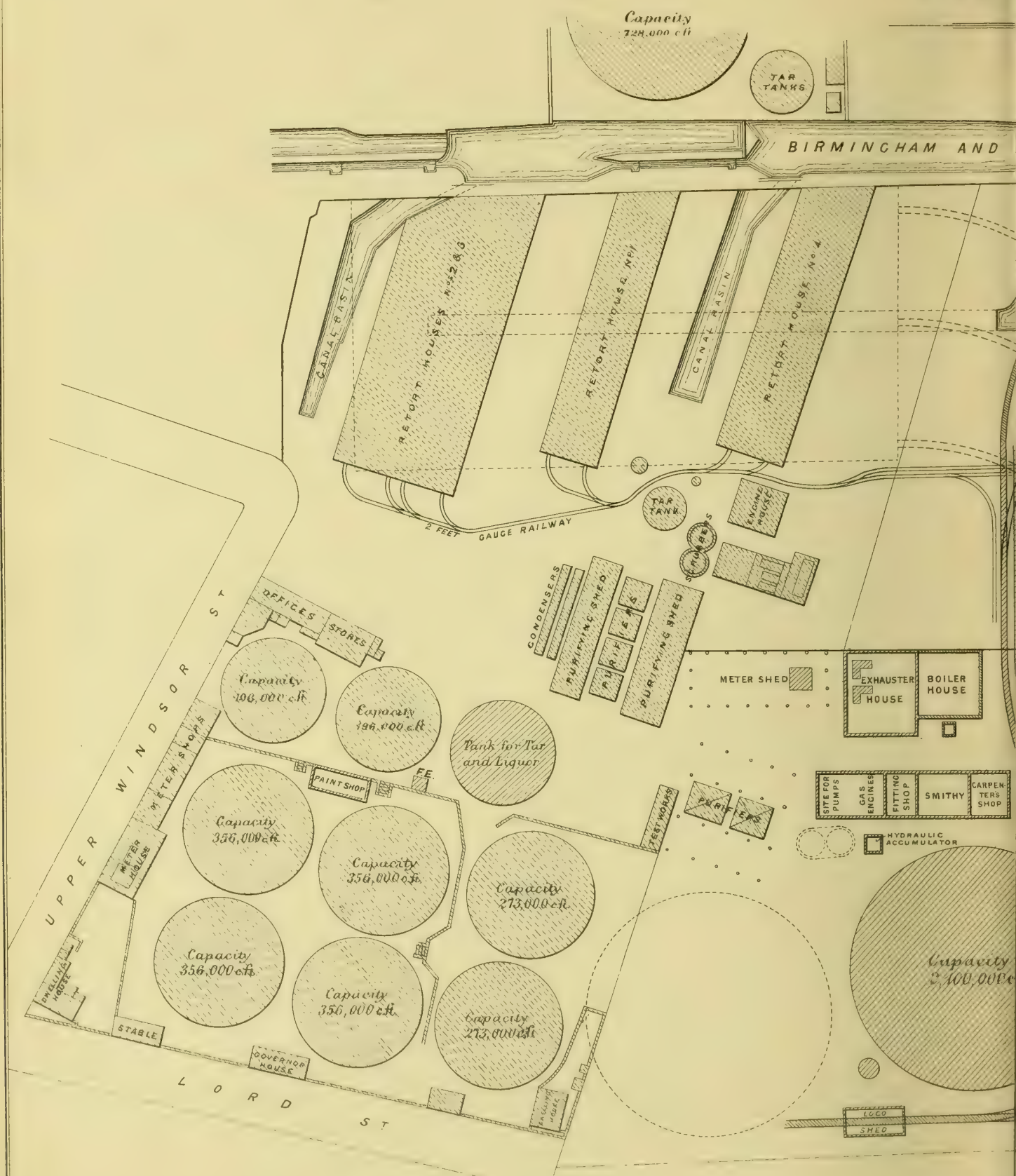
Mr. BIDDER: In 1875, when the sliding scale was considered by Mr. Forster's Committee, was not the question raised as to what would be a fair initial price, to practically secure the companies, under ordinary circumstances, their 10 per cent.?

Witness: I do not know that it was considered with reference to the 10 per cent., but the question of a fair initial price was considered.

You were asked, "Have you considered fully the question of what the proper initial price would be, and whether 3s. 9d. per 1000 cubic feet which we provide as our initial price is sufficient to enable the Company to divide its maximum dividend with due care and management?" and your answer was, "Yes, I think 3s. 9d. for 16 candles in the Metropolis is sufficient to enable the companies with a moderate capital, and in a normal state of things, to divide their maximum dividends; and it is enough to enable the Chartered Company, which has the largest amount of capital of any company, in a normal state of things to divide their 10 per cent. dividend?"—I do not think this was entirely the object, and the next question and answer show it was not.

The Chairman then interposed, "If that were the case, it must be more than enough for some companies;" and your answer was, "A great deal

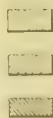
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New plant recently erected

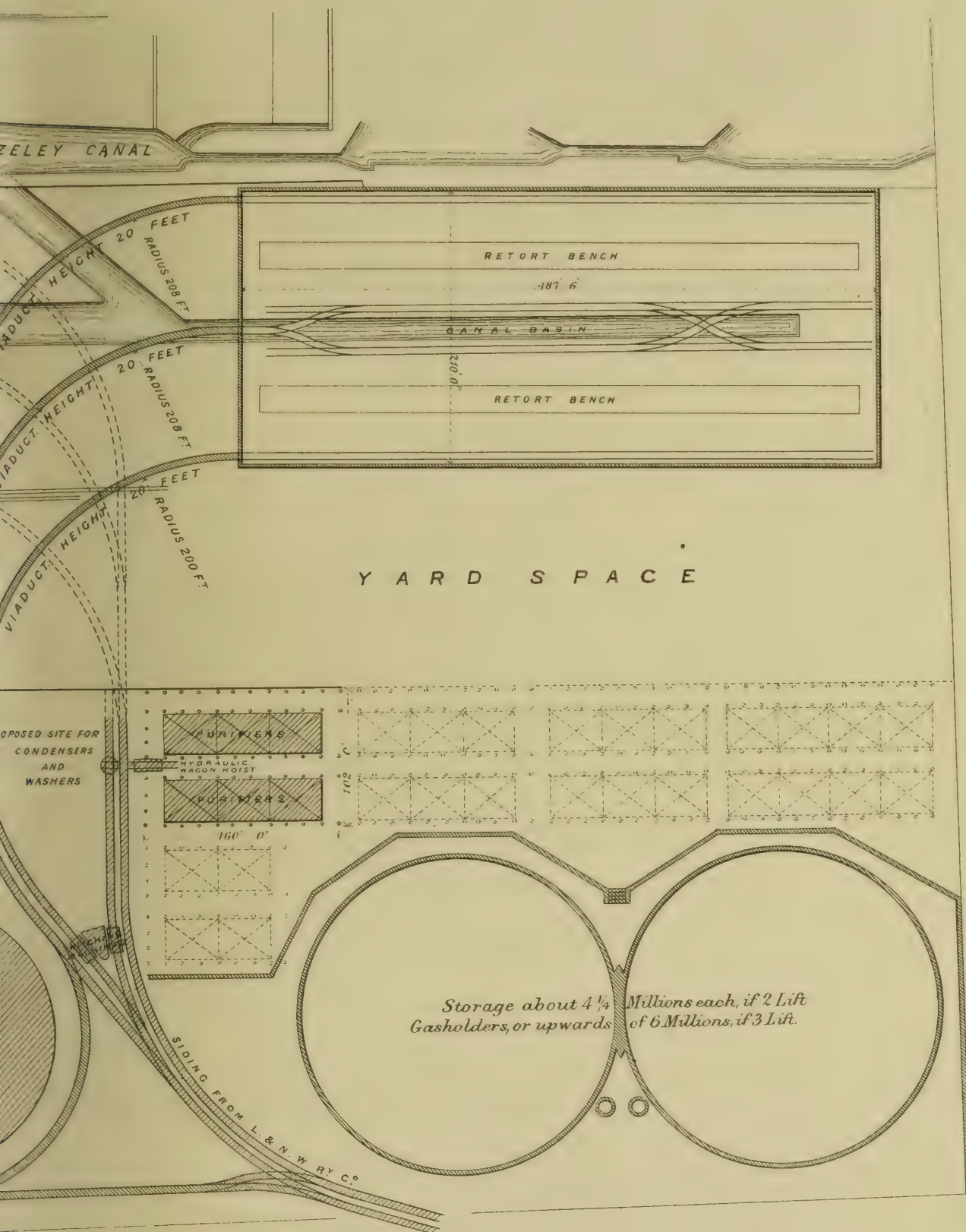
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CHAS. HUNT, M. INST. C. E. ENGINEER.

May, 1881.

more than enough"?—Yes; it was more than enough for the South Metropolitan.

Mr. Cripps then asked, "Considering the quantity of gas that can be sold, and is sold by any company in the Metropolis, and the population they have to supply, do you consider 3s. 9d. quite a sufficient price to enable them all to divide 10 per cent.?" to which you replied, "I do, excepting in abnormal years"?—And I say so still.

By the COMMITTEE: I have seen no reason to change my mind since that time.

Mr. BIDDER: The point I wish to bring out is that the Committee at that time were endeavouring, with such experience as the world then had, to fix a fair price to secure, under ordinary circumstances, that the companies should get their 10 per cent.?—I do not know what was in the minds of the Committee. It was a public Bill, introduced by the Board of Trade, and supported by the Metropolitan Board of Works, in which 3s. 9d. was inserted as the standard price, which might be varied up and down at the instance of the companies.

Was it not, then, a tentative thing, that it was suggested should be fixed, subject to revision a year or two after, when further light came?—I never heard of revision; on the contrary, Mr. Forster, the Chairman of the Committee, distinctly stated that he hoped it would be a final settlement, and Mr. Cripps, on behalf of the Metropolitan Board of Works, expressed the same sentiment.

The CHAIRMAN: But you would not maintain that, supposing the price of coal had been reduced by one-half, or had been doubled by some extraordinary circumstances, that then it would be intended it should be finally settled?

Witness: I quite admit that circumstances might arise which might render a revision of the price a proper thing, and the *raison d'être* of the Metropolitan Board of Works being here is to appear in the interest of the consumers of gas. If it be in the interest of the consumers of gas that the standard price should be reduced, I think it ought to be reduced, but I am prepared to show that the reduction of the standard price of gas would be disadvantageous to the public.

Mr. BIDDER: You do not mean to say that if the price of coal had been reduced one-half, then this initial price was to be finally applicable and to stand?

Witness: Oh, no.

That is very nearly what it amounts to in regard to the price of coal, is it not?—No, indeed.

What was the price of coal in 1874?—This inquiry was in 1875.

You had only the accounts of 1874 before you; they were the last accounts?—We knew the price of coal in 1875, and it was very much higher than it is now. In 1873 and 1874 there was a panic in the coal trade, although there was no famine, and the price went up immensely.

By the COMMITTEE: I say there was no deficiency, but there was a ring formed among the coalowners, and this sent up the price.

Cross-examination resumed: The average price the London companies paid for coal in 1874 was 24s. 6d. per ton, and in 1875 it was 19s. 4d., but this included cannel. There is not so much cannel gas sold now as there was then, and the companies have also a better mode of working. The average price of coal to the London companies in 1880 was 15s. 9d., as against 19s. 4d. per ton.

Mr. BIDDER: Pardon me; the average of 1874 was 24s. 6d.

Witness: I think that it is not fair to take 1874.

You could not, on the 9th of June, 1875, know the average price of coal for the year?—We could not know the average for the year 1875, but we knew the current price of coal.

It was going down, and again in the same way this year it is going down on what it was in 1880. Will you now come back to what I was asking you. I put it to you whether this was not a tentative thing in 1875, and you say it was not; but I will draw your attention to your own evidence—although I admit it does not apply to the whole case—and I think you will see that there was a discussion about the reserve, and you were asked whether, over a smaller or larger period, what you recommended was that there should be an extra price allowed for a certain time until the reserves were filled up?—Yes; that would be beyond 3s. 9d.

Your answer is, "I think 3s. 9d. is quite enough to enable the companies to create a reserve. I am only speaking of the contingency of their not being able with that price to create a reserve, and I think that might be tested very fairly by letting them work under 3s. 9d. for a year or two; and, if it is found, by exercising due care and management, they are not able to create this reserve, then I think they should have a somewhat higher price to enable them to create it?"—I have nothing to retract in that. I thought this was a sufficient price to enable them to earn their maximum dividend, and also to put by a reserve fund; but I suggested that, if it were found not sufficient after trial, they should have something more given to them, in order to enable them to create a reserve fund.

Equally you will agree that if, after several years, it proved to be too much, it should then be revised by Parliament in the interests of the public?—I do not accept that statement.

You mean that this was an arrangement of "heads I win, tails you lose," between the public and the companies. If the 3s. 9d. proved not to be enough, you would alter it; but if it proved to be too good, you would hold to it?—I do not make any such suggestion. You must go back to the history of gas legislation to understand this question.

You say, if it is found that 3s. 9d. is not enough to give the 10 per cent. dividend and to form a reserve, after a few years the companies should look to Parliament to alter it in their favour; and surely it follows that if after a few years it proves to be too much, Parliament should be equally asked to alter it in the favour of the consumers?—No; if it proves enough, the 3s. 9d. should stand.

It has proved a great deal more than enough?—If it proves more than enough is a question; 3s. 6d. has proved more than enough in the case of the South Metropolitan Company, because it gives them 10 per cent. and money to put by for a reserve, but that is no reason why the 3s. 6d. should be reduced.

In 1876 the South Metropolitan Bill was before Parliament, and the question was raised whether 3s. 9d. had been properly fixed in the previous session?—Was it? The South Metropolitan Company asked for 3s. 9d.

They asked that the 3s. 9d., which had been the figure fixed by Mr. Forster's Committee, might be introduced into their Bill; but they were opposed by the Vestries, and with the further light which twelve months had thrown upon the subject, the Committee said, "We see our way to go down to 3s. 6d."?—I do not think that was the case. The reason for fixing 3s. 6d. as the standard price was distinctly stated in the report of the Committee to be that the South Metropolitan Company, in their Act of 1869, had had 3s. 6d. fixed as their maximum price, and the Committee could not give a higher standard than the maximum.

Coming to the result of the experience of the intervening time from 1876 till now, I suppose you agree that the various amalgamations which have been effected have produced considerable economy?—Some economy, but not very great.

Can you form an estimate of how many pence—2d., 3d., or 4d.—of economy per 1000 feet has resulted from these amalgamations?

Mr. MICHAEL: The economy resulting has been 11d. in the one case, and 6d. in the other.

Mr. BIDDER: An average, I may say, of between 7d. and 8d.

Mr. MICHAEL: You cannot take that, because there must be an average of averages, on account of the varying conditions.

Mr. BIDDER: At the present time the initial price suffices to give the Company fully 12 per cent., and I suppose as their business extends the economy of working on a greater scale will reduce the cost of gas to some little extent?

Witness: They are sure to get a higher dividend in course of time, by the mere growth of the undertaking, and by improvements in gas manufacture.

Then, again, the improved arrangements of the new works which they contemplate at Greenwich, and the chance of getting coal 1s. 6d. per ton cheaper, will to a certain extent lessen the cost of gas?—Perhaps a little. I think you may fairly set the 1s. 6d. per ton saved on the coal against the lessened price you can get for the coke.

Re-examined by Mr. MICHAEL: I cannot conceive that Mr. Forster's Committee were blind to the fact that the South Metropolitan Company could, if they were able to earn it, immediately divide another 1½ per cent., the standard price being 3s. 6d., and the Company at the time selling gas at 3s. The object of passing the sliding scale was that there should be such an incentive to economy as to enable the price to be lowered from time to time, and also to give an additional benefit to the Company. This has already eventuated in a reduction of 2d. so far as the South Metropolitan consumers are concerned, while in other portions of the district 11d. and 6d. have been respectively gained by the gas consumers through the amalgamations. The larger the amount of capital invested in a concern which does not bear any dividend or interest, the cheaper the rate at which the commodity can be sold. If a man could obtain all his capital for nothing, he could sell his goods at a very much less rate than if he had to work with borrowed capital. If this were not so, the operation of the auction clauses would be useless in the interest of the consumers. The great benefit—although it may appear to be a paradox—is that, the larger the amount of dividend that is earned, there is a double action in reducing the price of gas—first, a direct action, because a greater dividend cannot be obtained without reducing the price of gas; and, secondly, there is a larger amount of capital not bearing any dividend thrown into the ordinary capital of the company. By means of the auction clauses and the introduction of premiums into the capital of the company, the consumers and company really became partners in the undertaking, and the consumers get the greater advantage of the two. It also happens that the more the gas company improves, the larger must be the proportion of the non-dividend bearing capital to the proportion of capital which is dividend bearing; so that, in every view of the case, benefit is continually accruing to the gas consumer; but if the standard price were reduced, the premiums upon the shares offered to the public would be immediately reduced also.

[At the request of the Referee, witness handed in a table showing the standard price per 1000 cubic feet which had been fixed in 50 different instances. With reference to one case—that of Plymouth—he explained that the Company for a great number of years divided only a portion of their authorized dividend, and applied about 4 or 5 per cent. of their dividend to the extension of their works, in this way keeping down their capital; and the South Metropolitan Company had done precisely the same thing.]

Mr. LEDGARD said that unless the Committee were prepared to go into the conditions under which the whole of these instances of initial price were fixed—which, he admitted, would be an endless inquiry—he contended they had no value whatever.

The CHAIRMAN: They have a general value.

Mr. MICHAEL said he did not base anything upon them, and should not make a single observation upon the matter.

Mr. George Ayscough Wilkinson, examined by Mr. MICHAEL, said he was a surveyor, auctioneer, and land valuer, of very considerable experience, and was well acquainted with the portion of the land proposed to be taken by the South Metropolitan Company for the construction of their new works. A great number of persons were owners of this property, and all had given their assent to the purchase excepting Mrs. Fryer. Amongst others he might mention Mr. Angerstein, and the authorities of Morden College, who were very largely interested in the land outside the boundary proposed to be taken.

Mr. MICHAEL said this was the case on behalf of the promoters of the Bill. He might, however, again state that Mr. Farrer, of the Board of Trade, who represented the department in the inquiry before Mr. Forster's Committee of 1875 with respect to fixing the initial price and the general gas legislation for the Metropolis, would attend the Committee, if they desired to examine him upon the subject.

The CHAIRMAN said the Committee did not think it was necessary to trouble this gentleman to attend.

Mr. BIDDER, in addressing the Committee on behalf of the Metropolitan Board of Works, said that although he did not intend to call any witnesses, yet the question involved was undoubtedly one of very great importance. It had been the invariable practice, when gas and water companies applied for further powers and additional capital, that Parliament had a right to revise and consider their position; and those who were interested, as representing the public, had a right to discuss the question. He could quote statute after statute with regard to these very companies, but he had only to take the Act of 1876 to show that the issue of further capital by the South Metropolitan Company was one of the questions placed before the Committee, subject to an inquiry before the Board of Trade, at which inquiry Parliament had said his clients should have the right to intervene, and discuss whether the issue of capital was necessary. The Act of 1876 recited that when the Company had raised by shares and stock, and by borrowing, or by the issue of debenture stock, the sum of £250,000, the Company should, previous to raising any further capital, prove to the Board of Trade, on the report of some impartial person, that the sum proposed to be raised was necessary for the purposes of the Company during the three years then next following, and the President of the Board should sign a certificate to this effect. The first question, therefore, was why the Company had quietly given the go-by—in the enormous capital power they now sought—to the restrictions of the Act of 1876?

Mr. MICHAEL said because it was unnecessary; but, if it was wished, the promoters were perfectly willing to put in similar requirements, although they were totally valueless.

Mr. BIDDER said the Metropolitan Board of Works considered they were very important. There was one other clause with reference to capital which he should propose, in order that legislation now might be uniform with that of 1876. It was clause 11 of the Act of 1876, the substantial part of which was that, for every £50,000 raised by share capital, £37,000 (that was, three-fourths) should be raised by borrowing powers. The reason for this was obvious—viz., that the Company being well established and in the best credit, and being able to borrow money probably at very little over 4 per cent., it was to the interest of the public that further

capital should be raised as cheaply as possible. His learned friend said he had no objection to this.

Mr. MICHAEL said his object was the interest of the gas consumers as much as that of the Company, and therefore the Committee might insert whatever amount of borrowing powers they chose, even up to the amount of the new capital to be raised. He was quite willing that power should be taken that, instead of £1,500,000, the share capital should be limited to £1,000,000, and the other £1,000,000 raised by borrowing.

The REFEREE: Only £500,000.

Mr. MICHAEL said it was £1,000,000. The Company were to have borrowing powers to make up the total money to be raised in capital and borrowing powers to £1,500,000 of capital and £500,000 of borrowing powers; but he was perfectly willing to agree that when the Company raised any sum of money they should raise an equal amount by borrowing; and instead of £37,000 and £50,000 he would give more than his learned friend asked.

Mr. BIDDER said it appeared that for the difference between £37,500 and £50,000 it was not worth altering, or deviating from the Act of 1876.

Mr. MICHAEL said he assented to this.

Mr. BIDDER said that, with reference to the capital, all that remained for him to discuss was the question of the amount. His learned friend asked that power should be given to raise £1,500,000 by shares.

The CHAIRMAN: It is £1,500,000 by shares and £500,000 by borrowing.

Mr. BIDDER said that altogether it amounted to £2,000,000, and he suggested that it was a very great deal more than was necessary, or than ought to be given all at once. There was a very well recognized reason why provision should not be made for so many years, because it was desirable that all companies should, at the end of ten or twelve years, apply to Parliament; but, if they were given an enormous capital, it would enable them to keep out of Parliament for perhaps a quarter of a century, during which time the most monstrous abuses might have grown up in the finances. Of course there was the normal extension of works going on year by year—the permanent annual expenditure of capital, owing to the growth of the district—but in this particular case they were told there was a certain special expenditure owing to the transfer of some works to Greenwich. The normal annual expenditure of the Company, as near as it could be made out from the evidence of Mr. Livesey and Mr. Woodall, was under £70,000. It was not a matter in which one wished to draw the line too hard, and therefore he (Mr. Bidder) said take it at £75,000 a year as being about the average; and if the Committee provided for seven or eight years ahead, they would give them as much as they ought to have at the present time. When this capital was exhausted it would be time for the Company to apply to Parliament again to show that they were managing matters properly between themselves and the public. Therefore he suggested that eight years at £75,000 a year, which was £600,000, was what they ought to require for their normal expenditure. There was also the exceptional expenditure, but they had made no estimate of this, and were not in a position to say what it would be. Mr. Livesey did not mention any figures at all, and Mr. Woodall said he had not made any estimate, but thought it would be a million. The difficulty, therefore, was that they were really left in the dark in the matter. No doubt the Company contemplated spending a considerable sum of money; but it might be observed that they still had unexhausted capital powers, in addition to those asked for at present, and which Mr. Livesey said would enable them to raise practically £600,000.

A MEMBER OF THE COMMITTEE: £600,000 in money and £400,000 in premiums.

Mr. BIDDER said he did not wish to misrepresent the figures, but the Company had practically unexhausted capital powers, under the Act of 1876, sufficient to carry them on and provide for their ordinary capital expenditure for eight years to come; therefore, under these circumstances, all they ought to have extra capital for was to provide for their exceptional expenditure, but the Committee were left very much in the dark as to what this was. The largest figure was that given by Mr. Woodall, who said he thought they probably might ultimately spend £1,000,000. Give them, however, £500,000 of share capital and corresponding borrowing powers, which would amount to a total of £875,000 to be spent in works, of which very little was known, and he (Mr. Bidder) thought this was as far as Parliament ought to go, and this was his proposal to the Committee as regarded the capital. The next question was as to the revision of the initial price, and he thought his learned friend had fairly given up the contention that there had been a bargain which could under no circumstances be departed from. Mr. Stevenson had admitted that under certain circumstances the initial price ought to be revised, and such circumstances were manifestly existing at the present time. Until the year 1875 the understanding was that a shareholder was never to get more than 10 per cent. for his money, under any circumstances; and the Gas-Works Clauses Act, 1847, provided that as soon as a company made more than was sufficient to pay 10 per cent., and the reserve fund had been made up, the consumers could take the matter to Quarter Sessions and insist upon a reduction in price. There were disadvantages in this system, because the temptations sometimes proved too strong, when the 10 per cent. dividend had been made up, to find ways and means of getting rid of the surplus, other than by reducing the price to the consumer. He did not mean to say there was robbery, or anything of that kind; but engine-houses, and works of the most magnificent character, with the most wonderful ornamental stonework, were erected, and all possible ways were discovered of expending the surplus money. Somebody, however—and a very clever man—thought of the sliding scale; and in 1875 the matter was discussed before Mr. Forster's Committee. The principle of the sliding scale was to provide security to the companies under ordinary circumstances, with fair management and economy, for their 10 per cent. dividend, and at the same time to do away with the temptation to squander surplus revenue—making the companies' interest coincide with that of the consumers. There was no intention in 1875 to give the companies 12 per cent., or a higher maximum than they had before, because there was no reason for it. The obvious intention of the sliding scale was to fix an initial price which, under ordinary circumstances, would secure to the companies 10 per cent. In 1876 the South Metropolitan Company applied for their Act, and their contention was that Mr. Forster's Committee in 1875 had decided that 3s. 9d. per 1000 feet was to be a final settlement of the whole thing; and therefore 3s. 9d. should be inserted in their Bill, and thus settle the question. The Metropolitan Board, it was true, in the previous year, when they were legislating generally for the Metropolis, looking at the question generally, thought 3s. 9d. was fair, and would be the right figure to serve the end they had in view, and having done this they did not interfere in the contest in 1876; but then came the Vestries, who said, "We, as representing the consumers who are interested in this question in the South Metropolitan district, tell the Committee that, though 3s. 9d. may be a right thing for the Metropolis generally, it is not a right thing in the case of this Company. They are so situated, and the cost of gas in their case, and the amount of capital they have had to expend, is so moderate, and they have managed their works so well, that 3s. 9d. is too much, and 3s. 3d. is the right initial price to fix." On the other hand, the contention was that 3s. 9d. was the final sum fixed, but the Committee did not think so—and

they showed they did not think so—by fixing 3s. 6d. as a figure that would be likely to attain the end in view. At that time (in 1876) the Committee were legislating for the South Metropolitan Company only, not the Company now in Parliament.

Mr. MICHAEL said the Act expressly provided for the amalgamation.

Mr. BIDDER said he was aware that power was taken generally to amalgamate with other companies. It was known that the amalgamations would be very advantageous to the public as well as to the companies—it was an argument that had been used over and over again; but what reduction of management would actually effect it was utterly impossible for the Committee to know anything about. The present was the first opportunity Parliament had ever had of dealing with the united Company, and acquiring a knowledge of their finances and the effect of amalgamation in reducing their expenditure, and it was the duty of the Committee to consider the question. He did not wish to approach the subject in any cheese-paring attitude, or to endeavour to deprive the Company of the fair results of economy and good management; but he did say that to accede to their suggestion to treat the initial price as a thing that was fixed, and not to be touched, would be to do exactly contrary to what Parliament intended. The evidence showed that the working of the sliding scale—resulting from the simple fact of amalgamation, which was quite apart from good management—had resulted in a saving of 6d. per 1000 feet in the case of one Company, and 11d. per 1000 feet in the case of the other; and, if he recollected rightly, 1d. per 1000 feet was £15,000 a year. Their present dividend was £18,000 a year, and therefore he might say that unity of management had resulted in a saving equal to somewhere about 5 or 6 per cent. on the dividends of the year.

Mr. MICHAEL: How can that be? You must multiply by four.

Mr. BIDDER said he did not mean to say it enabled the Company to take another 5 or 6 per cent., because the operation of the sliding scale came in, and the question doubtless became complicated by this. They could not take all the 6 per cent. of dividend, although it was saved; for they must give part of it to the public. The saving, however, would result in their being entitled to divide a fourth part, which would be about 1½ per cent. of dividend. The state of things at present was that, instead of having an initial price and a sliding scale which gave them in ordinary times 10 per cent., the Company were enabled, through the working of the sliding scale, with a reduced cost of management and so on, to pay a minimum dividend, under ordinary circumstances, of 12 per cent., and this dividend would be continually increasing in the future. This, however, was not what Parliament meant. If the Committee said, "We will not touch the initial price," they were, in effect, saying, "We will make you a present of 2 per cent. dividend in perpetuity," because this was what it came to. He (Mr. Bidder) therefore suggested that it became their duty, now that Parliament for the first time had the opportunity, to make such an alteration in the standard price as would maintain the 10 per cent. dividend, subject to any fluctuations which might arise. This, however, was not all, because Mr. Stevenson said that the 12 per cent. would grow with the growth of business ordinarily; and this gentleman also admitted that the move to Greenwich would produce a great economy, because there would be a reduction in the price of coals of 1s. 6d. per ton, which worked out to something like 2d. per 1000 feet of gas. When, therefore, the Company were asking Parliament to give them additional capital powers, and power for taking lands and erecting works, in order that they might be enabled to carry on their business at a reduced cost, was it not a proper time for the representatives of the public to say, "Make a proper and corresponding alteration of the initial price?" The Committee might safely fix 3s. as the standard, which, at the present time, with their present finances, would give them 10½ per cent., and leave a surplus. This amount was based upon the Company's own figures, and their own admission. It was more than the maximum Parliament had formerly limited them to; and in addition there was the probability—or the certainty, as Mr. Stevenson said—that there would be a further growth as time went on. Curiously enough, and it was worth noticing, it was the very figure the Company were selling gas at before the sliding scale came into operation. In conclusion, the learned Counsel asked the Committee to limit the capital to £500,000, with corresponding borrowing powers; and to fix the initial price at the sum he had named—viz., 3s.

Mr. DRYDEN having shortly addressed the Committee on behalf of Mrs Fryer and Sir Henry Barron,

The committee-room was cleared. After some time, the Counsel and parties were again called in.

The CHAIRMAN said the preamble of the Bill was proved, and the Committee had determined not to reduce the standard price. They were rather disposed to reduce the capital and borrowing powers, but would be glad to hear what the learned Counsel had to say upon the subject.

Mr. MICHAEL said he was entirely in the hands of the Committee. It was so strictly in the interest of the Company only to expend every penny of capital where there was likely to be a return for it, that it made no difference whatever whether one million or two millions was inserted. If the Committee thought, from the past behaviour of the Company, that they were not entitled to be trusted with the power they sought, let them reduce the capital; but if they thought the Company were entitled to confidence, then they said the sum asked for was required in order to carry out their operations properly, and should be granted.

The CHAIRMAN: We have had an assertion that the whole of this money is wanted, though you have not laid any estimates before us; but, as far as we can see, the highest guesswork made has been a million for the new works; and then you will have very considerable borrowing powers, besides the £600,000 in hand. It would seem from what we have heard that this will be almost enough to carry you on for a considerable time.

Mr. MICHAEL: Will it meet your view, by way of dividing the difference between us and the Metropolitan Board of Works, to reduce the capital to a million and a half, distributed in the way I have agreed with my learned friend, Mr. Bidder.

The CHAIRMAN: It would suit the views of the Committee exactly.

Mr. MICHAEL: Then I assent to it at once on behalf of the Company. It will be taking half a million off what we asked for.

A MEMBER OF THE COMMITTEE: I do not know by what proceeding you will do that.

Mr. MICHAEL: I propose that we should have power to raise, in the way of capital, including premiums, £900,000, and £600,000 by borrowing, making a total of £1,500,000, thus carrying out the wishes of the Committee.

The REFEREE said he had a doubt about the advantage of the borrowing powers. Were they increased?

Mr. MICHAEL said that when he asked for borrowing powers of half a million, it was merely following the ordinary course of taking a fourth of the capital; but, if it was the view of the Metropolitan Board that, in the interest of the gas consumers, the borrowing powers should be increased in order to raise the money at the lowest possible rate, he was willing to concede this.

The REFEREE: I see what you mean, but it is very questionable.

Mr. MICHAEL: The only difficulty is to see that you do not take so large an amount of borrowing power as that the lender has not sufficient security for the money lent; but seeing that we shall have a large

security, in the interest of the Company, I extend the borrowing powers, and put £600,000 as against £900,000 capital, which will be represented in money.

The CHAIRMAN said the Committee would accept this proposition, if it were agreed to on both sides.

Mr. DRYDEN proposed a clause to the effect that in assessing the compensation to be paid to Mrs. Fryer and Sir Henry Barron, allowance should be made for any deterioration in value of other lands belonging to the same parties, arising from the carrying on of the operations of the Company.

After a few remarks from Mr. MICHAEL, the Committee deliberated.

The CHAIRMAN said the Committee did not agree to the clause.

The preamble, as amended, was agreed to.

The clauses were read and, with amendments, agreed to, and

The Chairman was then directed to report the Bill, as amended, to the House.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.

At last Friday's Meeting of the Board, the following report of the Parliamentary Committee, in reference to the action of the Board with regard to the Bill of the South Metropolitan Gas Company—which, as will be seen from the report in another column, passed the House of Commons' Committee on the 20th inst.—was presented:—

Your Committee have to report, with reference to the South Metropolitan Gas Company's Bill, against which the Board petitioned the House of Commons with a view to a reduction of the initial price of 3s. 6d. per 1000 feet fixed by the Company's Act of 1876, that the Select Committee, after hearing the Company's Counsel and witnesses in support of the Bill, and Counsel for the Board in favour of a reduction of the initial price, decided that no alteration of the initial price should be made. The Company, by the Bill as at first introduced, sought power to create additional share capital to the amount of one million, which when disposed of by public auction to the highest bidders would have produced to the Company a much larger amount. The Company having been required to name in the Bill the actual amount of money to be raised, and not the nominal amount of the new stock, proposed to raise by the issue of stock or share capital a sum not exceeding £900,000, and in addition thereto to raise a sum equal to three-fourths of that amount by borrowing; and this proposal was approved by the Select Committee of the House of Commons. It appears to your Committee that the amount which by the Bill, as it stands, the Company would be authorized to raise is too large, and that the Board should, by petition to the House of Lords, represent the expediency of reducing the amount. Your Committee do not consider it desirable to raise again at the present time the question of the initial price, but they recommend that a petition be presented to the House of Lords asking for a reduction of the amount of capital authorized by the Bill as passed by the Select Committee of the House of Commons.

Mr. SELWAY moved the adoption of the report.

Mr. ROGERS thought the Committee should again be empowered to raise the question of initial price, and moved as an amendment the omission of that part of the recommendation after the word "Lords."

Mr. RICHARDSON, who seconded the amendment, said the idea of many members was that in 1876 a contract was made between Parliament and the South Metropolitan Gas Company. It was quite true that there was a contract, and he should be very unwilling to attempt to break the contract; but it was made when the South Metropolitan Company was one Company with a capital of £350,000, having, comparatively speaking, a very small area. Since that time it had amalgamated with a Company about three times its size—the Phoenix—and also with the Surrey Consumers' Company. The capital was now close upon two millions and a half, and they asked in the Bill for two and a half millions more. No one could pretend that there was any contract made with the Phoenix or with the Surrey Consumers' Company. The South Metropolitan Company now supplied a very large area, and the Board were bound to do what they could in the interests of the consumers. He hoped the matter would be allowed to go back to the Committee, with authority to act upon their own judgment in regard to the question of initial price.

Mr. FOWLER supported the amendment.

Mr. RUNTZ alluded to the circumstances under which the sliding scale was embodied in the more recent Acts relating to the Metropolitan Gas Companies, dwelling particularly upon the fact that ever since it became law the price of gas had been going down. It had made economy the great object of all gas companies, and, in consequence, gas was never cheaper than at the present time. The initial price in South London was already 3d. per 1000 feet lower than in North London. The two Companies who had amalgamated with the South Metropolitan Company might have raised their price to 4s. 6d., and still have paid a 10 per cent. dividend. The public had already benefited to a very considerable extent by the operation of the sliding scale, and it would be a great breach of faith with the investing public if the Board now attempted to obtain a reduction in the initial price.

Mr. LLOYD held that not only would the Board be justified, under the altered conditions of the gas supply so far as this part of London was concerned, in seeking a reduction in the initial price, but that it was the duty of the Board, in the interests of the public, to make this effort.

Mr. FREEMAN said the question was whether, after the proceedings of 1876, it would be prudent for the Board again to raise the question of initial price at so early a date. He thought not, but that their efforts should rather be directed to cutting down the amount of capital the Company would be able to raise, so that it would not be 15 or 20 years before the Company would have occasion to apply to Parliament again.

The amendment was carried by 17 votes to 3.

ELECTRIC LIGHTING IN THE METROPOLIS.

LAMBETH VESTRY.

At the Meeting of this Vestry on Thursday, the 19th inst., the following report was presented from the Lighting Committee:—

Your Committee desire to report what information they have obtained relative to lighting the public roads by electricity.

When the electric light had been practically applied in London to the lamps on the Thames Embankment, an application was made on the 7th of January last to the Société Générale d'Eclairage Electrique for an estimate for lighting on their system the Waterloo Road, from the Bridge to the South-Western Railway Station. The Company replied that they were not in a position to entertain the matter, and therefore declined.

Soon after this the Anglo-American Company (known as the Brush system) became localized in the parish, and entered into a contract with the City of London for an experimental lighting of a portion of the City. Inquiry was made, and the Assistant-Secretary intimated that the Company would supply the Vestry of Lambeth on the same terms as they supply the Corporation of the City of London, as soon as a tender is required for that portion of the main road from Westminster Bridge to the "Horns" Tavern, Kennington. A tender has since been asked for, but up to the present moment none has been received. Since these inquiries have been made by your Committee, it is well known that the lights supplied by this Company have been out, owing to the breaking down of the cable employed to transmit the current from the machines to the lamps.

The "Siemens" lighting in the City of London up to the present time appears to be a success, but a very expensive one. The Chairman of your Committee has had an interview with Mr. Siemens, who furnished him with an estimate of cost for lighting the road from Westminster Bridge to Kennington Park. The outlay for plant in the first place would be about £4000, and secondly, for the production of the required electrical light,

about £1694 per annum. The present lighting by gas of this line of road, including the four large standard lamps, is estimated to cost from £450 to £500 per annum.

Anticipating that the simplification and improvements in electric lighting will be developed by the experiments now being made, your Committee feel that it will be best not to take any action in the matter for the present, more especially taking into consideration that the precept issued for the year's expenses of lighting would not bear any considerable increase.

Your Committee are very anxious at all times to give a fair trial to any new system of improvement for public lighting, and Lambeth has the credit of being the first parish of the Metropolis that adopted the large Argand standard lamps that have so much improved street lighting.

Mr. SMITH stated since the above report was printed the Committee had received a letter from the Brush Company, who said that they were not prepared to enter into a contract to light the Kennington Road from Westminster Bridge to the "Horns." The Company had, however, the question of street lighting under consideration, and hoped to arrive at a definite conclusion on the subject before long. The Committee had, he (Mr. Smith) added, done everything in their power to further any improvement, such as the introduction of the electric light; but the cost was found to be so heavy that they did not think the time had arrived when they could recommend such a proposal to the Vestry.

Mr. FOWLER thought the Vestry would be pleased with the report just submitted, but he was rather surprised to find that the Committee had gone so far as to ask for tenders, because he did not understand the Vestry gave them the power to do so.

Mr. TAYLOR, jun., thought the Vestry might well wait and ascertain the result of the electric lighting experiments in the City. What he wanted was for the Committee to take into consideration the present bad system of gas lighting, and try some new kind of burner. It would be some years before the electric light could be adopted over the whole parish.

Mr. BENNETT said the Committee were doing the best they could in the matter of gas. They were trying new burners, and it must be understood that the large burners were very costly. If they adopted the best burner that could at present be obtained a better and cheaper one would perhaps come out next week.

Mr. SMITH, replying to the various speakers, said the Committee were very desirous of trying all new burners and lanterns. Some improved two-light lanterns, by Mr. Sugg, had been recently put up, and if they were found to answer would be adopted with the permission of the Vestry.

The report was agreed to.

PRESENTATION OF A TESTIMONIAL TO MR. ROBERT JONES.

It will be remembered that at the half-yearly meeting of the Commercial Gas Company in October last an announcement was made that the Company's Chief Engineer (Mr. R. Jones) had expressed his intention of retiring from the service; also that this intention was carried out early in the present year. On Mr. Jones's proposed retirement becoming known, it was determined by the *employés* and trade connections of the Company to present him with a testimonial, as a mark of the esteem in which he had been held by those with whom he had been associated in business during the past 27 years. The presentation took place on Friday evening last, and the occasion was signalized by a dinner at the Guildhall Tavern, Gresham Street, at which upwards of 150 guests assisted, the chair being occupied by Mr. THOMPSON NASH—the Accountant to the Company, and organizer of the Testimonial Fund.

The usual preliminary toasts having been duly honoured,

The CHAIRMAN proposed—"The Health of Mr. Robert Jones." In doing so he said they were met to present a testimonial to Mr. Robert Jones on his retirement from the service of the Commercial Gas Company, after work extending over a period of 27 years. In 1854 Mr. Jones, who was then but a "young man from the country," took the command of a large metropolitan gas district, and in doing so left a post which peculiarly was better than the one he was about to fill. But he was bent on breaking a lance with the London Gas Engineers, and none could deny that he had gained a substantial victory. All who knew what the Commercial Gas Company was in 1854 and what it was now, would appreciate the value of Mr. Jones's exertions. In 1854 the price of gas was 4s. per 1000 cubic feet; it was now 3s. per 1000. In 1854 the whole of the district was in a state of internecine confusion; it was now in a state of internal peace. In 1854 there was a loss of gas by leakage of 30 or 40 per cent.; it was now reduced to a minimum. When Mr. Jones came into the service of the Company he immediately began to increase the size of the mains, and thus reduced the leakage by one-half, and afterwards was even more successful in this respect. In addition to this the Company were engaged in parliamentary contests for several years, which ultimately ended in a distribution of the whole Metropolis amongst the several Gas Companies—an issue which prevented undue competition, and enabled each Company to turn its attention to more peaceful and lucrative objects than fighting with its neighbours. In 1854 the Commercial Gas Company paid a dividend of 6 per cent., though they did not earn it; but they leaped into prosperity within a year or two after Mr. Jones's appearance on the scene, and they had been progressing ever since. The success of the Company went on increasing until the amalgamation with the Ratcliff Company in 1875, and there again Mr. Jones, by his personal exertions, materially improved the position of the Company, and brought the negotiations to a successful issue. And now, after 27 years' service, he had determined to retire from office. The testimonial was proposed as soon as the announcement of Mr. Jones's retirement was made, and he (the Chairman) gladly undertook its management. He could only say the task was an easy one; for he had but to hint the matter to find everywhere a ready response. The sum collected amounted to £803 10s. 6d., and in enclosing subscriptions letters were received from all quarters, vying in testifying to Mr. Jones's singular faculty of securing the respect of those with whom he had been associated in the course of his long career. He had much pleasure, therefore, in handing to Mr. Jones the testimonial which had been drawn up, together with the articles of plate and jewellery which had been purchased by the fund subscribed.

[The testimonial, which was beautifully inscribed and appropriately framed, set forth that it was presented to Robert Jones, Esq., M.Inst. C.E., on the 27th of May, 1881, upon his retirement from the office of Engineer to the Commercial Gas Company, by the staff and *employés* of the Company and numerous friends whose names were appended, as a token of their high esteem and friendship, and in recognition of his able and courteous discharge of the responsible duties of his position during 27 years. It was accompanied by a gilt desert service of the richest character, six silver-gilt cruet stands, and (for his daughters, the Misses Jones) two pairs of diamond earrings and a gold bracelet. The testimonial was signed by about 200 persons.]

Mr. FINLAY having in a brief speech endorsed all that the Chairman had said in reference to Mr. Jones's services to the Company, the toast was drunk with all the honours.

Mr. R. JONES, on rising to respond, was received with long-continued cheering. He began by thanking the guests for the very kind way in which they had received the toast. The career of the Commercial Gas Company had, he said, been very much mixed up with his own career, and its history had been an eventful and very peculiar one. Hence, if

those present would permit him, he would, as succinctly as possible, indulge in some retrospections. The Commercial Gas Company commenced in the East of London, with Stepney as its centre, as a consumers' association, promoted in the interests of those who were dissatisfied with the supply of gas then obtainable, and who were thus invited to rally round the standard of a new Company in the district. In its prospectus the concern offered a promise to supply gas to the district at something like 1s. 6d. per 1000 feet less than the other Companies were charging, those Companies being the Imperial, the Chartered, the Independent, the City of London, the British, and the Poplar Gas Companies. Of course the proposition was hailed with great pleasure, and the new Company began with a very large promised rent-roll or list of those who would take gas from it as soon as it commenced operations. Works were accordingly erected upon the site at Stepney, and a commencement was made under the most favourable auspices; for what could be better than a consumers' company supplying gas at a lower rate than other Companies? But the very first thing was a mishap. The first stone of the works at Stepney was laid amid great circumstance and display, and in the cavity of the foundation-stone was placed a selection of current coins of the realm and the customary documents. Then the Directors and their friends retired to a neighbouring inn, and were toasting themselves in celebration of the day's ceremony, when in rushed a shock-headed boy with the news that somebody had lifted the foundation-stone and "prigged" the money! That was not a very excellent beginning, but the works went on to completion, and then the Directors turned to their promised rent-roll. But a change had taken place in the interval. As soon as the other Companies supplying the district found out the terms proffered by the Commercial Gas Company, they reduced their prices to the same rate—an experience not confined to new gas companies, or indeed to new companies or competitors of any kind. The result was that when the Commercial Company had completed their works, their promised supporters had vanished, and they found that only one-tenth of the roll of customers were willing to fulfil their original pledges. Well, the Company struggled on for several years, and it resulted at last in this—that the Directors every Friday came down to the works with cash supplied by themselves to pay the men's wages, and keep the concern going. The shares of the Company, originally £25 each, dwindled to £5, and then rapidly sank to 2s. 6d.; and the story is told that a great many of the shares were parted with by an original shareholder for a pot of beer. In their dilemma the Directors looked anxiously around for some one to help them out of their serious difficulties; and they lighted upon Mr. C. Salisbury Butler (M.P. for the old borough of the Tower Hamlets) as a man of known judgment, great energy, and considerable means. With this gentleman at their head, the Board laboured on, the Directors being still frequently compelled to make themselves personally responsible for the wages of the men and the material required at the works. But hope had all along animated Mr. Butler and the friends whom he introduced. Up to 1847 there was great competition on the part of neighbouring Companies; and Mr. Butler, seeing the vital importance of the issue, laboured sedulously to gain for the Commercial Gas Company a district to itself. He made amicable arrangements with the Chartered, the Independent, the City of London, and the Imperial, and so, upon that side, got his Company districted fairly; but no headway could be made with the Poplar and the British Gas Companies, who lay eastward. In 1847 they went to Parliament, and it was a singular thing that in the measure which they then obtained they accepted a provision like that of the later Gas-Works Clauses Act, which gave a 10 per cent. dividend when sufficiently earned, and provided for the establishment of a certain reserve. The Commercial Gas Company were the first to accept these terms. In 1850, under the advice of Mr. Butler, they succeeded in purchasing the works of the Poplar Gas Company, and so got rid of one hindrance; and in 1852 they obtained parliamentary powers to purchase the British Gas Company, leaving only the Ratcliff Gas Company to deal with in the whole district. The Company went on earning only a bare pittance of a dividend, and even this the Directors did not give to the Proprietors, but appropriated to a fund called the "contingent fund." From 1852 to 1854 they paid a 6 per cent. dividend, and added surpluses to the contingent fund. This fund, it would be observed, was built up of profits undivided, and not of profits beyond the dividend the Shareholders had power to take; because, under the Act of 1847, they were entitled to divide up to 10 per cent. In the year 1854 he (Mr. Jones) was introduced as the Engineer of the Company; and upon entering into office he found this state of things—the British Gas Company (with works in School House Lane), and the Poplar Gas Company, which had been absorbed; and means were being adopted to concentrate the works at Stepney. At that time gas from four different manufacturing stations was being supplied to the district; the Stepney works were in a transition state; the connections from the gasholders and from the purifiers were made with temporary joints; and the whole thing was in disorder. He found also that in the half year ending June, 1854, the Company had earned a dividend of 14 per cent. only. To obtain about 4-10ths or 5-10ths pressure in Bethnal Green they had to put on about 38-10ths pressure at the works; and he found a leakage of about 38 per cent. Those who knew anything of gas manufacture would not wonder that the earnings were so small. But he went to work cheerfully, although he could not help reflecting now that the greatest obstacles which he met with in the path of reform were found within the Company's own works. Persons who should have helped him, strenuously opposed him, and his task was rendered doubly difficult in consequence. When, in spite of the financial condition of the Company, he advised the laying down in the first year of something like 13 miles of mains of an increased size, the Board regarded him with amazement! They had been advised so differently that they did not know what to make of "the young man from the country." But he urged that there was no help for it, and the Board finally accepted his views. The result of carrying out his recommendation was to bring down the leakage from 38 to about 14 per cent., and in this alone there was a big dividend; and in the second year of his service there was an amount of profit which made the Company scarcely able to believe their own eyes. He had mentioned the contingent fund because "thereby hangs a tale." It would be observed that although the Company were earning so considerable a profit, dividends of 6 per cent. only were paid, the rest being appropriated to form a working capital. It was money withheld from the pockets of the proprietors, and it amounted to £14,500. They went on until the year 1858 paying only 6 per cent., but earning considerably more, and laying out the amount in extending the works and in building up a contingent fund. In 1858 a general agitation throughout the Metropolis resulted in the appointment of a Parliamentary Committee of 15 members—five representing the Companies and five the gas consumers. A battle was fought throughout that session, and continued through that of 1859-60. The Commercial Gas Company stood aloof, allowing the other Companies to fight the agitation which was caused by the so-called "districting," to which the Local Boards objected. The reason of the Commercial Gas Company's attitude was that after Mr. Butler had taken the control of the Company's affairs, the Great Central Gas Company planted their works in Bow Common Lane, and proposed to supply the City of London with gas at 4s. per 1000 feet. Upon this the

Mile End and Whitechapel authorities pressed for the same rate from the Commercial, this being 1s. less than the current charge. The situation was such that the Company were obliged to consent to an agreement conceding terms identical with those offered by the Great Central Company. When they were before Mr. Sotheron Escount's Committee in 1859, they consequently felt in a difficulty in view of this agreement. When, after much inquiry, a general Bill was proposed, the Commercial joined with the rest of the Companies to consider its provisions. When he (Mr. Jones) found that it provided for a gas supply of 12 candles (instead of 10 as theretofore) at 4s. 6d. per 1000 (instead of 5s. as theretofore), he said the measure would not satisfy the Commercial Gas Company, whatever it might do for the other Companies; because if they were to supply this extra quality of gas, the agreements with Mile End and Whitechapel would prevent the raising of the price beyond 4s. per 1000 feet; and failing parliamentary relief from these agreements, he said he must advise his Directors to withdraw. He acted accordingly; but at this juncture he sought the counsel and assistance of a man who had been now five or six years in his grave—a man of great ability and commanding local position—Mr. William Newton. The whole facts of the case were laid before Mr. Newton, and his judgment was, "Well, I think you are entitled to be placed on the same footing as the other Companies." Expressing his great gratification at this, he (Mr. Jones) at once said, "Will you give evidence for us before the Committee?" "No," replied Mr. Newton; "I don't see my way to that." "Then," said Mr. Jones, "I must subpoena you." He did so; and he did more—he threw himself upon the Mile End Vestry's and the Whitechapel Board of Works' own sense of justice in the situation forced by public opinion and Parliament upon the Commercial Gas Company. When the case came before the Parliamentary Committee, and the whole matter was fully explained, the Chairman of the Committee frankly saying, "Nothing can be more fair or more correct than that you should be placed on the same footing as the other Companies, and we will consent to a clause which will meet your case." The result was the 36th clause of the Act of 1860. Respect for the memory of Mr. Newton compelled him to say more. At the end of the business of the Parliamentary Committee he asked Mr. Newton what was to be his fee for the 21 days' attendance. "I shall make out no bill of costs," said Mr. Newton; "I shall leave it to your Directors." The Directors voted Mr. Newton 50 guineas! Beyond a doubt a most paltry sum; more especially when it was recollected that the abrogation of the local agreements was, as the Chairman of the Company himself admitted, worth £10,000 a year to the Company. The 1860 Act carried on the legislation of 1847—it gave a 10 per cent. dividend, and it restricted the payment of back dividends to six years; whereas before this the Company had the power to make up 10 per cent. from the beginning of the enterprise. The position of the Commercial Gas Company was then peculiar; it had built up a contingent fund of £14,500 by subtraction from the dividends to which the shareholders were entitled, and it was being used as working capital. But with back dividends to make up, amounting to nearly £50,000, the Commercial Gas Company were content to divide the £14,500, and the balance of the £50,000 was thus in effect given to the consumers. In this matter, as he thought, the shareholders behaved with signal generosity to the consumers; but he had another reason for mentioning it in this place. In 1875 it was insinuated by some people that the books of the Commercial Gas Company for the year 1860 or thereabouts! would not bear examination, inasmuch as the £14,500 contingent fund had been secretly divided between the Chairman (Mr. Butler, M.P.), Mr. Newton, and himself. Justice to the memory of a man who, though he wrought great benefits for the East of London, was pursued with great malignity, compelled him to repeat that the paltry fee of 50 guineas for 21 days' attendance upon the House of Commons' Committees of 1859-60, was every farthing of remuneration which Mr. Newton ever received; while the £14,500 was divided amongst the shareholders of 1860, as was their right. In 1874 the Company had again to go to Parliament because they had exhausted their powers of raising money, and they required more capital to meet the wants of their district. There was then another great agitation existing in London regarding gas supply, and the Metropolitan Board of Works were opposing the Companies right and left. Mr. Newton heard then make a most rabid speech against the Gas Companies in the Mile End Vestry, whom he represented at the Metropolitan Board of Works; and he (Mr. Jones) had occasion to remember it, since he was compelled to essay a reply at the same meeting. Afterwards, he had an interview with Mr. Newton on the subject, for he had every faith alike in his sense of justice and his straightforwardness. After a long conversation Mr. Newton said, "What the Metropolitan Board of Works will require of the Companies is a sliding scale, and that you should meet the requirements of London in a liberal spirit." Well, as all present were aware, this principle of the sliding scale became law, but previous to this he had accepted Mr. Newton's views, and advised his Directors to do so. In accepting the principle of the Bill of 1875, the Commercial Gas Company were very freely condemned by the other Companies, and one Chairman very warmly accused him of having "sold" the Companies. He (Mr. Jones) thought the present position of affairs was the best defence of the views which he then advocated. At any rate, the Directors of the Commercial Gas Company had never had occasion to regret their early acceptance of the principle of the sliding scale; and throughout they had maintained their attitude of willingness to accept legislation called for by the changing circumstances of the times. Up to 1875 he fought the battle of the Company, under great difficulties in the first instance, but on the whole successfully. From that time, as he must confess, he had left the burden very much upon the shoulders of the present Engineer—his son, Mr. Harry Jones. It was the present Engineer who designed the new Bromley station; and almost all the general management fell upon him. The legacy left to his son was a work of not less difficulty and responsibility than any which he (Mr. Jones) encountered; for the Act of 1875 required the Company to supply gas of a higher illuminating power, and of purity far beyond that which anybody ever thought was needed before certain visacres came into vogue. The thing went home to him, because it would be remembered that on one occasion the Metropolitan Board pounced upon the Company, and fined them for a trifling and accidental impurity. And now as regarded the testimonial before him, he would say it was the fourth of this nature which he had received. He received one at Chester in the early part of his career, and another at Bath; but nothing so handsome as the splendid gift of that evening. He saw around him not only employees of the Company, and its connections, but a number of esteemed private friends, to each and all of whom he tendered his deep and grateful thanks. He had no expectation of so munificent a gift, but he trusted they would believe him when he said that he should look upon it less as regarding its intrinsic value, although this was great, but as an enduring mark of the good feeling which had animated those who contributed to it. He felt unable to account for their great generosity to him, and could only attribute it to the endeavours which he had always made throughout his career to treat every person with whom he came in contact, no matter what his position, with the utmost urbanity and kindness. He would indulge the hope that the testimonial was presented to him as a monument of respect to one who had always tried to do his duty in a kindly spirit, and with an earnest desire to act fairly. He found included in the gifts some

presents for his three daughters; and in this the Testimonial Committee had regarded his wishes in the most graceful and kindly way. His daughters united their thanks with his; and, in conclusion, he would only say that the handsome presents would be handed down to his family as an honoured memorial of the respect he had gained among those with whom he had long been associated.

In responding to the toast of "Prosperity to the Commercial Gas Company," proposed by Mr. KIMBER,

Mr. H. E. JONES said he was proud to be selected to respond to it, and especially upon an occasion of such pride to his family. His father had said that he had left the new Engineer a legacy. This legacy he (Mr. Jones) understood and accepted as one of hard work, although he would also regard the legacy as the enforcement of the principle of doing one's duty in the sight of God, and dealing fairly to those around one. In his father's case the strict adhesion to this rule had met its reward in the universal respect to all who knew him, and it was an example he was not likely to forget, emphasized as it was by the remarkable scene of that evening. Although he despaired of emulating the career of his father, he felt stimulated to labour for a day when he might create the same favourable impressions amongst those who knew him. In looking forward to his work for the Company he was consoled by the reflection that he was surrounded by an efficient staff, full of confidence, and zeal, and earnestness. If the staff would have faith in him, he could only say he would reciprocate it, and together he believed they could steer the Company at any rate to no less dividends than in the past. He was thankful to acknowledge that they possessed an enlightened Board of Directors, who were capable of moving with the times; and he entertained the hope that very shortly the Company would take the lead in the Metropolis for the low price of their gas and its high quality, at the same time as they gave an increased return to their shareholders. All things considered, he thought there was every reason to believe that the good old ship, the Commercial Gas Company, would pursue her course through storm or calm in safety and prosperity.

In responding to the toast of the Metropolitan Board of Works, Mr. RUNTZ owned his position was a novel one. He had responded for the Metropolitan Board in many places and on many occasions, but this was the first time he had been asked to return thanks for the Metropolitan Board's health being drunk at a Gas Company's meeting! He was there in consequence of his personal friendship for Mr. Jones, who had done the Commercial Gas Company great service, and who, in leaving his post had joined what he might be pardoned for considering the most important administrative body in the Metropolis. Mr. Jones, in retiring from his post as Engineer of the Commercial Gas Company, had, as a member of the Metropolitan Board of Works, given the London public the benefit of what the Commercial Company had lost—viz., his zeal, his singlemindedness, his tact, judgment, and experience.

The health of the Chairman having been cordially given by Mr. ROBERT JONES and briefly responded to, other minor toasts followed, and the company separated.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

QUARTERLY MEETING AT BUXTON.

Last Saturday afternoon about 40 members of this Institution visited Buxton (Derbyshire) in order to inspect the new gas-works erected by the Buxton Local Board, and which have been in operation but a short time. Mr. George Smedley, the Manager, met them, and the members partook of luncheon before visiting the works, which are about half a mile from the town.

After luncheon, the PRESIDENT (Mr. J. Chew, of Blackpool) called upon the Secretary to read the minutes of the last meeting.

Mr. R. HUNTER (Stalybridge) read the minutes of the annual meeting held in Manchester at the end of February; and these, on the motion of Mr. JONES, seconded by Mr. SMEDLEY, were confirmed.

The company afterwards proceeded to the new gas-works, over which they were conducted by Mr. Smedley, who, in passing through them, explained the various appliances, and subsequently read the following description of the building and of the machinery:—

BUXTON NEW GAS-WORKS.

The building is of the Italian style of architecture, executed with chiselled dressings and dripping-stone facings, lighted on the front by eight massive windows with chamfered sills and groined recessed jambs, with bold circular rims and keystones, and moulded imposts in the jambs between each window. There are also four massive pilasters with moulded bases and capitals, the bases supporting bold stone finials. The main entrance is in the centre of the front elevation, and has panelled and moulded sliding doors 11 feet wide, with stone moulded jambs and panelled circular head with spandrels on the face. Projecting from the jambs are pilasters with moulded bases and capitals supporting the architrave, frieze, and bold moulded pediment.

A fine feature is produced by projecting the centre portion of the building about 18 inches, and placing neat groins at the angles, finishing over the centre doorway with entablature and massive moulded and panelled pediment, with circular panel for a clock, if necessary.

The whole of the front is surmounted by neatly worked friezes, neck-mould bold cornices, and finished with entablature or blocking. The two side elevations are carried out similar in every detail to the front elevation, except that they have smaller doorways with quoined jambs, ashlar circular rims and keystones. The back elevation—which is next to a hill—is simply built of rubble wallstones on both sides, having five window openings left for light and ventilation. The whole of the external walls are lined inside with rubble wallstones, pointed and limewashed.

The foundations are built on rock, and the drainage is executed with 6-inch to 15-inch diameter pipes connected with the adjoining river. The flags used are from the neighbourhood of Huddersfield, and the sets are Mount Sorrel granite.

The ventilation is effected by means of sliding sashes, and wood louvres in the windows, and louvre ventilating boards at the ridging. The windows are glazed with obscure glass with marginal squares. The whole is covered with an iron roof (made and fixed by Messrs. C. Janson and Son, of Darlington), and is slated with Welsh slates, Staffordshire ridge tiles, and with snow guards to the gutters. It is lighted from the roof by four rows of Hartley's $\frac{3}{4}$ -inch rough cast plate. The total area covered by the building is 2111 square yards.

The building is divided into the following compartments:—Retort-house, 68 ft. 8 in. by 56 ft. 2 in.; coke store, 60 ft. by 56 ft. 2 in.; purifying house and meter-room 83 ft. 4 in. by 56 ft. 2 in.; boiler, engine, and exhaust rooms, workshops, stores, and bath-room for workmen, each about 23 ft. by 14 ft. The latter has a boarded floor, and is fitted with bath, water-closet, and lavatory.

The purifying-room floor is constructed with Homan and Rodger's wrought-iron and concrete fireproof flooring; and 18 inches below the level of this floor is the level of the railway siding. This is connected outside the buildings with the main line of the Midland Railway by a viaduct supported by twenty iron columns, and is then run inside the building the whole length, and supported therein by three stone arches

and stone piers, and eight iron columns, carrying Homan's patent girders. It is left without flooring between the rails over the coal stores, behind the retort-house and coke store. The pathway or horse road is made of 9 in. by 8 in. wood planks, with $\frac{1}{2}$ in. by $\frac{1}{2}$ in. laths across. The remainder is covered with a concrete floor with a number of Hyatt's patent lights to light the engine room, workshops, and other rooms below. At each end of the siding in the building are large folding doors.

The two gasholder tanks were constructed by Mr. Frank Dawson, contractor, of Bury. The larger one is 83 feet diameter, and the small one 47 feet. The walls are built of common limestone rubble wallstones, in Barrow lime mortar, with a lining of 9-inch brickwork in Portland cement, coped with Rowsley stone 4 feet wide and 12 inches thick, fenced with 18 in. by 8 in. coping doweled at the joints and beds. It has further been necessary to build a strong river wall 250 yards long.

The whole of the architectural portion of the above-named work was designed and superintended by Mr. W. Telford Gunson, of 10, Marsden Street, Manchester, the contractors for the building being Messrs. Chappel and Laughton, of Buxton.

Having described the building, I will proceed with the plant in the retort-house. Here you will find seven through arches 7 ft. wide and 7 ft. 6 in. high, divided in the middle by 9-inch brickwork, making fourteen ovens, each capable of holding five single retorts, or of being converted into throughs when necessary; or seventy mouthpieces. At present eight ovens only are furnished. There is a separate chimney to each furnace, built only 18 inches above the ridge, which has been found economical and efficient in controlling the heats and less in cost for erection. The retorts are D-shaped, 20 in. by 14 in., fitted with Tassie's patent lids. There is no hydraulic main proper, but instead an 8-inch pipe fitted with White's automatic valves, which have proved perfectly satisfactory. The 8-inch main and ascension pipes are 12 feet above the retort-bench, to prevent any deposit of pitch upon the valves or in the main.

The tar produced in the 8-inch main is conveyed from the end of it direct to the tar cistern, whilst the gas ascends in a 12-inch pipe to the first condensing or precipitating chamber, situated along the upper part of the wall of the coke store. This chamber is 57 ft. long, 3 ft. 6 in. wide, and 6 ft. high; and the tar from it is also conveyed direct to the tar cistern. [From tests I am satisfied carbonic acid and sulphuretted hydrogen are largely deposited here.] From this point the gas and condensed products proceed together to a Morris and Cutler's patent condenser, which is an alternate layer of either air or water and gas. The exhaust—Baker's—manufactured at the Savile Street Foundry, Sheffield, is fixed after the condenser, and forces the gas through a Kirkham, Hulett, and Chandler's "standard" washer-scrubber to the purifiers, which are 14 feet square with dry surface valve and 12-inch connections. These were made by Messrs. Newton, Chambers, and Co. The condenser, scrubber, and valve are placed upon the ground floor, with the purifiers above them; and for the purpose of lifting the lids there is a travelling crane upon wrought-iron girders extending the full length of the floor, where there is space for four purifiers of the same dimensions. The crane was made and fixed by Messrs. C. Janson and Co., of Darlington; and the two movements of lifting and travelling are effected from the floor.

The exhaust, scrubber, tar pump, and machinery are all driven, by shafting and straps, by one engine of 8-horse power.

The tar is daily pumped into a cast-iron cistern (made by Messrs. Jones and Son, of Warrington), fixed on the side of the railway for the convenience of immediate loading into tanks.

You will observe that every part of the apparatus is under cover, every pipe containing gas above ground, and all bye-passed. The only part of plant outside are the gasholders—one telescopic, 80 feet by 18 feet, erected by Mr. D. Howard, of West Bromwich, and one 45 feet, removed from the old works by Messrs. Ashmore and White.

By the side of the holders is the valve and governor house, containing two of Foulis's patent 12-inch governors, with bye-pass valves, and inlet and outlets to both holders, and provision made for two more to connect to a third when required.

The works were completed at a cost of about £30,000, which includes two 12-inch mains measuring 1600 yards, to connect the works with the town.

The Engineers were Mr. Henry Lyon, Consulting Engineer, of Manchester, and your humble servant.

The PRESIDENT said that having seen the works and heard the description, they would, he was sure, express an opinion on them. He did not think they could, under the circumstances, do less than tender to Mr. Smedley and the Gas Committee of the Town Council their best thanks for the enjoyment afforded them in allowing them to inspect the works.

Mr. CARR said he had great pleasure in proposing a vote of thanks to Mr. Smedley and to the Gas Committee of the Buxton Town Council for the pleasure of being allowed to inspect the works; and, in doing so, he would like to make a few remarks with reference to the works they had seen. The object the Institution had in view in these visits was to see new gas-works where they expected to find some improvements in the machinery used for making gas, as also the very latest principles adopted. Here they had seen this done; and it was only fitting that they should recognize the spirit that had actuated the Gas Committee in putting down such machinery. There were some points that might be discussed; he did not, however, intend to enter into them, but he must say there had been no fault committed in putting down the most modern and scientific apparatus for the manufacture of gas. There were many things at the works they had not the opportunity of seeing in old works, because they had been discovered since old works were built; therefore without such opportunities as that then afforded some of them would not have a chance of seeing or of judging of their utility. He must say, speaking from what he had just seen and heard, that Mr. Smedley was going in the right path, and many of the things he had in use at the works would place him at an advantage over some of those managers who had to use old-fashioned appliances. He (Mr. Carr) was remarkably pleased to see that Mr. Smedley believed in keeping up with the times, and had obtained the most modern machinery. This was a credit to him, while the support given him by the Gas Committee of the Local Board proved most conclusively that they were sensible men who could anticipate future requirements, and had not, on the ground of expenditure, put down old-fashioned machinery, as in some places which were a long way behind the times. Instead of this they had tried to get such apparatus as would assist them in making gas both cheaper and better than in the past. He was pleased to see a member of the Gas Committee present, as he would be able to hear what practical outsiders thought of their works.

Mr. JONES, in seconding the votes of thanks, said it had been a source of much gratification to him, as it must have been to all, to inspect the works; and he could thoroughly endorse what had been said about them, and about Mr. Smedley and the Gas Committee. As they had walked through the place they could see that the importance of making provision for the future had been carefully considered; and machinery, with the latest improvements, had been obtained. They all knew the difficulty gas

engineers had in persuading companies and corporations to adopt these modern improvements, on account of their cost. The fact that this had been suggested by Mr. Smedley redounded to his credit, while the adoption of his views by the Gas Committee proved that they had the good sense to see that in doing so they were acting in the interests of the rate-payers and for the benefit of gas consumers generally. That this course was a wise one he had had ocular demonstration; as even in matters of detail there was nothing left to be desired. Some of the things they had just seen they had not the opportunity of seeing in some old works; and, in fact, their introduction was scarcely possible. When, however, new works were erected, it was highly desirable they should be introduced, and what they had seen must reflect credit on the Board for sanctioning the action of their Engineer, while the greatest praise was due to the Engineer for designing them. Feeling this, he had much pleasure in seconding the vote of thanks, and also in congratulating both parties on the success of the undertaking.

The PRESIDENT did not think it necessary, on his part, to add to what had been said; but on looking round he could not but think that both the Gas Engineer and the members of the Buxton Local Board must have had some thoughts in their minds relative to the question of electric lighting when they undertook the building and fitting up of the new works. He, as one having some experience in this lighting, could say that it was only by the use of the most modern improvements in gas-making machinery that they could compete with the electric light. They (the Board) must have considered the question of how gas could be supplied cheaply to the consumers, and had seen that this could only be done by the use of the best kind of machinery. Not only so, but they had not confined their attention to the necessities of the present, but had made provision for the future, and he could say in the presence of Mr. Milligan—a member of the Gas Committee—that he did not think they had spent a single pound more than was necessary, and he also thought that the expenditure would prove beneficial to the town. He had, therefore, pleasure in submitting the vote of thanks to Mr. Smedley and to the Gas Committee of the Buxton Local Board.

The motion was carried by acclamation.

Mr. E. C. MILLIGAN, in response, said he was sure, after the labours of the Gas Committee during the past two years, and the anxiety felt during the building of the new works, it was highly gratifying to see so large a gathering of those who were capable of judging of the work of the Committee, and more especially to hear the encomiastic remarks made by them on the action of the Gas Committee and their Engineer. When he informed his colleagues of what had been said—as he most certainly should—he knew that the opinions expressed in the hearty manner they had been would afford them the greatest satisfaction, and repay them for the patience with which they had borne the many hard words used about them and the expenditure at the gas-works. They would all doubtless have experienced the amount of jealousy with which the expenditure of public money was watched, and how severely it was criticized. The present gas-works might seem large, but when they looked back to the establishment of the old works, some 20 years ago, and saw how the demands made had increased to such an extent that they could not be met, he did not think they ought to be blamed for making provision for an increased demand in the future. He only hoped that those present would live to see the day when even the new works would prove too small for the requirements of the town; as it would show increased prosperity for Buxton, which was what was wanted by those who lived in it. He again thanked the members for the manner in which they had spoken of the Board and their Gas Engineer, and said he could anticipate the pleasure that would be afforded to the other members of the Board when he told them how their efforts had been appreciated by so large a number of gas engineers.

Mr. SMEDLEY, in responding, said that though there had been some occasions which he had thought would prove the "happiest moment of his life," these had been put in the shade by the event of the day, when he saw the consummation of his design, and the healthy condition of this his "first born" in the shape of gas-works. The carrying out of the work had been a difficult task, but he was fully repaid for what he had done in hearing those present express their approbation of it. He might say that when the project was first mooted there was an opinion that it could not be accomplished except at a cost that would not pay; but he called into his counsel Mr. Henry Lyon, of Manchester, who pulled with him, with the result they had seen that day.

This concluded the formal business of the meeting, and those present set out to spend the hours between then and tea-time in examining the public buildings in the place, and many in taking advantage of the mineral springs in the town. At 4.30 p.m. they met at the Eagle Hotel, where they had tea, after which the evening was spent in social intercourse, many remaining over Sunday in order to view the beauty-spots in the country.

HIGHAM FERRERS GAS AND COKE COMPANY.—This is the title assumed on the re-registration, on the 7th inst., of an old company, which was constituted by a deed of settlement, on the 20th of April, 1855, and afterwards registered as an unlimited company. The capital is fixed at £1500, in £10 shares.

THE WATER SUPPLY AND SEWERAGE OF WHITCHURCH.—On Saturday, the 21st inst., Mr. J. T. Harrison, C.E., opened an inquiry at Whitchurch on behalf of the Local Government Board, in reference to an application made to them by the Whitchurch and Doddington Local Board for power to borrow £11,000 for water supply, sewerage, and other improvement works. With regard to the water supply scheme, the Engineer to the Board (Mr. W. Wyatt) produced plans of the proposed works, and explained that it was intended to take the water from a spot about 2½ miles from Whitchurch, which would be supplied by gravitation. The total cost of the works was estimated at £6353. By the proposed scheme 100,000 gallons of water could, he said, be obtained per day, and there was no reason for supposing that this quantity could not be maintained. Dr. W. N. Thursfield, the District Medical Officer of Health, stated that he had analyzed the water to be supplied under the proposed scheme, and had found it free from sewage matter and injurious metallic impurity, and did not contain an excess of organic matter. Regarded as a potable water, it was good for culinary, domestic, and trade purposes, but was somewhat hard. His analysis agreed, he said, with one made by Dr. Hassall, of London. The Inspector inquired whether a supply could not be obtained by boring nearer the town. According to the proposed scheme the water would, he said, have to be pumped about 70 feet higher than if it were drawn from a spot nearer the locality to be supplied. Some conversation having taken place in reference to the possible existence of a more suitable site than that selected by the Local Board for the proposed works, the inquiry as to the water supply scheme, to which there was no opposition, closed. As to the sewerage scheme, Mr. Wyatt explained that it was intended to deal with the sewage by filtration, and the amount proposed to be expended was £3662. There being no opposition to the scheme, the other purposes for which the loan had been applied for were considered, and the inquiry terminated.

MONTE VIDEO GAS COMPANY, LIMITED.

The Ninth Ordinary General Meeting of this Company was held at the City Terminus Hotel, Cannon Street, E.C., on Friday, the 27th inst.—Mr. JOHN BRAMLEY-MOORE in the chair.

The SECRETARY (Mr. J. T. Denniston) read the notice convening the meeting, and the following report of the Directors was presented:—

The Directors submit to the Shareholders the accompanying audited statement of accounts for the year ending Dec. 31, 1880.

The net revenue from the working of the Company during the year amounts to £38,453 10s. 5d. After making provision for bad and doubtful debts and law charges, and transferring £3000 to contingency account, there remains a balance at the credit of profit and loss of £33,146 4s. 9d., which is sufficient for a dividend at the rate of 6 per cent. for the year. One-half of this dividend was paid by the Board in February last, and they now ask for powers to pay the balance, which they will be able to do before the end of June. The net revenue of the year is less than that of 1879 by about £9320, which arises from a reduction in the number of public lamps, and from economies in the use of gas among private consumers. On the other hand, the funds due to the Company for public lighting have been more regularly paid than hitherto, the agreement with the Junta, or Municipality, having been faithfully fulfilled in this respect. If, as the Board hope, this improvement in collections be maintained in future, one of the principal difficulties of the Company will be removed.

The promises of instalments, in respect of the old debt due by the Government, have not been fulfilled, owing to the financial difficulties of the country, and although the amount in arrear has been reduced to £53,782 1s. 1d., the sum received has been very disappointing.

The Directors retiring by rotation are Mr. Bramley-Moore and Mr. Alexander K. Mackinnon, who, being eligible, offer themselves for re-election. Messrs. Price, Waterhouse, and Co., and Mr. Edward Cheshire retire, and offer themselves for re-election as Auditors for the ensuing year.

Dr.	Balance-Sheet, Dec. 31, 1880.	Cr.
Capital authorized—		
30,000 shares of £20 each, £600,000	0 0	
2,904 shares of £20 each, unissued	58,080 0 0	
27,096 shares of £20 each, fully paid and issued to date	£541,920 0 0	
Contingency account	40,000 0 0	
Added this year from profit and loss	3,000 0 0	
Sundry creditors, London	409 13 2	
Do., Monte Video	1,493 2 4	
Bills payable	813 19 6	
Dividends unclaimed	173 8 0	
Interest in suspense, not received, Dec. 31, 1879	5,282 2 3	
Add, charged to Government, 1880	1,429 12 10	
Suspense account, for balance of profit, 1878	32,515 4 0	
Profit and loss, balance as per account below	33,146 4 9	
	£660,183 6 10	
Cost of works, &c., as per balance-sheet, Dec. 31, 1879	£539,639 3 10	
Add expenditure on meters	40 11 2	
Total capital expenditure to date	£539,679 15 0	
Stock of canal and coal	14,771 4 3	
Do. gas-fittings	5,849 9 1	
Do. residual products	58 16 10	
Do. materials for use	7,588 14 9	
Do. do. sale	2,097 8 6	
Do. furniture, at Monte Video	746 6 2	
Sundry debtors at Monte Video	14,076 8 6	
Government accounts	59,782 1 1	
Furniture in London	100 0 0	
Bills receivable in hand and in transit	12,000 0 0	
Shipments afloat	1,218 19 6	
Cash in Monte Video	429 6 9	
Do. London	1,784 16 5	
	£660,183 6 10	

Revenue Account, for the Year ending Dec. 31, 1880.

Cost of manufacture and expenses at Monte Video	£44,041 10 9	Sales of gas, residual products, rent of meters, and sales of gas-fittings	£80,932 14 1
Directors' fees, salaries, and London expenses	2,437 8 2	Revenue from dock & workshops	5,231 3 5
Income-tax	900 19 7	Profit on exchange (balance)	562 15 6
Interest and discount (balance)	962 4 1	Transfer fees	69 0 0
	£48,342 2 7		
Balance to profit and loss account	38,453 10 5		
	£86,795 13 0		£86,795 13 0

Profit and Loss Account, Dec. 31, 1880.

Bad and doubtful debts	£2,180 1 4	Balance	£157 18 0
Law charges	285 2 4	Revenue account, 1880	38,453 10 5
Transfer to contingency account	3,000 0 0		
Balance	33,146 4 9		
	£38,611 8 5		£38,611 8 5

The CHAIRMAN, in moving the adoption of the report, said the Directors had endeavoured to give the Shareholders the fullest information as to the position of the Company, and he hoped that under all circumstances it would be found satisfactory. They were perfectly well aware of the obstacles against which they had had to struggle, which, in fact, originated from the circumstances of the country where the undertaking was placed. The Government had had great difficulties to contend with, and so had the Company, but he was happy to say that, so far, their prospects were better than on the last occasion of their meeting. As to the consumption of gas, the Shareholders would find all the information detailed in the report. He might state that Monte Video had a very variable population, and at the present time there were probably 30,000 inhabitants fewer than at this time last year. The population was a fluctuating one, and consequently there had been a good deal of suffering in the way of trade in the place, and people had had to economize. These were consequences in a country like Monte Video, which had been subject to revolutions and changes; but he thought the Shareholders might hope, if the country remained quiet, that future prosperity would return. Referring more particularly to the report, he observed that the Shareholders would find that the old debt of the Government was rather less than it had been. There was a decrease of £4000, and although they had not kept regular with their payments, still it was so far satisfactory, that, although only a small decrease, it really was a decrease; and the debt had been further reduced this year by £2000. The Directors hoped that, as prosperity returned, some arrangement would be made for the more regular payment of the old debt; but as regarded the new arrangements they had gone on in the most satisfactory manner, and the payments of the Municipality had been met very punctually. This enabled the Directors now to offer to the Shareholders a dividend up to the end of the year, which would be paid in the course of June. Reference was made at the last meeting to the differences between the Company and a gentleman who issued to the Shareholders a pamphlet reflecting somewhat upon the Directors. That lawsuit was over, and it terminated in the only way in which it could terminate—in favour of the Directors. Turning to the accounts, he said there was one item which might strike the Shareholders—namely, the large amount of coal. The stock appeared to be very heavy, but the explanation of it was simply this—that at one time the Company had four ships in lumber, and all came to grief in their loading and their voyages. It was therefore necessary for the Board to supply their places with all possible despatch, and, consequently, instead of having so many ships out at one time, as they ought to have had in the regular course, they had double the number for some time. This, however, was a matter, which was now righting itself, but it could not be avoided at the time. Some of

the Shareholders might be desirous of knowing something about the dock. The increase on the dock in the past year was £437, but he might remind them that there was now an opposition to the Company. The dock, however, was invaluable, and could not very well be dispensed with, even if it were less profitable. There had been a good deal of "scare" about the electric light, but he thought there was nothing to induce the Shareholders to be alarmed about this light up to the present time. It had succeeded, perhaps, in street lighting, and very probably might be successfully used in this direction; but still it had not penetrated into any dwellings, and it was very doubtful, from what he gathered from the scientific men whom he had conversed with on the subject, if those interested in it would be able to introduce it into private houses. Still, there was no telling what science could do in these days; but if any change was to be made in the lighting of the city of Monte Video—any change by an improved system, no matter what it might be—it was provided for in the concession of the Company. If, therefore, a change should be made, and the electric light be successful, it would devolve upon the Company to carry it out. The Shareholders would find that there had been some reduction in the expenditure. He was happy to say that in the course of June the Company would pay a dividend of 8 per cent., which would bring the dividend up to the close of the year.

Mr. BARTLETT JAMES seconded the motion.

Major DUNDAS inquired whether any overtures had been made by the Directors to have the large balance due to them by the Government funded, for it seemed to him, he said, that there was not much chance—and the Chairman did not hold out much hope—of their getting these arrears. The credit of Monte Video was not so bad but that the Government might issue a certain number of bonds. The Chairman had stated that he had every reason for believing that the country would become thriving and rich, and therefore it would be advantageous for them, if the Government issued a certain number of bonds, that they should be received by the Company now, as they would get them on lower terms, the benefit of which they would feel when a more prosperous state of things prevailed in the country.

Mr. SIMPSON ROSTRON said he was at first a little alarmed at the decrease of £9360 in the net revenue of the Company as compared with that of 1879, but the Chairman had satisfactorily accounted for it by referring to the great falling off in the number of the inhabitants in Monte Video. He (Mr. Rostron) wished to know whether there were any signs of a recovery from this state of things. On the face of it, however, it behoved the management to carry out every practicable economy in the working of the concern. One pleasant feature of the accounts, on the credit side of the balance-sheet, was that the stock of residual products stood at only £68, indicating, of course, that all the rest had been sold, and that there was a ready sale for them.

Mr. BYFIELD asked a question in connection with the extension of the Government contract.

The CHAIRMAN, in replying, assured the Shareholders that the subject of the old debt of the Government had had the most careful attention of the Directors, not only of late, but ever since the debt had been owing. At present they were initiating some process in the matter, but what the result would be it was impossible for him to say. They were, he was happy to say, now represented at Monte Video by the Viscount de Mauá, who probably had more influence there than any other gentleman, and this matter he would carefully look into. Bonds at the present time would not be of much value. Still, they had some value; and if they were taken at a low rate, supposing such an arrangement to be come to, there would be a hope of improvement, and of the debt being liquidated, though at some loss. However, the matter was now in hand, and as soon as the Directors knew what the result was it should be communicated to the Shareholders. The demand for residuals at one time was insignificant, but it was now springing up. There was no doubt that Monte Video was a splendid country, and if it were incorporated with the empire of Brazil it would command a flow of emigration perhaps unequalled anywhere in the world. It had a good port, and everything that could attract people, and he knew perhaps of no place more attractive if it were incorporated under a permanent and secure Government.

Mr. BARTLETT JAMES replied to the other questions, observing that he would first add a few words to what the Chairman had said with regard to bonds. A law was passed last year in Monte Video, authorizing the Government to issue bonds to pay their outstanding debts. The bonds were to bear no interest, but were to pay 4 per cent. amortization—viz., the holders were to wait 25 years for their money. Even this law was vetoed by the President of Uruguay. At present he (Mr. James) believed the Government were quite ready to issue a sort of bond promising to pay at some time or other. Some people, he understood, had accepted these bonds, and they were worth about 25 per cent. in the market. This was how the matter stood, but in the present depressed state of the country they could not expect to get much better. Should things revive there, it was his opinion that the Company would get much better terms, and it was certainly worth while waiting some time to get an improvement on the terms he had stated. As regarded the recovery of trade, he had no doubt himself that it would come about very shortly. Their crops of wheat were very good this year, and the number of cattle in the country was perhaps unprecedented. The Municipality did not owe the Company any money; it was the Government who owed them the old outstanding debt. The Municipality had paid month by month as regularly as possible. The old debt now amounted to £50,000 odd. With regard to the residual products, coke was sold and paid for long before it was delivered, not only in Monte Video, but also in Rio de Janeiro. People had to wait their turn to get the coke. With regard to ammoniacal liquor and the other residual products, there was no chance for many years of their ever being made anything of, owing to the high price of labour. As to the Government contract, the Company had a contract, such as it was, but he did not know that they would not have liked almost to remain a little independent for some time. There was no great advantage at present in pushing forward in this matter. There was one good feature in connection with the country, and this was that, at the present time at any rate, the people were very peaceful. For the last ten years he had had something to do with Monte Video, and it had been a case of cutting throats the greater part of that time.

The motion for the adoption of the report and accounts was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. F. YOULE, a dividend for the half year to the 31st of December last was declared, payable free of income-tax, making with the interim dividend already paid 6 per cent. for the year.

Mr. J. L. C. DE SALLES then moved, and Mr. JAMES seconded, the re-election of the retiring Directors, and the motion was carried.

The CHAIRMAN, in reply, acknowledged the confidence reposed in him by his re-election, and expressed a hope that as long as he remained with the Company he would meet with the Shareholders' approbation.

The retiring Auditors having been re-appointed,

Mr. MATHEWS moved, and Mr. WILLIAMS seconded a vote of thanks to the Chairman and Directors, and the motion having been carried unanimously, the proceedings terminated.

THE WATER SUPPLY OF RYDE.

At a Special Meeting of the Ryde Town Council on Wednesday, the 18th inst.—the Mayor (Alderman Colenutt) in the chair—a report from the Water Committee was presented, containing an estimate by the Borough Surveyor of the cost of completing the water-works at Knighton, and the new reservoir at Ashley, amounting in the whole to £8411 1s. 6d. The Committee recommended that application be made to the Local Government Board for power to borrow the sum of £8500 for carrying out the works.

The Mayor (in the absence of the Chairman of the Water Committee) moved the adoption of the report. In doing so, he said that on a recent occasion the Inspector and the Chairman of the Water Committee, the Borough Surveyor, and himself went to Knighton to inspect the water-works. The Inspector examined all the details of the works, and told him that an additional amount would be required to complete these works, advising that application should be made to the Local Government Board to borrow the necessary money. The matter was reported to the Water Committee, and they recommended the sum named in the report. Some of the principal items in the estimate were:—Arbitration, £1120; works in hand, £3120; well in chalk, culvert, &c., £1160; reservoir to hold 500,000 gallons of water, £3000; distributing mains, &c., £460. There was some plant to be disposed of, engines, &c., which it was estimated would produce £450. The total cost would be £9390. The Committee had not spent this sum alone on the works. The award cost £5500, and the actual works £3200. The sum estimated by the Committee to have been spent was £2750, and for this sum they had deepened and very much enlarged the lower pond, and covered part of the pond with concrete; they had also dug a well in the greensand 10 feet square and 64 feet deep, which would secure a considerable increase in their future supply, and they had prevented the water being impregnated with any vegetable or animal matter. They had a brick culvert, &c., and the whole of the land was to be sewered. These were the actual works they had in hand at the present time. With regard to the reservoir to be made at Ashley to hold 500,000 gallons of water, they had purchased the land and paid for it some time ago, but they had not been prepared with the plans at the time, and he thought that every one would agree that it was necessary to have a store in case of an emergency. It was also recommended to dig another well in the chalk at Knighton, which was specially recommended in Mr. Bristowe's report of 1863. In October, 1880, Mr. Easton confirmed this gentleman's opinion, that they should by this means obtain a large addition to the present supply. The Committee advised that the Council should ask for sanction to borrow money for the second well, but they need not spend the money yet, but wait until they saw the yield from the well they had already sunk. He did not think the ratepayers need take alarm at the expenditure of this considerable sum of money, seeing that they would be able to supply the town 25 per cent. cheaper than they did consumers outside the borough.

Mr. RIDDETT seconded the motion.

Mr. SPENCER said he thought the Council had already spent enough money on the water-works without obtaining any adequate results. They had exceeded the estimates by £3800, and now they were compelled to say that more works were required in order to make this £3800 profitable. He hoped when the application was inquired into by the Local Government Board's Inspector the ratepayers would oppose it, as he considered public money was being wasted.

Mr. NEWBOLD moved, as an amendment, that the report be referred back to the Water Committee.

Mr. SPENCER seconded the amendment.

The Mayor reminded the Council that if they voted against the motion it could not be brought up again for six months. In these works it was very difficult to follow plans, but they followed the advice of one of the most eminent Geologists—Mr. Bristowe—and also the advice of Mr. Easton, a well-known Engineer. He (the Mayor) held that it was a solemn and responsible duty to do the best they could to give the town an adequate supply of pure water.

The amendment was then put and lost, and the original motion carried.

LAMBETH WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Tuesday last, at the Offices, Brixton Hill, when the following report was presented:—

The Directors, in submitting the accompanying accounts for the half year ended March 31, 1881, duly certified as correct by the Government Auditor and by the Company's Auditors, congratulate the Proprietors on the steadily increasing prosperity of the Company.

During the half year 1337 houses and other supplies of water, estimated to yield an annual water-rental of £3212, have been connected with the Company's works, as against 1245 houses, estimated at a rental of £2969, in the six months ending March 31, 1880, which were in number and amount greatly in excess of those of any former corresponding period.

The capital account shows an expenditure in the six months of £15,432 0s. 4d., making a total capital outlay of £502,688 10s. 11d. since the Metropolitan Water Act was passed in 1871.

The bond debt has been reduced from £84,055, at which it stood on the 31st of March, by the payment of bonds due on the 1st of May, to £53,355. When this debt is extinguished a further issue of £92,000 share capital can be made to the Proprietors. On the 4th of February last a circular was issued inviting applications from any Proprietors who desired to deposit a sum to meet future calls at 3½ per cent. interest. In response thereto numerous offers were received, and £32,718 15s. have been paid in advance of calls.

The revenue account shows an increase in the water-rents, &c., of £4895 12s. 10d. over the six months ending March 31, 1880. Compared with the same period, the increase in the expenditure is £2293 2s. 9d. Some bills for paying from Newington Parish, which had not been rendered in due course as required, amounting to £1320 4s. 10d., account for this to a great extent, and the severe frost in January and February involved a heavy expense. On many days in those months more water was pumped than on any single day heretofore in the Company's experience.

The surplus transferred from the revenue account to the dividend and interest account is £43,928 19s. 1d. After payment of the interest on the bond debt and debenture stock, there remains an available sum of £41,441 12s. The Directors propose to supplement this amount by a temporary transfer of £500 from the contingency fund, and they recommend to the Proprietors the distribution of a dividend at the rate of 7 per cent. per annum (less income-tax), which will, it is estimated, amount to £41,783.

The Engineer reports as follows:—"The new reservoirs and filters at Ditton are finished, and have been in full operation for some two months, and the engines are also sufficiently advanced to pump water into the new upper reservoir. With the exception of some minor details, the whole of these works, which have been in progress for about three years, are now practically completed, and they bring to an end the extensive series of permanent works which were commenced in 1872 for the purpose of securing the excellent quality of the water supplied by the Company as apart from works for pumping or distribution. It is satisfactory to state that these new works quite fulfil the duties for which they were designed. At present the filtering-beds of the Company are of sufficient extent to filter the water at the most approved rate, and the quality of the water is such as to compare favourably with that of any of the London Companies, as stated by the three eminent chemists, Messrs. Crookes, Odling, and Tidy, in the report dated April 21, 1881, on the water supply of London, submitted by them to the Local Government Board. That portion of the Company's district lying south and east of the Sydenham range of hills is extending so rapidly that it has been found necessary to bring into it, by a series of large mains from the Norwood reservoir, a more copious supply of water. These mains are now in course of being laid down, and will be ready for use during the summer months of the present year. The Company's works, includ-

ing the extensive series of reservoirs, filters, engines, and pipes, are generally in sound condition and efficient working order."

The prescribed notices have been served on the owners and occupiers of 4337 houses, constituting a third division of constant supply in Lambeth and adjacent parishes, to be ready to receive such supply on the 1st of July next. At present 13,575 houses in the Company's district have constant supply, in 13,480 of which the fittings are in accordance with the Board of Trade regulations. Since the Company commenced affording constant service systematically by divisions, on Oct. 1, 1878, 9427 houses have been placed on this system. In combination with an efficient waste inspection, the Company, as well as the public, will ultimately benefit from the adoption of this important sanitary measure.

The Government have intimated their intention to apply for leave to bring in a Bill in the present session of Parliament for the constitution of a Public Water Authority, but no information regarding such measure has yet reached the Directors.

The Shareholders are no doubt aware that, owing to the very large increase in the business of the Company, the duties of the Secretary have also been materially increased; and the Directors, taking into consideration Mr. Louttit's great abilities, his unwearied attention to details, and his zealous devotion to the general interests of the Company, feel confident that the Proprietors will give their cordial support to a proposal that his salary be increased by £200 per annum, and they accordingly will propose to the general meeting a resolution to that effect.

The Directors retiring by rotation this year are Mr. John Deedes, Mr. Edward Thomas Edmonds Besley, Mr. George Puckle, and Mr. Adolphus William Young, all of whom are eligible, and offer themselves for re-election. The Auditor who retires by rotation this year, and who offers himself for re-election, is Mr. Burroughs Dickie Kershaw.

Dr.—REVENUE ACCOUNT, FOR THE HALF YEAR TO MARCH 31, 1881.

Maintenance.

To Maintenance and repair of impounding and service reservoirs, filtering-beds, works, and pipes, or for obtaining and storing of water, including the cost of materials and labour	£760 14 9
Maintenance and repair of mains, pipes, fittings, meters, and works connected with the distribution of water, including the cost of materials, labour, and renewals	7,041 4 6
Pumping and engine charges, including the cost of coals, wages, &c.	9,938 7 7
Filtration, including the cost of materials and labour	619 1 2
Salaries of Engineer (or Superintendent) and Clerks, and wages of Inspectors and Turncocks	2,823 18 9
Rents of houses and lands, accrued due to date, and owing by the Company	105 12 6
Thames Conservancy	1,126 0 0
Rates and taxes	3,910 12 4
	£26,325 11 7

Management.

Allowance to Directors	£922 10 0
Allowance to Company's Auditors	32 5 9
Salaries of Secretary, Accountant, and Office Clerks	884 5 0
Superannuations of servants of the Company	637 15 0
Commission to Collectors	1,914 13 1
Stationery, printing, and general establishment charges	427 15 10
Official Auditor and Water Examiner	69 17 0
	4,889 1 8
Dividend and interest account for transfer of profits	43,928 19 1
Balance carried to next account, to provide for losses	6,000 0 0
	£51,143 12 4

Cr.—REVENUE ACCOUNT.

By Balance brought from former account	£6,000 0 0
Add surcharges on rental to Sept. 30, 1880	522 14 3
	£6,522 14 3
Less sums written off as losses—viz.:	
Empty houses, houses cut off, and bad debts	5,305 18 9
	£1,216 15 6
Water-rents accrued to the date of this account	79,881 18 4
Rents of houses and lands accrued due to date and owing to the Company	20 16 0
Fees received for registration of shares, transfers, &c.	24 2 6
	£81,143 12 4

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, May 28, 1881.

Tar, 38s. to 40s. per ton.
 Ammonia liquor (sp. gr. 1.03), 24s. per ton.
 " sulphate (white), about £20 5s. per ton.
 " (good grey), £19 10s. to £19 15s. per ton.
 " muriate (brown), £26 per ton.
 Muriatic acid, £1 5s. to £1 10s. per ton.
 Sulphuric acid (brown vitriol), £2 15s. to £2 17s. 6d. per ton.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

We have been so busy in Edinburgh during the past week in purifying the ecclesiastical atmosphere of Scotland, that little attention has been paid to any other subject. Newspapers, morning after morning, have been teeming with the periphrastic utterances of orthodox divines, and gas managers who manifest a lively interest in the heretical views of a Free Church professor, or the "unsettling tendency" of sermons preached by an Established Church divine, are not therefore likely to lack mental manna for some time to come. But these proceedings, especially in the Free Church, cannot in any way be considered analogous to what has been or is being done in the gas world, unless, indeed, we except the high-handed mode in which the Professor of Hebrew has been metaphorically kicked from his chair. In this case a majority have thrown their constitution to the winds in order to expel their heretical brother; and in the other case which I have before my eye, a minority, consisting of one, has thought proper to override the Act of Parliament, and to introduce certain regulations as to the stamping of meters, which will prove a great annoyance to all meter makers, and which, if submitted to in Edinburgh, will do much to render meter-making rather a precarious operation. I think it is high time a strong protest was made about the way in which these things are to be managed here, and all I can say is, that if meter makers submit to the illegal ruling of one or two persons "dressed in a little brief authority," they deserve to be annoyed. On some future occasion I shall speak more plainly on the subject I merely hint at now.

As soon as the public become convinced that the adoption of a certain course is one not likely to prove conducive to their interests, there is hope for the introduction of reform. In a quiet and very general way it has been said over and over again in public prints, that the application of gas profits to city or other improvements is a sin against equity; but it is difficult to get attention thoroughly aroused on the subject. In Glasgow, where the price of gas is low, a large sum was recently devoted to the improvement of George Square; in Dumbarton the people have been saddled with a pier which does not pay, and a call is made upon the elastic purse of the Gas Manager to make good the deficit; whilst in Greenock the police rates are largely subsidized from the gas profits. The latest blast which has been heard on the subject comes from Arbroath. A person in that town, who "sees with both eyes open," writes to a local paper calling attention to the subject. The shoe which pinches, and compels him to cry out, is the price charged for gas in the town. In Dundee, as the writer points out, the price is 3s. 8d. per 1000

cubic feet; in Brechin it is 4s. 6d.; and in Arbroath it is 6d. dearer. But it is not alone the price of gas of which he complains; he finds fault also with the quality, which he says is very poor. He then winds up his letter by saying: "I would just make a remark about the manner in which the Commissioners disposed of a portion of the gas profits last year. What on earth had the Abbey improvements got to do with it? Had the tax been charged direct, nobody would have a word to say against it; but to take the gas profits and pay the debts of the Abbey improvements was far from being right, if not illegal." If a little more of this feeling were exhibited, commissioners would not dare thus to utilize the profits made from the consumers of gas, and then there would be some chance of gas being sold at the price which it costs to make and distribute. On the point as to the quality of gas in Arbroath, it is right to mention that the Editor of the paper in question, says, as a matter of justice, that within the last few months there has been an improvement in the quality of the gas supplied to the town.

Last night the employees at the Arbroath Gas-Works held a meeting in the Board-room, and presented to their Inspector, Mr. Henry Steele, a token of their esteem, prior to his leaving the works for a new sphere of labour. The testimonial took the shape of a handsome albert chain, locket, and pencil-case. The presentation was made by Mr. Carlow, who, while wishing Mr. Steele every success in his future career, gave expression to the kindly feeling which existed between the men at the works.

Referring to the appointment of Mr. Frank Scott to Kelso, the local paper of the district he is leaving says: "General regret will be expressed at his having to leave this community where his services have all along, during his residence of fully four years, been highly appreciated, and very successful. We heartily wish Mr. Scott every success in his new situation."

The adjourned annual meeting of the Buckie Gaslight Company was held on Saturday last, at which the report of the Directors was submitted. From this it appeared that the increase in the consumption of gas for the year ending the 15th of April was 83,000 cubic feet. Out of the profits the Directors recommended a dividend at the rate of 5 per cent., and that 2½ per cent. be written off for depreciation of apparatus, &c. The report was unanimously adopted.

The Directors of the Haddington Gas Company, at a meeting held on the 27th inst., agreed to reduce the price of gas, from and after May 15, 1881, from 6s. 8d. to 5s. 10d. per 1000 cubic feet.

After a good deal of local contention and wrangling, the party in favour of introducing a sufficient supply of pure water to the clean little sea-coast town of Elie have been successful, and now that this point has been attained, the work is pretty well through. On several occasions I have referred to the legal steps which were adopted to frustrate, if possible, the efforts of those who saw it was for their advantage as well as for that of the crowds of summer visitors who spend a brief period of the year in their midst, that there should be a plentiful and a wholesome supply of water; but it remains to be added that after the opposition had been defeated in two Courts to which the matter had been appealed, and after the opposition had indeed been formally withdrawn, the Chief Magistrate of Elie and the Treasurer resigned their offices. It consequently became a question whether the parties nominated to the vacant offices should introduce the scheme voluntarily or compulsorily. Two gentlemen favourable to the scheme have now been elected, and the result has been that the Commissioners, by a majority, have resolved to take steps to introduce water by gravitation. A scheme is likely to be adopted to supply Elie, Earlsferry, and St. Monance, which places are contiguous to each other.

It is satisfactory to learn that there is every probability of Carnoustie having a water supply ere long. The contention between the two parishes, who have a joint, but not equal interest in the village, ended, as I previously mentioned, in favour of Barry parish, but the minority, acting on the advice of Mr. Gale, C.E., of Glasgow, condemned the Brax scheme, which was favoured by the majority, and in the end an appeal was made to the Board of Supervision, who appointed Mr. Thomas Stevenson, C.E., of Edinburgh, to inquire into the subject. Acting upon this gentleman's report, the Board of Supervision have recommended the Public Works Loan Commissioners to advance the sum of £6000 to enable the works to be completed. In their communication to the Barry Parochial Board, the Board of Supervision say: "The Board are satisfied as to the nature of the works to be executed, and the mode of execution; and having regard to the durability of the works, and the amount of the rates charged and proposed to be charged upon the district for which the loan is required, they are of opinion that the loan may be safely spread over a period of 50 years."

During the past week the authorities at Nairn have had men employed cleaning the main water-pipe between Geddes and the town. The work is being done by Kennedy's scouring machine, and so effectually has it accomplished the work of removing the incrustations of ten years, that the water rises in the town to a height of 90 feet—a height it has not reached for some time.

On Saturday last a good supply of water was turned on for the district of Strathblane. This will remove complaints on the score of scarcity of water, which have been pretty frequent of late. The pressure of the water is such that it rises to a height of 40 feet in the district. It may be mentioned that the reservoir is built of concrete, covered with silicated granite pavement.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

Referring to the paragraph in last week's "Notes," in which mention is made of the tokens of regard that are to be presented to Mr. William Mackenzie at the forthcoming meeting of the North British Association of Gas Managers, I find that a mistake has crept in which should be corrected at once. They are on view at No. 261, Argyle Street, Glasgow, and not at No. 26, as was stated.

The gas liquor case to which I referred last week has now been raised and formally opened in the Glasgow Sheriff Court. The case in question is a dispute as to an alleged non-fulfilment of the terms of the contract entered into between the Coatbridge Gas Company and Messrs. James Ross and Co. It commenced on Wednesday before Sheriff Guthrie. Proof was brought forward at some length on that day, evidence being given, I understand, on the part of the Gas Company, by Mr. Robert Mitchell, late Manager at the Coatbridge Gas-Works, and other officials of the Company, and by Mr. S. Stewart, Manager of the Corporation Gas-Works, Greenock, and Dr. W. Wallace, Public Analyst and Gas Examiner, Glasgow. I am informed that the witnesses cited on the part of Messrs. Ross and Co. include Mr. J. Hislop, of Maryhill Gas-Works; Mr. T. Whimster, Gas Manager, Perth; Mr. Reid, late Manager, and Mr. Linton, present Manager of the Leith Gas-works; Mr. P. Watson, Gas Manager, Stirling; Mr. Boyd, Gas Manager, Alloa, and others. After proceeding so far, the Sheriff adjourned the further hearing of the case till next Wednesday. As the matter, therefore, is still *sub judice*, I shall not now venture to say anything further regarding it, lest I might be led to show a bias on either side of the dispute.

At a recent meeting of the Gaslight Company, Reuton, Vale of Leven—

Mr. Alexander Wylie presiding—it was resolved to purchase ground on the north side of the Company's works for the erection of a new gasholder. The extensions are to be carried out according to plans which are in course of preparation by Mr. James McGilchrist, of Dumbarton. It is estimated that the cost will be about £1200.

Schedules for the extension of the Stewarton Gas Company's works have been issued, and are now in the hands of the contractors. The proposed extensions, which will cost fully £1000, will include a new gasholder, the site chosen for which is on the other side of Annoch Water from the present works. The communication between them is to be by means of a light bridge. The fact of such extensions as these being projected at Renton and Stewarton shows that there are still some gas companies who are not yet afraid of being extinguished by the so-called "light of the future."

Some extensions are likewise to be made at the Linlithgow Gas-Works, the plans of which were considered and approved of at a special meeting of the Police Commissioners which was held last Monday.

The accumulation of gas coke has recently attained such enormous proportions at the Dalmarnock, Dawsholm, and Tradeston Gas-Works, that the Glasgow Corporation Gas Commissioners have lately given instructions for the price of riddled and unriddled coke to be sold at 3s. 6d. and 2s. 6d. per ton respectively.

Business was done in Glasgow Corporation 9 per cent. Gas Annuities yesterday at £225, which marked a rise of £1.

The town of Renfrew is threatened with a water famine, the supply in store being more limited than it was last year, when the consumers were put on short allowance for several months.

At the last meeting of the Town Council of Paisley, a report was read from the Master of Works, which stated that, as compared with the same period of last year, the supply of water for the town was about 20 days short. Since then the Water Commissioners have made their annual inspection of the various works under their charge, on which occasion they learned the unwelcome fact that the Rowbank reservoir was 6 feet lower than at the same time last year. The Magistrates are considering the advisability of shutting off the water supply from ten o'clock at night till six o'clock on the following morning.

A new water supply scheme is being carried out for Tighnabruach, a lovely seaside watering-place in the Kyles of Bute. The reservoir will have a storage capacity equal to a supply for five months for a population of 2000.

At the last ordinary meeting of the Police Commissioners of Linlithgow a resolution was passed fixing the water-rate for domestic purposes at 1s. per £1 of rental; and at the special meeting, held last Monday, the Provost moved to rescind the resolution, and to fix the rate at half this amount; but it was agreed by a majority, on the motion of Bailie Hardie, to adhere to the former decision.

A meeting of the Kirkcubright Town Council was held on Wednesday, when there was submitted a resolution by the Local Authority, stating "that there is still an insufficient water supply, and that unless the Town Council resolve to make an adequate increase in the supply, the Local Authority will have no alternative but to take the whole matter into their own hands." After some discussion, the letter was ordered to lie over for a week, when a special meeting will be held to consider the matter.

Some time ago complaints were made by several inhabitants of Newton-Stewart as to the impure nature of the water supply of the town, and in consequence the Police Commissioners had samples of the water sent for analysis. The complaints were shown to be well founded, and several of the public wells were ordered to be closed as unfit for domestic use. To remedy this state of matters, the Commissioners called in the services of Mr. W. R. Copland, C.E., of Glasgow, who has since made a survey of the district, with a view to bring in a supply by gravitation. His report was submitted to a recent meeting of the Commissioners. He recommends that a supply be obtained from the Caldstream Burn, and estimates the cost at £3250, exclusive of cost of land and tenants' damages. After deliberation the meeting resolved to have the water, along with samples from two other sources suggested, sent to Dr. Stevenson Macadam for analysis before proceeding further in the matter. Should the Caldstream scheme be adopted, it will necessitate an assessment of 8½d. per £1 of rental.

A much firmer tone has been experienced in the Glasgow pig iron market this week, and a very large amount of business has been done daily at improving prices. Beginning on Monday at 45s. cash, the price advanced until 46s. 4d. cash and 46s. 6d. one month were reached yesterday, the close being, for sellers, at 46s. 3d. and 46s. 5d. cash and one month respectively, buyers offering 1d. per ton less. It should be said, however, that much of the buying was to cover over-sales.

Dulness continues to prevail in the coal trade. The summer demand for home consumption is very low, and at most of the West Coast ports there is a falling off in the shipments. Prices and wages are both low.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

For both house-fire and steam coals there is a very limited demand, and stocks are accumulating rapidly, whilst prices continue to give way gradually. The better qualities of Arley for house-fire purposes can be bought at about 8s. 6d. per ton, and other descriptions of house coal range between this figure and 6s. 6d. per ton, according to quality; whilst common coal for steam purposes can be bought as low as 4s. 9d. up to 5s. 6d. per ton at the pit. The present condition of the market, so far as house-fire and steam coals are concerned, is, of course, affecting the price at which gas coals are being quoted for contracts, for which a fair number of inquiries have recently been coming into the market for deliveries over one to three years. For delivery over the next twelve months, colliery proprietors are willing to contract at low figures; but generally they are not open for more extended engagements, and it is only under considerable pressure that contracts can be placed for three years. The prices at which business has recently been done have ranged from a trifle under 5s. for common unscreened gas coal at the pit's mouth up to 6s. 6d. and 7s. for good screened qualities, and 7s. 6d. to 8s. for the better sorts of Arley gas coal. These figures may be taken as about the average quotations now being sent out from the leading collieries in the Wigan district raising coals suitable for gas-making purposes. Engine classes of fuel are in moderate demand, but supplies, as a rule, are tolerably plentiful, and prices are not more than maintained at late rates. Burgy at the pit fetches from 4s. 6d. to 5s., and good slack 3s. 9d. to 4s. 3d. per ton.

The iron trade continues in an extremely depressed condition, and prices still tend downward. Pig iron meets with little or no inquiry beyond small lots here and there, which are bought at low figures to cover the present very limited requirements of consumers as they arise. For Lancashire pig iron delivered into the Manchester district makers quote about 43s. to 44s. per ton, less 2½ per cent., but they are open to offers, and some outside brands are to be bought at considerably under these figures. Finished iron is also very dull, with £5 12s. 6d. to £5 15s. per ton being still about the average price for bars delivered into the Manchester district. Sheets have been a little more inquired for, but this seems to be the only department in which there has been any activity.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade continues depressed, and there is at present no perceptible sign of improvement; in fact, there is every appearance of its present dull state continuing for the remainder of the summer season. The decreasing demands of the local iron-making industries, together with the diminishing requirements for household consumption, has placed a sudden check upon the operations at the collieries throughout the district. Several of the pits having overstocked, are standing for a time, whilst many are not running more than two or three days per week. Even in the Cannock Chase neighbourhood, where activity is generally the greatest, the output is being very much curtailed. Notwithstanding, however, the depressed market, prices, so far as the recognized lists are taken, are rather firm, and higher too in comparison with the ruling rates of both raw and finished iron. There is plenty of underselling being practised, but it is chiefly done by the smaller proprietors raising inferior qualities, and who seek a ready market in the neighbouring mills and foundries. It is, however, satisfactory to note that, though a depressed state prevailed in the coal trade during the close of the past year, business transactions were fairly remunerative at some of the largest collieries. The report on the Pethall Coal and Iron Company, issued a few days ago, shows that a profit of £1665 6s. 1d. was made out of the year's trading.

The outlook in the iron trade is of much the same character as reported for the past few weeks. At the recent weekly meetings a slightly more animated tone prevailed in the finished department. The chief of the business done, however, was in medium quality, and better inquiry was traceable to the near approach of the Whitantide holidays, prior to which orders somewhat more extensive are usually given out. Marked bars hold firm to their quotation, but the call is unimportant; bars of second-class qualities receive more attention, though prices are exceedingly low. Nail rods sell better, and orders are reported of a more extended character. Gas plates are in fairly good request, but girder and boiler plates are rather dull of sale at £8 5s. to £9. Girder work generally is in request; prices, however, are of a variable nature. Puddled bars are receiving a better inquiry at £5 to £6 5s., and galvanizers sheets are asked for in heavier parcels.

The pig trade is very depressed; stocks are large, and the number of furnaces are gradually decreasing. Best pigs are scarcely asked for, and the low price of £3 does not find much response. Outside makes continue to be very freely offered in the market, and at such prices as are unremunerative, if not much below the cost of production.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The position of the coal trade in both the South and West Yorkshire colliery districts is very quiet, and with few exceptions the pits are working short time, yet the output is much in excess of the demand, and as a consequence prices are very low. The business doing with London is very moderate, as is evidenced by the quantity of coal carried by the Railway Companies. In the Metropolis, house coals obtained from the Yorkshire collieries are selling very low, Silkstones being quoted at 21s., and Barnsley thick-seam coal at 19s. per ton. The demand for the Eastern Counties and various other markets is not only quiet, but the competition is very keen.

Steam and locomotive coal is only in moderate request. The former class of fuel is being more freely sent to Hull and Grimsby, and it is expected that the Baltic ports having been opened the exports will increase. Fully half of what is being sent to Hull is conveyed by water. There is only a moderate tonnage sent to Goole from the West Riding pits.

With regard to gas coal, about an average tonnage for the season is being sent from the South Yorkshire collieries to Derby, Nottingham, Leeds, and other places, on account of contracts, some of which will expire shortly.

The coke trade is very flat, and as this branch of the coal trade has been so largely catered for by coalowners, the falling-off is very keenly felt. There is but a moderate tonnage of coke finding its way to North Lincolnshire, where less is required, owing to the quiet state of trade and the damping down of one of the Frodingham Iron Company's furnaces.

Some idea may be formed of the state of the coal trade when it is pointed out that only about time has been worked during the week at the pits in the Whitwood, Altofts, and Normanton districts, whilst others have only been able to work two days and a half. Several pits in the South Yorkshire coal-field are only making two and three days per week, yet this is more than suffices to stock the market.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The last two weeks' shipments of gas coals from the Tyne, Wear, and adjacent ports abroad, especially to the Baltic, have been very heavy; but the first rush to make up stocks is over. Business is therefore, by comparison, quieter. Exports are still very considerable; the shipments being in the fulfilment of extensive contracts made in March for deliveries month after month during the summer, and to commence at the first open water. I stated at the time that those contracts had been taken at comparatively low figures. The freight market continues to work against the shippers, who are obliged to pay fully 1s. per ton more than they estimated. Some idea may be formed of the enormous character of the Durham and Northumberland coal trade—Durham is the district which supplies gas coals most largely—from the fact that inclusive of the small output of Cumberland and Westmoreland, no less than 36,681,569 tons of coals were raised last year. This is more than the yield of the whole kingdom 60 years ago. It is the highest yet attained, and Durham is the largest of the coal-producing counties of the kingdom. Nearly all the coal needed coastwise is carried by regular steamers over the summer months. The shipments therefore are of a pretty uniform character. The largest exports are steam coals. The coke trade is unaltered. The most important consideration in connection with the general trade in coals is price. It is a matter of notoriety that in all departments of the great trade in the North, profits, when they have been made, have had to be cut fine over the past four or five years, and in this respect there is no change. As circumstances have served to favour, the colliery owners have attempted, from time to time, to establish a rise; an official rate has been impossible; but, like a whip applied to a slow-stepping horse, it has gone forward with a few jerks, but has as uniformly fallen back upon its former pace. That is so this summer. There have been talks about advances, or proposed advances in prices, but they have all come to nothing. High profits were killed by the enormous development of second-class collieries in 1874-5, in the time of inflated prices, and also from a considerable amount of colliery property having passed into limited liability companies. The prosperity of these undertakings depended upon the iron trade. When it collapsed, quantities of second-class coals were brought into the market to compete with other and better varieties, and they have continued to press upon the trade ever since.

The general business of the North is not very much altered from last report. The iron trade is dull in all its branches. No great amount of new business is transacted in gas and water pipes. The best fire-brick and fire-clay goods manufacturers show an extensive business and large shipments; but second-class makers have a difficulty in keeping up prices, and in finding a ready market for their produce. The chemical trade shows a slight improvement; but business is still done without profit, and in the sale of some articles at a considerable loss. The copper, lead, and cement trades are unaltered.

SMETHWICK AND THE BIRMINGHAM CORPORATION GAS ARBITRATION.—The price to be paid by the Smethwick Local Board for their portion of the Birmingham Corporation gas undertaking has just been decided by the Arbitrator, Sir Henry Hunt. The sum asked by the Corporation was £62,000; the amount offered by the Smethwick Local Board was £46,000. The price fixed by the Arbitrator is £52,250.

THE WATER SUPPLY OF DAWLISH.—The new works which have been in course of construction for the supply of Dawlish with water are now approaching completion, and were recently inspected by the members of the Local Board, accompanied by their Clerk, Surveyor, and the Sanitary Inspector. The source of supply is at the Thorns, and the water is delivered at the rate of 200 gallons per minute into the intake chamber, from which it passes through the filters into the 5-inch supply-pipe to the reservoir, situated at the Burrows. This reservoir is constructed to contain 500,000 gallons, and from it the water will flow into the town through a 4-inch pipe. The works have been carried out under the direction of the Surveyor (Mr. Ellis).

DEATH OF MR. JAMES WEBSTER.—A Gas Manager north of the Tweed writes: "Your Scotch correspondents have omitted to notice the removal by death from amongst us of Mr. J. Webster, Manager of the gas-works at North Berwick. He had charge of the works since the formation of the Company 35 years ago; and when the increase of that fashionable watering-place necessitated an additional water supply the Water Company also appointed him their Manager. His management of both concerns was successful, and his loss is much felt by the community at large. His presence will be greatly missed by visitors from all parts of the kingdom who have been in the habit of spending their summer in North Berwick; as, from a large amount of pawky humour possessed by him, his company was much sought after. His successor, I understand, is Mr. Meiklejohn."

EXHIBITION OF GAS APPARATUS AT ROMSEY.—On Monday and Tuesday last week an exhibition of gas cooking and heating apparatus, burners, and other appliances, was held in the Corn Exchange, Romsey, under the auspices of the Romsey Gas Company. The exhibition was officially opened at noon on Monday, the 23rd inst., by the Mayor (W. E. Godfrey, Esq., J.P.), who was supported by the Right Hon. Lord Mount-Temple

and a number of ladies and gentlemen connected with the Gas Company and with the town. The Chairman of the Company (Mr. W. O. Purchase), in a short address, testified from 30 years' experience, to the advantage of using gas for cooking purposes, dwelling upon its comfort, cleanliness, and he thought he might say economy. After a few remarks from the Mayor and Lord Mount-Temple, the Rev. E. L. Berthon referred to the competition of gas and electricity, remarking that though the latter great discovery was likely to become light and motive power, yet he thought gas had nothing to fear from its rival. As to the cooking and heating stoves then exhibited, he thought they would prove a great boon, especially if gas could be reduced in price to about 8s. per 1000 feet. The various stoves were then examined, their merits being put to a practical test by Mrs. Faulkner, who at one of the large stoves cooked a dinner which was partaken of by the Mayor and some of the principal visitors, by whom the successful treatment the joints had received was fully attested. A large number of persons visited the exhibition during the two days it was open, and Mr. W. Faulkner (the Company's Manager), who originated it, and supervised all the arrangements, may be congratulated on the success which attended his efforts.

THE WATER SUPPLY OF LEYLAND.—On Thursday, the 19th inst., Mr. J. T. Harrison, C.E., one of the Local Government Board Inspectors, held an inquiry into an application made by the Leyland Local Board for power to borrow £5000 for works of water supply. It was stated in support of the application that some time ago the Local Board were struck with the inadequate supply of water to the district, and a little later the Local Government Board called their attention to the subject, they having seen a report made by the Board's Medical Officer, the latter portion of which urged that some scheme for supplying the township with water was necessary, considering the inadequate supply then existing. This report led to an inquiry by the Local Government Board, the result of which was that the Urban Sanitary Authority were advised to obtain a supply of water for the district. At that time the Manchester Corporation were engaged with their Thirlmere scheme, and as the pipes would have to pass through the township it was thought wise to apply to the Corporation for a supply. This idea, however, fell through, and it was next deemed advisable that the Board should obtain a supply of their own. They had been in communication with Mr. Tomlison on the subject, and he had reported on various sites, and this report had been forwarded to the Local Government Board. Subsequently the Board requested Mr. De Rance, of the Geological Survey, to send in a report, and this stated that he had examined the various sites proposed, which were seven in number, and found that from them an adequate supply of good water might be obtained. The provisional agreements for the acquisition of the land had been entered into, and all that was now required was the Local Government Board's sanction to the loan. The Inspector expressed his approval of the scheme, and promised to report accordingly.

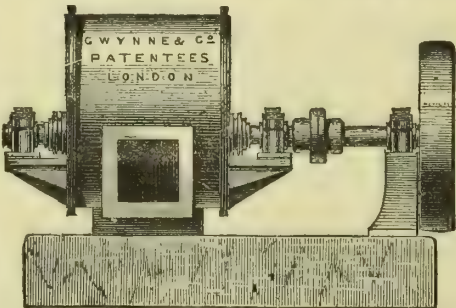
RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending May 25, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.7	17.1	17.4	11.8	9.1	10.1	0.0	0.0	0.0	None.	In excess.
	Camden Town	17.8	17.2	17.5	12.9	9.6	10.9	0.0	0.0	0.0	"	"
	Dalston	ratus	under	repair	8.6	8.6	8.6	0.0	0.0	0.0	"	"
	Bow	17.5	16.7	17.1	13.1	10.1	11.3	1.0	0.9	0.9	"	"
	Chelsea	16.9	16.6	16.7	12.9	11.8	12.4	0.2	0.0	0.0	"	"
	Kingsland Road	17.7	16.6	17.1	13.8	10.9	12.5	0.2	0.0	0.1	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas) . . .	21.7	21.2	21.5	9.0	6.7	8.0	0.2	0.0	0.0	"	"
	Peckham	16.8	16.4	16.6	11.2	8.6	10.4	0.3	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.5	16.8	17.2	10.3	9.1	9.7	0.3	0.1	0.2	"	"
	St. George-in-the-East . . .	17.4	16.4	17.0	13.0	8.2	10.5	0.5	0.1	0.3	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.
Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

S.—Do not see what you will gain. There will be great loss of power.
W. L. C.—We are at present so pressed for space in the JOURNAL that there is not much chance of our noticing the lectures just now.
A. G. H.—The correspondence a copy of which you send (interesting as it is in itself) is so inconclusive as not to warrant our devoting the space necessary to give it in full. When a definite conclusion is arrived at, we may perhaps have something to say on the subject.
W. I. E.—There is nothing in your letter to warrant its insertion. As to whether "a better machine . . . was protected by Woodcock's patent in 1842" is a matter of opinion, concerning which our readers can judge for themselves. Even had your letter been otherwise suitable, it would not have been given without your full address.
No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 7, 1881.

THE SUGGESTED GAS INSTITUTION.

EVERY member of the British Association of Gas Managers is now in possession of the new rules proposed to be laid before the forthcoming Birmingham meeting, and will therefore be able to judge of the extent to which any change is officially contemplated by the Committee. We may take it that the printed draft just issued represents no more than the farthest advance in the direction of reform for which unanimity could be secured; and we shall be surprised if it does not transpire, before the matter is disposed of, that more than one member of the Committee is prepared to go a long way beyond these tentative proposals. This may be supposed without arguing anything like disagreement among the authorities; the principal fact that a change is considered advisable remains, and when this is agreed on it is of little consequence that all should be prepared to advance together to the same new boundary line. If this consideration did not prevail, we should confess to a feeling of disappointment with what is proposed to be done, but with the present hope

that the time when these things are to be discussed will be taken as the occasion for a fundamental reconsideration of the official recommendations, we decline to be discouraged. In the first place, with respect to the proposed title of the new society we shall have little to say. In view of the admission of a body of members who will not be gas managers, the present style must be changed, or an irritating misnomer would remain. The suggested title is as good as any; brief—which is a great merit—and at the same time comprehensive. There is a subtle implication running through the draft rules, that an Institution is something different from an Association, and the proposed alteration of the name of the governing body from Committee to Council lends colour to this idea. We have, however, searched in vain through the new constitution for any positive indication of what in the present instance makes the difference real. We can imagine on general principles what might be indicated by the deliberate assumption of one style in place of the other. It may be urged that agglomerations of individuals, with any more or less definite calling, term themselves indifferently Institutions, Associations, Societies, and what not, and that therefore one name is as good as another; but these are different cases from that of a change of name, for the reasons given. In this case the chosen name means something, or it does not, and it can only have a real import when its suggested interpretation is borne out by the coincidence of facts. Hence if, as may be supposed, the Gas Institution is intended to appear something higher, better, and more important in every way than the old organization which it displaces, how is it to be made so in fact? If we turn to the draft rules we shall find, among sundry details of inner administration, the one radical change which must be taken as the cause of the alteration of name—the proposed admission of a secondary class of associates. Now this step, although good and necessary in its way, distinctly points to the extension of the Association downward instead of upward; it broadens its base without increasing its altitude. Consequently, to continue the figure, the height must be also enhanced if the form of the structure is to be what it was before. There is no provision of this nature in the scheme before us, no foreshadowing of special work to be done by the new machinery which is to be made up in this way, no indication of the use to which even the associates are to be put, or the benefits they are to derive together with the somewhat mangled rights which they are to receive. We must repeat our previously expressed conviction that unless new and better work is to be done by the Institution, the widening of its boundaries will be a positive evil, by letting in a crowd of new members who will infallibly destroy the old social fabric, without (in default of direction) adding in the slightest degree to its credit or usefulness in other ways.

We have so recently dealt with the whole subject, that any repetition of our former remarks on this particular division of it is unnecessary. We have already indicated with sufficient breadth some of the directions in which the work of the Institution might be made useful and authoritative, in a measure of which the existing organization has shown itself incapable or unapt. The establishment of technical committees; the watching of matters of interest to the profession, as they arise; the quiet intercommunication of thought, by members, on problematical subjects; the examination of apparatus; and, finally, the instruction and elevation of the rising recruits of the gas industry—are all open to masterful treatment at the hands of an impersonal authority. Are these things to be taken up—in other words, is the Institution to be a strong creation of men earnest in their endeavours to advance the position and estimation of their work in the world; or is it to be a less manageable, more heterogeneous and unsocial edition of the present Association, superior to the district societies only in numbers, and not in the manner of its work nor in its power as an engine for circulating information? This is an alternative which cannot be avoided, although opinions may with some reason differ respecting the imminence of all the consequences which will certainly ensue from the changes to be first made. We do not assume that it will be necessary to undertake the indicated duties at once or altogether; it would, indeed, be right to go safely and cautiously from one advanced post to another as the ground shall appear sure. We merely desire to point out that it would be a grave mistake to suppose that the first alterations will be the last; the process of reform, once begun, must be followed up without hurry and without delay. Whether they come sooner or later, these extended responsibilities are surely waiting in the future, and the

Institution will not completely fill its place until it has met them all, and perhaps others also of which we have not as yet any promise. In the hope that these future possibilities of the incorporation of all the personality of the art and mystery of gas lighting in one harmonious company will approve themselves to the interested as privileges rather than as terrors, we commend the subject to all whom it may concern.

SUSPENSION OF NEGOTIATIONS FOR FURTHER METROPOLITAN GAS AMALGAMATION.

SINCE we last noticed the subject, the negotiations for amalgamation of the London Gas Company with The Gaslight and Coke Company have been going on, and have only just terminated, as we expected, without result. For this unsatisfactory conclusion the Court of the London Company are apparently responsible, as they required terms not only better than the amalgamating Company could legally or consistently offer, but also greatly more favourable than they will obtain for themselves when they next go to Parliament; at the same time scorning offers which must in all fairness be deemed liberal. It is well known that the Governor of the London Company is an admirer of a steady ten per cent. dividend, rather than of the fascinating, but more unsettled sliding-scale dividend. He shakes his head when shareholders in other Companies speak of twelve per cent. stock, and turns away when like privileges are offered to himself. Therefore it is only consistent in him and his colleagues to ask that their ordinary stock, if transferred to other guardianship, shall have its maximum dividend guaranteed. This is only fair, as the guarantee would stand in place of the extra profit that might otherwise be earned if the stock were made ordinary sliding-scale capital; but it is difficult to find any justification for the demand that preference stock composed of the London ordinary capital should rank before the existing preferences borne by the amalgamating Company. The latter are stocks of different denominations, taken over from the various undertakings already amalgamated by the Chartered Company, and their sequence is purely chronological, having no money value in the market. This is readily conceivable when it is remembered that although entered under a formidable-looking collection of alphabetical headings, their total amount is a very small percentage of the ordinary capital which bears more than full dividends. It is therefore idle to suppose that the value of a maximum preference, such as that offered to the London Company in return for their ordinary stock, would show any difference in value, whether it ranked before, with, or immediately after these existing classes of preference stock; but at the same time it is easy to see that there would be grave obstacles in the way of giving the new stock a rank before the older denomination. In the first place, whatever theoretical advantage might attach to the primary charge—for, as already stated, we do not believe in the existence of any tangible difference between the classes—The Gaslight and Coke Company have no power to take it away from their old stockholders, and give it to new claimants who have no better title to it. Although a holder of existing "C" stock, for example, may be unable to sell his property for more money than the proprietor of "G" stock—so that, as far as individual interests are concerned, it would not matter in the least degree if all the present distinctions between guaranteed stocks were swept away—both holders would have reason to object to being set aside in favour of another person. They hold a position nominally different, but actually equal, and none can disturb them. In demanding priority of this kind, therefore, the Court of the London Company must have been aware that they were asking for the moon, and were taking the surest step for rendering an ultimate agreement impossible. There may have been other differences between the parties, all of which could, however, have been arranged, and in electing to break off negotiations in consequence of the dead-lock on the preference question, the Court of the London Company have, to our mind, shown an amount of impracticability of which they would not have been previously accused.

GAS AFFAIRS AT NORWICH.

ONE of the greatest living authorities on gas lighting—in his own estimation—is to be found in Norwich, and to the Town Council of this ancient city are his lectures on the subject periodically delivered. This gentleman finds much enjoyment in the investigation of the affairs of the British Gaslight Company, who have one of their principal stations in the town, and the manner in which the affairs of the Company are carried on never fails to suggest to his mind an infinity of ways whereby they might be better managed. It is to be regretted

that a critic of such power should be debarred from partaking actively in the work of administration, in which he would doubtless shine, for he knows to a penny how much gas costs in production—everywhere but in Norwich. He is also a practical experimentalist with gas as used for illuminating purposes, but prefers, instead of using a laboratory, to pursue his investigations by the aid of the public lamps. Fortified thus, he generally manages to block the way of other business in the Council meetings, by the delivery of diatribes against the Gas Company, brought forward on all possible occasions, and with as much utility to the cause he professes to espouse as may be surmised. Seriously, the British Gaslight Company are always in process of being arraigned in Norwich for all sorts of trivial and imaginary delinquencies which can be paraded to catch the ear of the groundlings. The method which has been recently selected to keep up an ill-feeling between the Norwich public and the Company is the old but still serviceable one of pointing to the towns wherein gas is sold cheaper, complaining of insufficient information as to the accounts of the local concern, ignoring the statements actually furnished, and constructing a fancy working account from imaginary data. For instance, the Company are as highly esteemed in Hull as they are abused in Norwich; but the Hull working is quoted against them in the latter place as affording convincing proof of the unfairness with which Norwich is treated. Mr. Linging, the Secretary of the Company, has repeatedly explained the reasons for the admitted inequality; but these are, of course, discredited by those who do not wish to be convinced of their mistakes. Again, the Norwich malcontents, professing ignorance of the Company's accounts, have recently asked permission for an inspection of the books by the Gas Committee. From this request it might be inferred that the Corporation are altogether in the dark on the financial question, the fact being that their own Auditor has, under the Company's Act of 1858, most extensive and unusual powers of inspection and examination; added to which the annual statements of accounts of all the Company's stations are published in the form required by general legislation. Facts such as these, incapable of being upset, however much they may be obscured by blind and senseless abuse, mis-called agitation, tend to show how little a trading organization working under legislative protection and control can expect to escape calumny, however carefully its obligations may be fulfilled. Trouble of this kind might, however, be generally passed over without notice, were it not that mud when thrown in sufficient plenty at an object sometimes sticks, and should be occasionally cleared away. The value of the chronic Norwich discontent may probably be considered equal to the scientific attainments of its chief instigator, already alluded to, who is reported to have recently stated that "an equal light could be obtained from petroleum 'at one-eighth the cost of gas.'" This, if true, would be undoubtedly the greatest discovery of our day; and if the inventor of the process—for we never heard of it before—can only demonstrate its general utility, we can safely promise that neither in Norwich nor elsewhere will Gas Companies long continue to vex the souls of the people.

THE ELECTRIC LIGHT IN DUBLIN.

THE offer of the Alliance and Dublin Consumers' Gas Company to lay down plant for lighting a portion of the streets of Dublin by electricity, under the direct control of the Corporation, has been declined. Any other result was scarcely to be looked for, as the authorities would naturally suspect the Company of some deep design, and be fearful of playing into their hands in some mysterious way. We cannot see that there was anything in the proposal other than the obvious intention of showing confidence in the power of gas to compete with electric lighting, with perhaps a desire to prove that an organization so well developed as a Gas Company is capable, if authorized, of supplying any other means of illumination with equal facility. There was, however, another applicant for permission to introduce electric lighting into Dublin, in the person of a local solicitor who had suddenly developed into Secretary of an Electric and Magnetic Company, promoted for the purpose of importing the Brush and Swan systems of lighting, with the necessary machinery; and the Dublin Corporation inclined towards this gentleman's proposals, although they were rather hazy, and, in effect, told the Gas Company to attend to their own business. It so happens that it is the business of the latter Company to supply artificial light of any kind, not limited to gas, although two ingenious Counsel were employed to make the clause in the Company's Act, under which this general power is exercised, bear a different construction to the plain meaning of its words.

If to this fact is added the claim of the Company, as a local concern, almost entirely owned in Dublin, to exert its powers to the full in the Shareholders' interest, it becomes clear that the Corporation have put a gratuitous slight upon the Company by passing them over in favour of an irresponsible and adventurous Company. Since the decision of the Town Council became known, bold advertisement of the Swan and Brush lamps has been given in Dublin, to the usual gaping wonderment of the people who saw these things for the first time, and several local scientific and medical gentlemen have become enthusiastic about the new means of lighting. One of them even went to the length of calling lighting by gas "stupid," and recommended Gas Companies to "leave lighting and illumination to modern science." To this it need only be replied that gas lighting endures because there is nothing in "modern science" to supplant it, howsoever "stupid" its use may appear; and with respect to the allegation of another Irish man of science, who is reported to have recently told his fellow-citizens that the present mode of gas manufacture is perhaps the most wasteful of all their manufactures, it may be said that, in any case, Gas Companies, besides making gas, can make no small amount of money, which is more than all electricians can accomplish. The proposed Dublin experiments in electric street lighting will not be of much importance, as the contractors will not at first be paid for the light; so we may expect every one to be satisfied with the spectacle until the Company grow tired, when perhaps the system may lose some of its charms, in view of the cost of its continuance.

Mr. D. M. NELSON, of Glasgow, announces his removal to new and more commodious premises, at No. 11, Bothwell Street—adjoining the Central Railway Station.

TAMPERING WITH GAS-METERS.—On Monday, the 30th ult., Henry Crompton and Herman Wright, the former a stallkeeper, the latter a butcher in the Southport Market, were charged before the local magistrates with having wilfully injured the gas-meters used by them, and belonging to the Corporation. The Town Clerk (Mr. W. Keighley) stated that the defendants were charged with having improperly tampered with their meters, so as to defraud. With respect to Crompton, it was proved that his meter was tested on the 10th ult., and it would not register. It was then removed to the Corporation Gas-Works and taken to pieces, when a large hole was found in the bottom. The hole, it was stated, could not have been pierced unless the meter had been disconnected from the pipe, and the hole must have been made with some square instrument. In Wright's case, it was shown that on the same day a Corporation official tested the meter, and that it passed gas without registering. It was then taken to pieces, and a large hole was discovered in the bottom of it. The meter was working correctly on the 9th of March. The defendants were each fined £2 and costs.

EXHIBITION OF GAS APPARATUS AT BASINGSTOKE.—An exhibition of gas apparatus, &c., was held in the Corn Exchange, Basingstoke, on the 27th, 28th, and 30th ult., under the auspices of the Basingstoke Gas Company. The exhibition was opened at noon on the 27th by the Mayor (Mr. W. H. Blatch), who, in the course of a brief address, said the thanks of the town were due to the Gas Company for the spirited manner in which they had taken upon themselves the duty of illustrating to the public what gas would do if properly used. He believed gas would, in the future, be more than ever used, and for many other purposes than merely giving light. The trouble and inconvenience of lighting a fire was met by the appliances about to be exhibited, which had this advantage, that they could be turned on and off at pleasure. After some few further remarks his Worship declared the exhibition open. On each day of the exhibition, joints, poultry, pastry, bread, &c., were sent and cooked free of expense, and in a very satisfactory manner. Mr. A. Thomas, the Company's Manager, superintended the arrangements. In connection with the above, it may be stated that the Directors of the Company announce that on the 1st of July the price of gas will be reduced to 4s. 7d per 1000 feet, and that on the 1st of January next year it will be further reduced to 4s. 2d.

THE WIGAN CORPORATION GAS ENGINEER AND THE ELECTRIC LIGHT.—Mr. J. G. Hawkins, the Gas Engineer to the Wigan Corporation, has just prepared a report to his Committee in regard to a visit he was instructed to pay to the Metropolis for the purpose of inspecting the various electric light systems at present in use. Mr. Hawkins seems to have been much impressed with the results attained in lighting the streets of London; and, on the subject of cost, says: "With the present appliances it is found that the electric light costs about double that of gas, but if light for light is taken as the basis, then the electric light is by far the cheaper of the two—in fact, I am certain that as the electric light becomes more generally used, it will be found that with proper centres of distribution it can be supplied at an exceedingly low figure compared with gas." He is careful, however, to guard himself against misinterpretation, for he continues: "It must not be supposed that in saying this I am inclined to think that illumination by gas will be entirely superseded by electricity, for that is not so. Gas will, in my opinion, hold its own against any other form of lighting for certain purposes. It is only to street lighting, the illumination of large spaces, large shops, and large buildings that the electric light can look forward with any amount of hope. Private lighting by gas will, in my opinion, never be seriously affected by the electric light, because there are so many intricacies continually cropping up against which gas has to withstand, and which it does successfully, but any single one of them might, where the electric light is employed, be the means of putting a whole district in total darkness. It is only where the whole thing, from one extreme to the other, can be brought under the personal control of the companies that the electric light can ever hope for success." The report, which will be laid before the Town Council at their next quarterly meeting, contains this postscript: "Though not requested by the Committee to make any recommendation with regard to carrying out experiments in Wigan at their cost, still I feel bound to say the success that has so far attended the use of the electric light, induces me to suggest that the Committee should at least try one of the systems on a scale just sufficiently large to enable them to satisfy themselves as to its cost and applicability to lighting the principal thoroughfares in Wigan."

Water and Sanitary Affairs.

THE difference between the estimated population of the Metropolis at the present time and that which the recent Census shows to be approximately correct, is of some practical moment. According to the estimate, the population of the Metropolis at the close of the present month would be 3,707,130, whereas the unrevised returns of the Census give a total of 3,814,571 on April 4, which by the end of the month is reckoned to become 3,829,751. Accordingly, the true figure exceeds the estimated by 122,621, and the increase of the Metropolitan population between the Census of 1871 and that of 1881 has been so much more than was reckoned upon. This is quite sufficient to affect the reported rate of mortality. For instance, the deaths in London last week were 1452, which, if compared with the estimate of population adopted the week before, would give an annual rate of mortality equal to 20·4 per thousand, whereas on the corrected account of the population the death-rate becomes 19·8. It happened that last week the Registrar-General issued an Annual Summary of the births, deaths, and causes of death in London during 1880, and took for the basis of his calculations the defective estimate which has prevailed since the previous Census. The population being under-estimated, the mortality would accordingly be made to appear higher than its true amount. Nevertheless, the Registrar-General states that the decennium which closed with the year 1880 "was one of lower mortality in London than any "of the previous decennial periods." He adds: "Moreover, when the decennium itself is split up into "two quinquennia, the second quinquennium (1876–80) "is found to have had a lower mortality than the "earlier one (1871–75)." These facts (which, as we have observed, are really below the mark) are cited by the Registrar-General as "strong evidence that the sanitary "efforts of recent years have not been unfruitful." The saving of life is also specified as "almost entirely due to "diminished mortality from causes whose destructive activity "is especially amenable to sanitary interference—namely, the "so-called zymotic diseases." The mortality from these diseases is shown to have fallen in the last decennium no less than twenty-five per cent. below the previous level. The death-rate from fever fell nearly sixty per cent. below the average of the three preceding decennia. Yet, despite all this improvement in the health of London, we find the same document, which gives so encouraging a view of the case, is accompanied by a report from Dr. Frankland, stating that "the water both of the Thames and the Lea is becoming "year by year less suitable for domestic use." Never since Dr. Frankland began his periodic analyses were the waters of the Thames so much polluted as they were last year, and the case is still worse with the Lea. How these things can be, we may perhaps consider at another time.

The fifth report on the London Water Supply, addressed to the President of the Local Government Board by Mr. Crookes, Dr. Odling, and Dr. Tidy, gives the results obtained by daily examinations of the water during the month ending May 19. It is stated that the waters generally have shown a continued improvement during the month, and have reached—somewhat earlier in the year than usual—a condition "of "extreme purity," so far as the presence of organic matter is concerned. The waters thus supplied are described as having been "uniformly clear, bright, and almost colourless," proving that they have been well and efficiently filtered. Examined chemically, they are said to have shown "excellent aëration and "great freedom from organic matter;" in short, "they leave "nothing to be desired for dietetic purposes." In only 9 out of the 182 samples, was it possible to detect the minutest trace of matter in suspension. The colour of the several waters, as seen in a two-foot tube, "has been as nearly as possible of the "tint of distilled water throughout the whole month." Following these satisfactory announcements, we have another almost equally satisfactory. Having urged upon Mr. Crookes and his colleagues that they should make their report synchronize with the ordinary calendar month, we are gratified to learn that the next report will be issued at the beginning of July, and will set forth the results of examinations made up to the end of June. This plan, we feel assured, will be found much more convenient for reference and comparison than the disjointed chronology hitherto adopted, and will afford altogether a more useful record.

Our contemporary, *Iron*, admits that "on the score of "quality nothing can possibly be urged against the London "Water Companies, seeing that they do everything to render "the water delivered pure." But the same journal goes on

to complain that the Companies are "still as remiss as ever in the matter of constant supply." It cannot be true that the Companies are as remiss "as ever," seeing that "all the Companies are now moving in the matter," as Lieut.-Col. Bolton says; whereas a couple of years back only some of them were doing so. Doubtless the progress made is less rapid than could be desired, considering the rate at which the population is increasing. Still the work is going on at something of a pace. Rather less than a year and a half ago—that is to say, at the close of 1879—Lieut.-Col. Bolton reported the number of houses under constant supply to be 141,068. In the return for April last, the number had increased to 168,597, being an advance of 27,529 houses, equal to nineteen per cent. in sixteen months. In this period the Lambeth Company had doubled the number of houses under constant supply in their district. Assuming that the course of improvement is almost *nil*, *Iron* undertakes to explain the phenomenon by stating that "the provision of compulsion by local authorities is a mere farce in the case of London, for, as far as we know, no such authority exists." The authorities may not choose to act, but they have the power to enforce the constant supply if they choose to take the trouble. If the Companies, who at their own instance are introducing the constant supply into thousands of houses in the course of a year, are to be denounced as being "remiss," what is to be said of the local authorities who, being invested with ample power to hasten the good work, choose to look on and do nothing? *Iron* predicts "there will be an explosion one of these days." Perhaps there may be, but we might not agree with our contemporary as to its direction and character.

The Southwark and Vauxhall Water Company are now fairly clear of their troubles with regard to the restitution of funds devoted to the capital account which should have been raised out of revenue. The last instalment is now paid off, and a considerable increase will accordingly take place in the amount available for dividend during future half years. The Directors draw the attention of the Proprietors to this circumstance in the report to be presented at the half-yearly meeting on Thursday next, and are at the same time able to recommend a dividend at the rate of seven per cent. per annum on the ordinary stock. The growth of the Company is also shown by the fact that more than 1300 houses have been brought into charge during the last six months. The total amount of revenue received from water-rates during the half year was £89,593, being an advance of £4782 on the corresponding period of the previous year. The Directors have been taking counsel with eminent geologists and other scientific men, as to the best mode of extending and improving their sources of supply, and have consequently decided on sinking wells on a piece of land purchased at Streatham, from whence they have every reason to believe a large supply of excellent water will be obtained. While we consider the outcry raised in certain quarters against the river water to be founded on a misconception of the facts, we recognize the wisdom of avoiding the river as much as possible in all extensions of the existing works. The construction of deep wells is much to be commended, as reducing the difficulties of filtration, and furnishing a most valuable auxiliary in seasons of flood.

The Cambridge Improvement Commissioners are considering how they may best divert the sewage of their district from the River Cam, and have received a very full report from their Medical Officer of Health (Dr. Anningson) respecting the treatment of the Coventry sewage by the River Purification Association, Limited. Sir Joseph Bazalgette has also been consulted, and has proposed a plan whereby the grosser matters contained in the sewage would first of all be strained off or deposited, to be mixed with ashes and town refuse, so as to produce a serviceable manure, the remainder of the sewage to be utilized on a farm. The Coventry scheme is one consisting partly of chemical treatment, the effluent being further purified by filtration through land. This method has the advantage of requiring only a comparatively small area for the operation; but it involves the use of chemicals and sundry appliances less simple than those proposed by Sir J. Bazalgette. A Special Committee of the Cambridge Commissioners, having the subject before them, recommended that a copy of Dr. Anningson's report should be sent to the Local Government Board, with an intimation that the Commissioners view the Coventry scheme favourably, but wish to know what objections the Board may entertain with regard to it. The Committee also recommended that Sir J. Bazalgette be informed of their preference for the Coventry method, rather than the system of irrigation which he had proposed.

These recommendations being presented at a meeting of the Commissioners, were adopted, one of the speakers observing that they could not view the scheme for a sewage farm without great apprehension, both on account of its magnitude and the risk which it involved.

The Dublin Sewerage controversy seems likely to last some little time. At a special meeting of the Corporation, held last week, application was made for a deputation to be received for the purpose of presenting a resolution passed at the recent meeting of working men and others, as mentioned in our columns last week. The resolution to be presented declared that the Local Government Board inquiry was "entirely unsatisfactory," owing to its limited nature, and urged the Corporation themselves to carry out "a searching investigation into the complaints made respecting the recently constructed sewers." On this application being laid before the meeting, the Lord Mayor observed that it was premature to go into the question further, until they had received the report of the Local Government Board Inspector. An animated discussion followed, in which all parties seemed to take one view of the case. There was a general agreement that one Mr. McEvoy, a member of the Corporation, who took part in the working men's meeting at the Rotunda, but who was absent on the present occasion, had behaved very unhandsomely in abusing the Corporation for a matter about which he uttered no protest at the time. Some rather strong things were said about Mr. McEvoy, especially by Mr. Gray, M.P., whose conduct had been severely criticized by the speakers at the Rotunda. One feature in the case is that Mr. Stanfield, the Scotchman who obtained the sewer contract, did so on a tender which was £12,000 below that of the Dublin contractors. This, according to the malcontents, came to pass because Mr. Stanfield knew the supervision of his work would be lax, so that he could carry out his contract pretty much as he liked. Accusations of this nature are obviously difficult to meet, and the Irish Local Government Board have carefully avoided being dragged into the details. Concerning the deputation from the Rotunda, the Corporation decided not to receive them; but with respect to the inquiry, it seemed to be felt that something more was needed, and there is every probability that the Corporation will carry the investigation further.

SALE OF GAS SHARES.—Last Tuesday week, Mr. J. Cotton sold by auction, at Bromsgrove, 35 fully-paid £1 shares in the Bromsgrove Gas Company, at the uniform price of 80s. each.

THE AWARD IN THE SMETHWICK GAS ARBITRATION.—The amount awarded by Sir Henry Hunt in the arbitration in reference to the price to be paid by the Smethwick Local Board for the portion of the Birmingham Corporation gas undertaking acquired by them is £53,344, and not £52,250 as stated last week.

PRESENTATION TO MR. J. B. ABBEY, OF HUDDERSFIELD.—Last Tuesday evening, about thirty of the *employés* in the Water-Works Department of the Huddersfield Corporation met for the purpose of presenting a writing cabinet, and a silver aneroid barometer, to Mr. J. B. Abbey, Assoc. M.Inst.C.E., on his retirement after nine years of service, from the management of the department. The cabinet was of walnut, and bore a suitable inscription. The chair was occupied by Mr. Henry Wilkinson; and the presentation was made, in suitable terms, by Mr. Thomas Shaw, who has been connected with the water-works for the past 37 years. Mr. Abbey said he did not feel that he merited all that had been said of him, but he accepted the remarks and the gifts as a recognition of the cordial feeling which it had always been his desire to foster. He received them as an expression of the confidence with which they had on many occasions entrusted to him the adjustment of matters relative to their own personal interests. It was not without regret that he was severing his connection with them and the works, to which he had been devoted nearly nine years; but it afforded him much satisfaction to be able to say (although perhaps he ought not to say it) that he should leave the works in such a state of efficiency as would compare well with the best arranged water-works in the kingdom. When he thought of the present magnitude of the works, and compared them with what they were only eight years ago, the rapidity with which they had been developed was marvellous. At that time the distribution area did not exceed 4 square miles, it was now upwards of 40 square miles. They were then giving an intermittent supply to about 85,000 inhabitants; now there was a population of upwards of 102,000 receiving a constant supply of water. Eight years ago the mileage of distributing mains was from 16 to 20; there were now more than 150 miles, independent of the supply or dead mains, of which there were 24 miles. He need not tell them that all these works had not been accomplished in so short a time without a little energy, nor was it necessary to remind them that it was only by strict discipline and constant care and attention that the efficiency of such works could be maintained. He felt proud to think that his efforts in this direction had been so well supported both by his office staff and outdoor staff, that they had only to continue in the faithful discharge of their duties—as he felt sure they would—to ensure the future success of the works. He assured them that he should highly prize the gifts they had made to him, and exhorted them to render all the assistance they could to his successor to the office, that he might the sooner become acquainted with the duties of the office. Mr. H. Telford said that the presentation had not been a formal matter with them; what they had done had been done out of the esteem with which Mr. Abbey had been regarded. He and Mr. Abbey had always worked comfortably together, and personally he should regret very much the severance. Other workmen present likewise offered a few remarks concerning the happy relations which had always existed between Mr. Abbey and those employed in the water-works department. The proceedings closed with a cordial vote of thanks to the Chairman for presiding.

Notes.

THE USE OF OXYGEN.

With reference to the communication by M. Guitton to the Société des Ingénieurs Civils on the Bria process for the production of cheap oxygen in practically unlimited quantity, M. Mallet, who has devoted many years' labour to the same object, makes some interesting observations on the utility of oxygen in the industrial arts. M. Mallet is the discoverer of the process, mentioned under his name in many treatises on chemistry, by which oxygen is extracted from air, previously rendered slightly damp, by the use of protochloride of copper. The latter compound becomes, under these circumstances, converted into oxychloride of copper, which, when heated to about 400° C., disengages its oxygen and regains the state of protochloride. This process is quite reliable, and as the material employed is capable of being used and restored an indefinite number of times, it is very economical. Having perfected the process, so long ago as 1866, M. Mallet was astonished to learn at that time that oxygen was commercially valueless, no profitable use for it having been found. Believing that the worthlessness of the gas was only due to the fact that chemists had not attempted to utilize it when obtainable only at a high price, M. Mallet set himself to find a use for his product. In this he was so unsuccessful that he was soon led to the conviction that there was scarcely any purpose for which oxygen was adapted, which could not equally well be fulfilled by atmospheric air. Among other attempts, M. Mallet endeavoured to obtain a lighting medium by the combination of oxygen with the flame of a highly carburetted liquid composed of petroleum spirit containing naphthaline in solution. This constituted the so-called oxy-carbonic light, and was brought out on a practical scale in Rhenish Prussia in 1869. M. Mallet's experiments, which are of considerable interest, were finally stopped by the war, and have never been published until now. He tried the carburized spirit with pure oxygen and with various mixtures of the gas of diminishing strength down to air alone. With pure oxygen the lamp, burning a certain quantity of spirit, gave an illuminating power of 100 candles; with equal proportions of oxygen and air the illuminating power of 95 candles was obtained; with 44 per cent. of oxygen the lamp gave 88-candle power; with 39 per cent. of gas it showed 64-candle power; and with 34 per cent. it dropped to 44 candles, below which the flame became smoky. The fact that lessening the supply of oxygen by one-half only diminished the illuminating power of the flame by 5 per cent. needs explanation, which is fortunately supplied by M. Mallet. He remarks that with pure oxygen the flame, although exceedingly brilliant, was very small, whereas with a diminution of the supply of gas the flame became larger, although, of course, the combustion was less intense, the net result being that given. The economy of this fact is noticeable, for with oxygen at 10s. per 1000 cubic feet, and spirit at 3s. per gallon, it enables a light equal to 100 candles to be produced at a cost of less than 3d. per hour. From these observations M. Mallet concludes that it would be useless to manufacture pure oxygen for lighting purposes, when it would need subsequent dilution by air. He considers the more profitable course would be to de-nitrogenize air; that is, to enrich it by the partial abstraction of its nitrogen, which might, in his opinion, be done at the simple expense of motive power, by taking proper advantage of the known difference in solubility of oxygen and nitrogen in water. By making a double solution, in a way which he did not fully describe, M. Mallet stated that air containing 52 per cent. of oxygen could be obtained.

GAS-ENGINES AT THE FRANKFORT OPERA HOUSE.

It is announced that, in order to guarantee the Opera House at Frankfort from all danger of fire, there have been established in the basement of a neighbouring building two pumps capable of raising 66,000 gallons of water per hour to a height of 60 feet. The motive power for these pumps is furnished by two Otto gas-engines of 50-horse power each, placed beside the pumps, and driving them by means of a shaft with friction gearing, which permits of one or both of the engines being worked at a time. During the period of representation within the house, one of these motors is kept slowly running, out of gear, so that on the first alarm being given a very few seconds only need elapse before all the machinery is in action. The consumption of gas for both engines when in full work is about 2540 cubic feet per hour; when out of gear it is only about 175 cubic feet per hour for one engine. The gas service-pipe is 6 inches in diameter, reduced to 4½ inches after branching off to the first engine. There is no special meter employed for this service, but a counter is provided to register the number of times gas is admitted to the cylinders, the volume of which was previously determined. The cylinders are cooled by a supply of water under pressure, the warm water returning to the reservoir. The products of combustion are taken away by a common pipe which communicates, through a depositing chamber, with the outer air. These are said to be the largest gas pumping-engines in existence, and their faculty of being instantly available, before steam could be raised in the best steam fire-engine boiler, is held to compensate for the additional cost of working, during the brief periods for which they would alone be required. They are said to give much satisfaction, and the theatre-going public have great confidence in the safeguards from sudden fires thus provided.

THE PARAFFIN OIL INDUSTRY.

In a paper read before the Institution of Civil Engineers on the 31st ult., Mr. R. H. Brunton described some of the more generally interesting features of the Scotch paraffin oil manufacture. It was

stated that since 1862, when the Boghead or Torbanehill mineral was worked out, this material has been derived from the bituminous shales existent in the coal measures. From 80 to 90 per cent. of the shale now worked is found in the counties of Linlithgow and Midlothian, and there is no apparent danger of the supply failing. There are in Scotland eighteen establishments for the production of petroleum oil, using together 1,036,000 tons of shale per annum, from which is obtained 34 million gallons of oil. From this are generally procured, by the process of rectification, 6 per cent. of naphtha, 35 per cent. of burning oils, 14 per cent. of lubricating oils, and 9 per cent. of solid paraffin, the remaining 36 per cent. being waste. The light portion of the naphtha is gasoline, used for carburetting air for burning as a substitute for coal gas; other portions are used for burning in open-air lamps, and for dissolving india-rubber; while the heavy portion is utilized for dissolving paraffin scale in the process of refining. There are several kinds of burning oils, called by different names, but the product is of variable illuminating power, and Mr. Brunton doubts whether paraffin is very superior in this respect to the vegetable oils when the latter are burnt, as for lighthouses, in the different forms of improved lamps lately designed for the purpose. Mr. Brunton mentioned the fact of mineral oil being, as a rule, too limpid for use as a lubricant, without admixture with a proportion of vegetable oil to give it the required viscosity, whereby it is enabled to adhere to the machinery. Mr. Brunton bore testimony to the great enterprise and skill of Dr. James Young, who, as he said, has made the manufacture what it is—a leading branch of Scottish industry.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE GAS INSTITUTION.

SIR,—I read with deep interest your recent remarks on the proposed alteration in the constitution of the British Association of Gas Managers; but have vainly searched the correspondence columns of the JOURNAL for the discussion and criticism of the same, which you invited from your readers. What, Sir, is the import of this universal silence? Can it be that the members are so wedded to a policy of "masterly inactivity" that so radical a change fails to arouse them; or is every one reserving his opinions for the annual meeting? Perhaps—to give it the most generous construction—the members have only been waiting to know the definite proposals of the Committee; and, now that these are issued, in the shape of the suggested rules of the new Institution, further silence is inexcusable.

I have been favoured with a sight of the document, and find that the Institution is to be composed of members, honorary members, and associates. Seeing that the principal departure from former procedure is in the admission of associates, I instinctively turned to the regulations affecting this latter class. I was, however, doomed to disappointment; as, upon the privileges of associates, the rules are almost silent, although, on the contrary, it is plainly set down that they shall not vote. In one thing the rules are explicit—the associates are to pay a subscription of 10s. 6d. each per annum (equal to the subscription of members elected prior to the alteration); in return for which they are to receive the Transactions of the Institution—a slight boon, seeing they can obtain the same thing in the JOURNAL. What is wanted is some means of educating the associates, so as to fit them more worthily to fulfil the duties of members; to which dignity there should be some hope of attainment, without waiting until they obtain the qualification of manager or secretary.

I trust that these ends will be kept in view when the matter receives final consideration.

June 3, 1881.

A WOULD-BE ASSOCIATE.

FATAL ACCIDENT TO MRS. SIMPSON, OF RUGBY.—A sad bereavement has befallen Mr. Peter Simpson, the respected Manager of the Rugby Gas-Works, in the death of his wife on last Saturday week. Mrs. Simpson was being driven by her nephew, in a dog-cart, through the lanes in the neighbourhood; and the latter alighted for the purpose of gathering some ferns, leaving a boy who accompanied them to attend to the horse. From some unexplained cause the animal started forward and ran into a deep dry ditch, throwing Mrs. Simpson out, and causing her to fall sideways on her head. The unfortunate lady was at once conveyed to a house near at hand, and attended by a medical man, who found she was suffering from shock, from which she alternately rallied and then fainted. There was a large scalp wound on the left side of the top of the head, the right collar-bone was broken, and the skull was fractured; and from these she died about two hours after the accident. Mrs. Simpson was much beloved by all who knew her, and general sympathy with Mr. Simpson in his loss has been expressed in the town.

INDIA-RUBBER JOINTS FOR MAIN-PIPES.—At the last meeting of the Société Technique de l'Industrie du Gaz en France, M. De la Chaumette brought under notice of the members a method he had adopted of using india-rubber rings for the joints of main pipes. The plan had been tried under ordinary conditions, and had been found to give satisfaction. The severe winter of 1879-80, however, afforded M. De la Chaumette an opportunity of testing his system under somewhat exceptional circumstances, and the results entirely bore out his previous experience of the joints. One point in favour of the system is that the elasticity of the india-rubber allows of a slight alteration taking place in the position of a pipe consequent upon the subsidence of the soil, or the expansion and contraction due to changes of temperature, without affecting in any way the soundness of the joint. During the long period of excessively cold weather in the winter referred to, when the frost penetrated for a considerable distance into the earth, a number of breakages of joints, made in the ordinary way with lead, took place, while not a single rupture was found over a considerable extent of mains where india-rubber had been employed for the joints, although the temperature had varied from 13° to 20° Fahr. below zero. These joints are said to be easily made and to be absolutely sound, when finished, while the pipes may be readily drawn asunder in the event of their having to be taken up—no inconsiderable point in favour of any system of jointing.

SOMERVILLE'S IMPROVEMENTS IN RETORT-FITTINGS.

THE closely related processes of closing the lid of a retort mouth-piece, and allowing the gas to pass as readily as possible into the mains while preventing its return, have exercised the ingenuity of a large number of gas engineers and practical mechanics, who have sought in many directions, and with more or less success, for the perfect lid-fastening and the never-failing seal, which are so easy to imagine and so difficult to realize. The requirements in both cases are so few and self-evident, and the successful appliances should therefore be so simple, that the fact of the want of such things, even at the present day, would be perplexing, were it not so well known that it is just such simple problems that are the most difficult to solve; they are like the weazel which was hunted for a fortnight by the man who knew very well where he was, but did not get him after all. We say this with no desire to disparage those admirable inventions which have from time to time been brought forward, and many of which are still widely held in favour. Some of these are very good, and if they are not so perfect as to render the continuous production of new and rival forms unnecessary and hopeless, it

would yet be invidious to point out wherein they fail. In describing some of the latest patented attempts in the same direction, we do not intend to imply that they are better in every way than those which have gone before; but it must at the same time be owned that, in some respects, they are very noteworthy.

Mr. John Somerville, whose self-sealing lid and dip-valve we are about to describe, is a practical gas engineer of such wide and varied experience, especially in all the details of works management, that he may be trusted in an eminent degree to know what he is doing in bringing out new arrangements of this kind; but, beyond this, Mr. Somerville was, we believe, one of the earliest to suggest the abolition of luting for retort-lids, and the substitution of metal-to-metal faces. This was so long ago as 1868, when Mr. Somerville was in Dublin, and the cumbrous compound retort mouthpieces and lids introduced there about that time by Messrs. Best and Holden had proved unworkable. These latter are noticeable as having been the first serious attempt to dispense with luting, and their failure was owing to other causes than the preference for the metallic joint,

although the bad form chosen for this had a great deal to do with it. The joint was intended to be made by the contact of two flat planed surfaces, of which the moveable one, belonging to the cover, was slid over the other. It is evident that a very little coke or tar would prevent these surfaces coming together; and, in fact, it was the burnt tar, which continually clogged the parts, that finally caused the abandonment of the idea in this form.

Shortly after this period, Mr. R. Morton brought out the lid which bears his name, and which, continually improved in accessories as experience dictated, is at the present time the most successful of its kind. Mr. Somerville's lid is essentially different from Mr. Morton's, as will be seen by the accompanying drawings. Figs. 1, 2, and 3 represent the mouthpiece and lid in side and front elevation and cross section respectively. The principal point, to which all the rest are auxiliary, is the method of making the joint. The Morton joint is made by the contact of a rounded edge with a plane surface; whereas Mr. Somerville's joint consists in the contact of the outside of the rim of the lid with the inner conical lip of the mouthpiece. It should be premised that the lid must be round, to which shape the \square mouthpiece shown in our illustration has been brought. The lid is bolted through its centre to a crossbar, which is hinged to the mouthpiece, the other end being secured by a catch, shown clearly in fig. 1. The bolt which passes through the lid, in which it is jammed tight, also passes loosely through a hole in the crossbar, and terminates in a lever handle. It will be observed in fig. 3 that the outside of the lid is provided with circular wedge-beading, showing like the half turn of a coarse screw-thread, which bears against studs on the inside edge of the crossbar. When the lid is swung into place, and the crossbar securely caught, a half turn of the handle of the lid causes the wedges to act against the crossbar, thus grinding the lid into its place with a circular action which is said to cut a bearing through any clogging tar or dirt that may be present. The whole arrangement is therefore quite simple, and the experience of the past winter at the Old Kent Road station of the South Metropolitan Gas Company has proved its efficacy.

The mouthpiece may also be fitted with an additional lever, or the catch already mentioned may be directly connected with a rod or chain passing up to the top of the hydraulic main, to actuate the so-called anti-dip pipe arrangement. Fig. 4 shows the details of Mr. Somerville's arrangement of anti-dip pipes; while figs. 5 and 6, on opposite page, give a general view of Mr. Somerville's patents applied to a bench of seven retorts, showing the method of combining the mouthpiece and hydraulic main fittings. The usual dip-pipe is retained, so that no stoppage is caused even if the apparatus should fail to act. To the lower end of the dip-pipe is attached a short bend, which turns one quarter round on its screw by means of the lever, which is actuated through the stuffing-box by an external lever, communicating with the mouthpiece fittings by the rod or chain before mentioned; so that when the lid is closed the bend is caused to revolve sufficiently to establish a free gas way above the liquid in the main, turning downwards and sealing itself again when the lid is

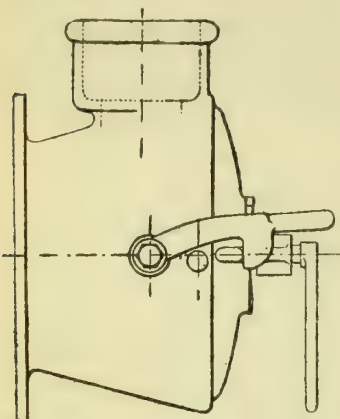


FIG. 1.

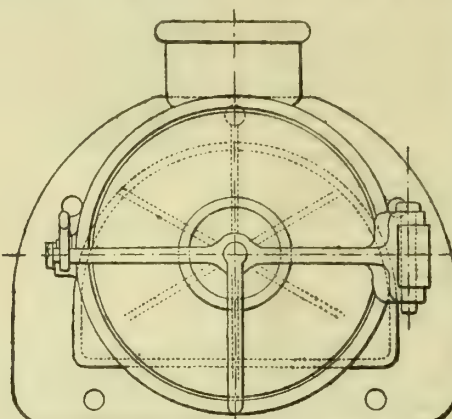


FIG. 2.

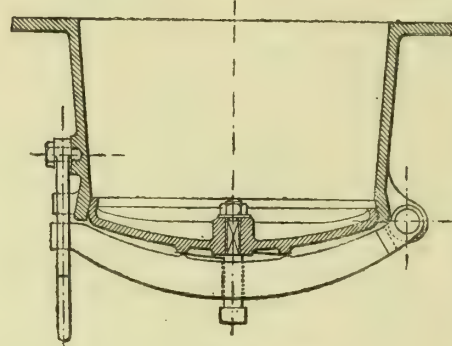


FIG. 3.

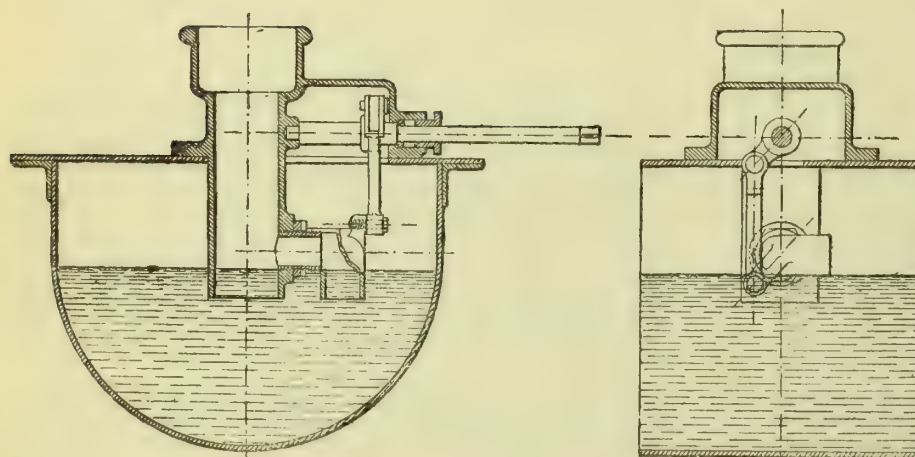
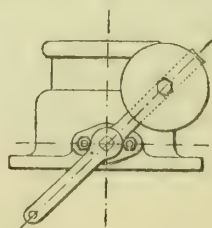
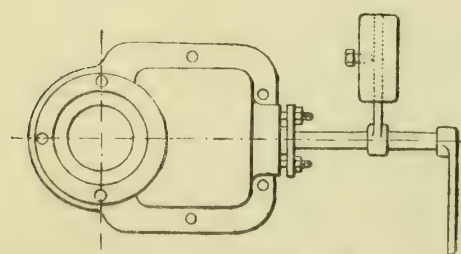


FIG. 4.

SOMERVILLE'S ANTI-DIP PIPE.—(Scale, 1 in. = 1 ft.)



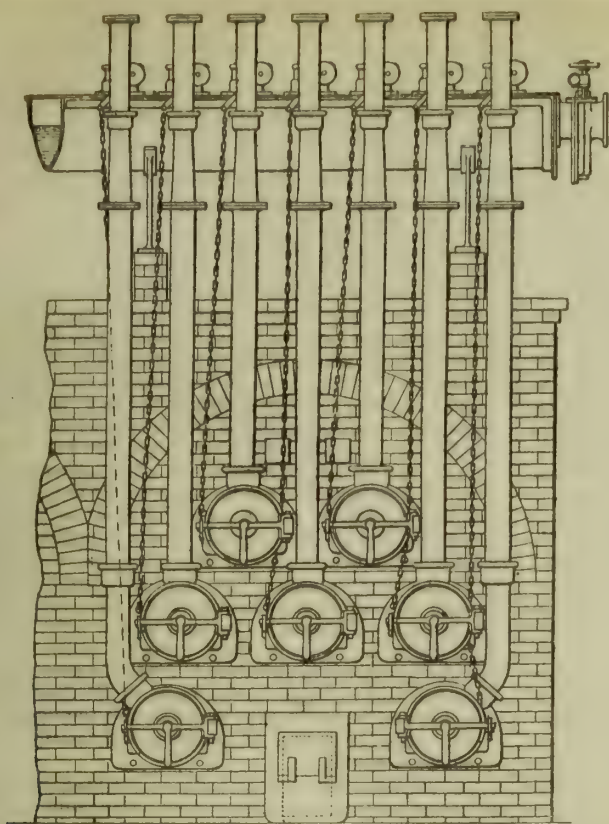


FIG. 5.

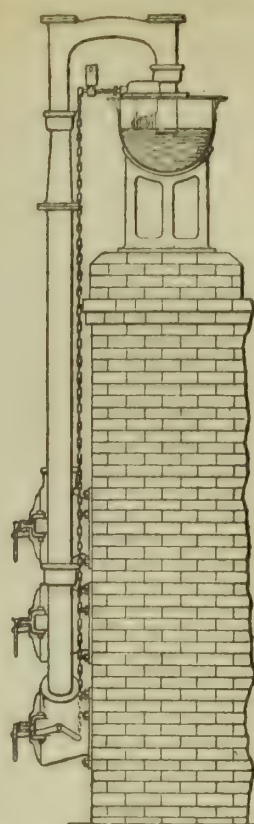
(Scale, $\frac{1}{4}$ in. = 1 ft.)

FIG. 6.

SOMERVILLE'S COMBINED RETORT-LIDS AND ANTI-DIP PIPES.

cast off. For new ironwork the arrangement is cast in one with the dip-pipe, but when the existing work is to be retained it is quite possible to fit up old dips with the new appliance without disturbing the hydraulic main.

We are well aware of the prejudice that exists against hydraulic main fittings requiring to be worked by rods and chains, in connection with the retort-closing operations or otherwise—especially when stuffing-boxes are also used, which is almost inevitable. This prejudice is well founded, as a general rule; but it by no means follows that Mr. Somerville's design is bad because he makes use of these things. A great point in his favour is that no harm can result from mishap in the working of his dip-bend; and, again, the motion of his

rods is very slight. The whole arrangement, and either division of it, is capable of being cheaply made; and while there is nothing to offend or to get out of order in either, we candidly own to a preference for the lid, which appears to be admirably thought out and carefully designed, with a clear view to practical necessities.

In the above illustration, Mann and Owens' patent valve is shown attached to the hydraulic main; and we understand that Messrs. S. Owens and Co., of Whitefriars, E.C., are now engaged in manufacturing a quantity of Somerville's retort-lids and anti-dip pipes, as described, for use at the Bankside station of the South Metropolitan Gas Company. A model of the appliances will be shown next week at the Birmingham meeting.

Communicated Article.

THE ROSS STOKING MACHINES.

By OUR AMERICAN CORRESPONDENT.

The Ross Stoking Machines having passed successfully through the experimental stage of their career, and fairly started on their work of supplanting manual labour in the retort-house, it will perhaps be of interest to your readers if I give a description of them, and an account of what has already been accomplished by their aid. The apparatus is the invention of Mr. A. Q. Ross, of Cincinnati, and is the result of four years of labour and experimenting on the part of this gentleman. The machines were first introduced at the Cincinnati Gas-Works, where they have been in continuous operation for eighteen months, and have given complete satisfaction; and very recently they have been adopted at the Eighteenth Street station of the Manhattan Gas Company, in New York.

There has not been any attempt in the Ross stoker to combine the two divisions of labour—discharging and charging—in one machine. On the contrary, a separate apparatus, complete in itself, is provided for the performance of each duty; the two machines being run on rails laid before the front wall of the benches, and parallel to it. The accompanying drawings of the machines,* as built for the Manhattan Gas Company, will give a clear idea of their construction and working. The machines run on an 8-foot gauge track, laid parallel with the retort-stack, the inner rail being 3 ft. 2 in. from the mouth-pieces. The discharging machine is supported on a light frame, 14 feet in length by 8 feet in width, composed of two longitudinal and five transverse 6-inch I-beams carried upon four wheels 24 inches in diameter and 4 inches on the face. On one side of the frame or carriage are the boiler, water-tank, feed-pump, and light traction-engine; and on the opposite side is the discharging apparatus proper. The boiler is of the vertical pattern, 7 feet high, 38 inches in diameter, having ten 6-inch flues 4 ft. 6 in. long. Adjoining the boiler is the water-tank, 7 ft. 0 $\frac{1}{2}$ in. high; and between the two is a small feed-pump, the traction-engine being behind the former. Each of these engines is well adapted for its duty, being very compact and with few working parts, well calculated to stand the wear to which

it will be subjected, and not likely to be deranged on account of the dusty atmosphere of the retort-house.

The frame in which the rakes work consists of two vertical cast-iron columns attached to the front and back of the platform respectively. The braces of the frame serve as guides for the reciprocating traveller, having also three wrought-iron pipe struts 12 ft. 9 in. long, tied by 1-inch tie-bolts 13 ft. 5 $\frac{1}{2}$ in. long, passing through their centres, and secured by nuts to the vertical columns. These pipe struts act as the rails upon which the traveller wheels run. To the column nearest the bench are fitted guides for the vertical play of a sliding box for controlling the height of the rakes. This guiding frame consists of three grooved and the same number of flat-faced rollers; and upon the former the rakes work, the latter being for the purpose of preventing the rakes leaving the grooved rollers, as might happen if the rake were suddenly stopped while being thrust into the retort. On the upper part of this guide frame, a lever with counterbalance weight is secured. The whole is governed by the handle shown at the rear, which acts by means of a compound lever, also shown. The reciprocating traveller at the rear of the frame consists of a cast-iron crosshead, riding between the guides upon two pairs of 6-inch grooved friction rollers. The rake-bars consist of flat iron bars 4 $\frac{1}{2}$ in. by 1 $\frac{1}{2}$ in. by 11-16ths inch; and 14 ft. 2 $\frac{3}{4}$ in. long, tapering from rear to front, and having at the rear end two grooves to fit over corresponding pins on the traveller and main frame, according as the rake is in or out of use. The rake-heads are of cast steel, made \square shape, with serrated edges, and are joined to the rake beams by rule joints. The rakes are actuated by means of a horizontal steam cylinder of 36-inch stroke, placed parallel to the traveller guides at their right. To the piston is attached a crosshead, moving in guides, to the under part of which is attached a rack, with teeth of 1 $\frac{1}{2}$ -inch pitch, which gears with a spur pinion, and upon the same shaft with the latter is keyed a drum, carrying the chain which operates the reciprocating traveller. This chain passes from the drum to grooved idler rollers, turning upon studs attached to the front and rear vertical columns—the four rollers being shown in the drawings by dotted lines—and secured upon opposite sides of the traveller. At the left of the pinion and above it are shown a water cylinder and air chamber for governing the speed and cushioning the impact of the reciprocating traveller. This water cylinder is situated on a line with the steam cylinder, and is connected with it by a piston-rod. The 2-inch pipe is shown connecting the two ends of the cylinder. The speed of the traveller is governed by the passage of the water through this pipe, which is

* See lithograph plate accompanying the present number of the JOURNAL. We may also refer our readers to the perspective view of the apparatus given in our issue of Nov. 30 last year, Vol. XXXVI., p. 855.—Ed. J.G.L.

It is to be understood that this table is only an estimate, as it is yet impossible to ascertain what should be charged for depreciation and repairs. A margin has been left in this connection, as in the figure for the hand stoking system I have not included any charge for repairs to rakes, scoops, and shovels, which, in a large works, is by no means a trifling item. Probably the charge for repairs and depreciation of the scoops, &c., for working 30 benches would be about 800 dols. (£160) a year. General Hickenlooper assures me that he is confident the allowance he made in his paper on the Ross stoker, read before the American Gaslight Association last Fall—namely, 10 per cent., or 1000 dols. (£200), a year—is ample. An inspection of the machines would seem to bear out this assertion, as they look as if they would last a great many years. In Cincinnati one man works each machine; in my estimate I have allowed one assistant to the two engineers.

Reckoning the make per retort per day at 6000 feet would give as the yearly production of 30 benches of sizes 394,200,000 feet. On this basis the following table will show at a glance the advantage accruing from the use of the Ross stoker:—

	Men required.	Gas made per Man per Year.	Cost of Stoking, per 1000 Cubic Feet.
Ross stoker . . . 20 . .	19,710,000 cubic feet . .	46c. or 2½d.	
Hand labour . . . 48 . .	8,212,500 . .	110c., 5½d.	

It will be of interest to endeavour to ascertain what is the smallest sized works in which the stoker can be adopted with a favourable financial result. I will consider then the result of its use in a works having six benches of sixes under fire in the summer, and twelve in the winter season:—

Ross Stoker.

Interest and depreciation as before	Dols. c.	£ s.
Two engineers (1 day, 1 night), at 2-50 dols., for 1 year	1600 00 or	320 0
Two " (1 " 1 ") " " " " 6 mos.	1825 00	365 0
Two " (1 " 1 ") " " " " 6 mos.	912 50	182 10
Two " (1 " 1 ") " " " " 6 mos.	540 00	108 0
Two firemen (1 " 1 ") " " " " 1 year	1460 00	292 0
Two " (1 " 1 ") " " " " 6 mos.	780 00	156 0
Fuel, say 20,000 bushels coke, at 6c. per bushel	1200 00	240 0
Water, lubricants, and sundries	160 00	80 0

Total 8417 50 or 1683 10

Hand Labour.

Ten stokers (5 day, 5 night), at 2-50 dols., for 1 year	Dols. c.	£ s.
Ten " (5 " 5 ") " " " " 6 mos.	8212 50 or	1642 10
	4106 25	821 5

Total 12,918 75 or 2463 15

Showing a yearly saving in favour of the Ross stoker of 3901 dols. 25c. (£780 5s.). I have allowed for lidmen during only one-half the year, as in summer their duties can be performed by the firemen. At this season one engineer can run the two machines. Thus it appears that the stoker can be advantageously adopted in works having 36 retorts in use at the season of the smallest consumption.

In the case of large works especially, it is not the financial result alone that is to be looked at; for, by the use of the stoker, a gas company is free from all the contingencies of manual labour—an important matter where a large number of men are employed. As to whether the stoker does the work as well as is done by hand labour, there can be no doubt. At the Manhattan works I examined a large number of retorts drawn by the machine, and found them thoroughly cleared out. At the same works I also saw that the coal was laid in the retort as evenly as any I have ever seen.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, MAY 30.

LOCAL GOVERNMENT (Gas) PROVISIONAL ORDER BILL.—The Examiners reported that the Standing Order applicable to this Bill had been complied with.

WATER PROVISIONAL ORDERS BILL.—This Bill was brought from the Commons, read the first time, and referred to the Examiners.

TUESDAY, MAY 31.

GAS PROVISIONAL ORDERS BILL.—The Examiners reported that the Standing Order applicable to this Bill had been complied with.

THURSDAY, JUNE 2.

WATER PROVISIONAL ORDERS BILL.—The Examiners reported that the Standing Order applicable to this Bill had been complied with.

The CHAIRMAN of COMMITTEES informed the House that the opposition to the Stalybridge Extension and Improvement Bill had been withdrawn.

LOCAL GOVERNMENT (Gas) PROVISIONAL ORDER BILL.—This Bill was read a second time, and committed.

HOUSE OF LORDS COMMITTEE.

FRIDAY, MAY 20.

(Before Lord BELMORE, Chairman; and Lords AMHERST, CLANBRASSILL, CLEMENTS, and KINTORE.)

DUDLEY GAS BILL.

Mr. VAUGHAN RICHARDS, Q.C., and Mr. LUMLEY SMITH, Q.C., appeared for the promoters; Mr. BIDDER, Q.C., and Mr. PEMBERTON STEPHENS for the Corporation of Dudley; Mr. SHIRESS WILL for the Upper Sedgley Local Board.

Mr. RICHARDS, in opening the case for the promoters, said that the Dudley Gaslight Company was incorporated in the year 1821, under an Act of Geo. IV., the capital being £12,000, in 600 shares of £20 each. By the year 1853 the whole of the capital was expended, and also an additional sum of £6000, which Parliament allowed to be capitalized, altering the £20 shares into £30 shares, on the ground that the expenditure had been made in the interests of the public. By the Act of 1853 the Company were also authorized to raise additional capital not exceeding £36,000, making a total of £54,000, in addition to which they had borrowed £2000. The Company had, however, expended—perhaps not wisely, but certainly

very generously—a total of £81,800 in plant, which was a great deal more than they were authorized to raise as capital. They now applied for power to raise additional capital, but they did not ask their lordships to capitalize the difference between this £81,800 and the £54,000, which they simply gave to the public, as they had only paid dividends upon the authorized parliamentary capital of £54,000.

The CHAIRMAN inquired what difference it made to the Shareholders. If the Company paid on £54,000 they paid a higher rate of dividend than if they paid on £81,000.

Mr. RICHARDS said this was not the case, because the Company were limited to a dividend of 10 per cent. For many years they had not received their full dividends, and there was now due a sum of something like £8000 for back dividends. By the present Bill an additional capital of £36,000 was asked for, for the purpose of erecting works essential for carrying on the business, and upon this capital a dividend of 7 per cent. was proposed, if it could be earned; and the auction clauses were also introduced, which took out of the hands of the existing Shareholders all interest in the new capital. The borrowing powers asked for were about the usual amount—viz., £11,500 with respect to the capital authorized in 1853, and the same with respect to that proposed by the present Bill. The illuminating power of the gas was proposed to be fixed at 15 candles, which was more than was usual in country districts; and it was also provided that a testing-place should be fitted up at the works of the Company, and that the gas should be supplied at a certain pressure. There was not a single clause spontaneously introduced into the Bill, except the one relating to fresh capital, all the others being introduced in compliance with the legislation of 1871; and under these circumstances, this being simply a money Bill, the *locus standi* of the Corporation of Dudley was objected to before the Court of Referees, and the objection was allowed. A representation was subsequently made to the Board of Trade that it was a very great grievance that corporations should not, on a money Bill, be enabled to go into every detail of price, pressure, illuminating power, and so on, and this idea having found sympathy at the Board of Trade, a Standing Order was proposed by the Board and agreed to by the House of Commons, giving corporations the power to be heard, although promoters simply applied for money powers. Their lordships, however, had always had the credit of being more liberal than the House of Commons on questions of *locus standi*, and therefore the new Standing Order did not affect them. With regard to the petitions which had been presented, it would be found that every possible question had been raised in them. The Dudley Corporation suggested that the Company had—of course, they meant imprudently—extended their mains beyond the suburbs of Dudley; but these suburbs were totally different now to what they were in 1821. With regard to Upper Sedgley, in common with other places, the Company had not gone there except by invitation. They had been a paying concern, and therefore no one had been prejudiced by what had been done. One allegation in the petition was that "by the Bill the Company seek to postpone the application to themselves of the Act of 1871 until January, 1882, and your petitioners believe that this postponement, combined with the large amount of capital (£20,000) they propose to raise in 1882, is done for the express purpose of enabling them to erect new works on certain lands which, but for this postponement, they would not be able to do, and also to postpone rendering the accounts which, under the Act of 1871, they would be compelled to render." The general opinion amongst gas companies had been that the Act of 1871 did not apply to companies which had come into existence prior to this date, but the Court of Queen's Bench had given a decision to the opposite effect, and as this decision had not yet been appealed against, it must be taken at present to be correct; but he (Mr. Richards) did not think the view taken by the Company, under the circumstances, was unreasonable or unnatural, and the same remark would apply to subsequent paragraphs in the petition. The Corporation also alleged that an investigation of the accounts of the Company showed that, "although the capital of the Company is limited to £56,000, they have, in fact, expended on works which ought to have been paid for wholly out of capital the sum of £81,802 14s. 6d., and that £23,251 1s. 10d. (part of that sum) has been paid out of profits made by the Company, and which should have been applied in making up deficiencies of back dividends of less than the prescribed amount, then in filling up the reserve fund required by the Gas-Works Clauses Act, 1847, to be created, and the balance of such profits should then have been applied in reducing the price of gas supplied to the consumers." It was not, however, £23,000, because really £5000 had been disposed of prior to 1853. It was not exactly in conformity with the Act. The Company might have paid their back dividends and have filled their reserve fund, and then have applied to Parliament for more capital; but the result would have been that the consumers would be paying more for their gas than they were at present. This £23,000 had been absolutely expended upon plant for the benefit of the consumers, and the Company did not ask for one halfpenny of it to be capitalized. It might not be exactly within the four corners of the Act of Parliament, but it was precisely what was done prior to 1853, when Parliament condoned the offence, and appeared to have marked their approval of what had been done, for they gave the Company every penny they had so expended. The 122nd section of the Companies' Clauses Act of 1845 stated: "Before apportioning the profit to be divided amongst the shareholders, the directors may, if they think fit, set aside thereout such sum as they may think proper to meet contingencies, or for enlarging, repairing, or improving the works connected with the undertaking, or any part thereof, and may divide the balance only among the shareholders." This was what had been done in the present case, and their lordships were aware that something of the kind must take place, because gas-works were especially liable to rapid deterioration, and in a short time they became good for nothing. Then would come a period when repairs must be made, and the whole dividend of a year would thus be eaten up; consequently the prudent thing was to form a depreciation fund, which had been done over and over again. Supposing what the Company had done had been illegal in every possible way, still the consumers had had the full benefit of the money expended, and had not been charged one penny for it; yet the Corporation alleged that they had a grievance upon the subject. The petitioners next submitted that no parliamentary powers should be given to the Company until the Directors should have "brought back and paid to the funds of the Company the whole of the moneys which since the passing of the Act of 1853 they have received and applied for purposes not authorized by their special Act and the Acts incorporated therewith, and shall have duly applied the moneys received from the sale of land and for premiums on shares for the purposes of their undertaking;" but if the Committee should be of a different opinion—and he (Mr. Richards) was glad to see the credit given to their lordships of the possibility of their being of a different opinion—and determined to grant further parliamentary powers to the Company, "then your petitioners respectfully submit that the capital the Company seek to raise is largely in excess of their fair requirements, and ought to be reduced in amount, and that a limit of time should be imposed for payment of arrears of dividend." On this point he could only say he hoped to make out to the satisfaction of the Committee that the Company required a considerable extension of their works, and therefore wanted a good

increase of capital, which would not be raised until it was absolutely needed. The Corporation also submitted that, "if the proposed or any capital be raised by the creation and issue of shares, your petitioners shall have a right of pre-emption in respect to a portion of the proposed capital, and be represented by a nominee of their own on the Board of Directors of the Company." The notion of a gentleman sitting at the Board professedly as a sort of spy, to carry from one body to the other what was going on, was rather good; but the Directors of the Company did not want such a nominee, as they did not think he would be at all a pleasant companion. Another paragraph stated that "the quality of the gas supplied by the Company, and the power and pressure thereof, are defective, and your petitioners submit that these should be increased, and that the maximum price, which in 1853 was fixed at 5s. 6d. per 1000 cubic feet, is excessive and should be reduced, and the same price be charged equally throughout the whole of the municipal borough; and that a testing-place should be provided at the offices of the Corporation." What did the Committee suppose to be the price of gas at Dudley? The petitioners had not the candour to say that, while the maximum price was fixed in 1853 at 5s. 3d., the price charged in Dudley was 3s., and in the outlying districts 3s. 9d. per 1000 feet. He did not know where the municipal boundary might be, but it was extremely unfair that any one living in a closely inhabited district near a gas company should have to pay precisely the same rate as a man who lived at a considerable distance. There was also a petition from the Upper Sedgley Local Board of Health—this district being a sort of suburb more or less approximate to Dudley—which was a mere echo of the one presented by the Corporation of Dudley. The petitioners stated that they were "desirous to obtain a supply of gas for themselves, but they will be precluded from doing so if the Company can bring the said district within their limits; and your petitioners are apprehensive that the effect of the Bill may be indirectly to recognize the said district as part of the said limits, and they are desirous that a clause may be inserted in the Bill to prevent this, and to compel the sale to your petitioners of the plant of the Company within the said district." This was a distinct request for the compulsory sale of so much of the plant as lay in Upper Sedgley; but there was not a single precedent in the annals of Parliament for such a proceeding in the case of a gas company. There was an instance a few years ago in the case of the Middlesbrough Water-Works Company; but he thought the Corporation of Middlesbrough would be extremely glad if they could get rid of the white elephant they purchased on that occasion. In conclusion, the learned Counsel said that, so far as the Bill went, the point raised was a very small one—it was simply a money Bill—and it would rest with the Committee to say to what extent they would enter into questions which did not arise on the face of the Bill, and how far it was desirable that every single question connected with a gas fight should be raised as proposed by the petitioners.

The following evidence was then called:—

Mr. G. W. Stevenson, examined by Mr. LUMLEY SMITH.

I have carefully examined the works of the Dudley Gas Company, and also the district and the accounts. The capital of the Company, amounting to £54,000, has all been expended, and also £2000 raised by loan. The Company cannot go on without further capital, as their business increases so rapidly. In 1857 the make of gas was about 32 million cubic feet, while in 1880 it was 120 million cubic feet. The share capital is low compared with the amount of business done. It is about £450 per million feet of gas made, while the average is from £600 to £700. An additional gasholder is required immediately. The Company's storage power is equal to 347,000 cubic feet, while their largest daily make is nearly double this amount, and the storage ought to be equal to the largest daily production. The Act of 1853 entitles the Company to hold six acres of land, of which between two and three acres are at present in use. For future extensions I think they would do better to select a site lower down than the present one, on account of its connection with the railway and the canal, which would give facilities for obtaining coals and also for getting rid of the residual products. When the Company obtain their additional land, they ought to expend from £20,000 to £30,000, but they require £10,000 instantly. The capital asked for is £46,000, which is to include the premiums on the sale of the shares, and £30,000 by loan, which is £76,000 altogether, and they will have to expend £72,000. The whole amount will be absorbed in ten years, and then the Company will have again to submit themselves to a revision by Parliament. It is proposed by the Bill that the illuminating power of the gas shall be 15 candles, although up to the present time there has been no limitation. The general illuminating power throughout the country is 14 candles. With regard to the testing-place—which it is provided in the present case shall be at the works of the Company—when gas is made at a distance from where it is supplied, it is usual to fix a spot 1000 yards from the works, because gas is supposed to lose something in illuminating power by travelling through a long length of mains. This is so, no doubt, where there is a mixture of coal and canal, because the heavier hydrocarbons become deposited in their passage through the mains, and when the gas arrives at its destination it has a lower power than when it is sent out from the works; but this does not apply where only common gas is supplied. In the present instance the works are in the centre of the district, and there is therefore no object in having the testing-place at the Town Hall instead of at the works; it is also practically inconvenient to the Company, because the tests ought not to be made in the absence of an officer of the Company, if penalties are to be enforced. The suburbs of Dudley spread very much, and are greatly undermined, causing the ground to keep settling. The Company have at various times expended considerable sums out of revenue for capital purposes. I do not know how much was properly applicable to revenue, and how much ought to have been charged to capital; but whatever has been expended in the way of extension of works in the past inures to the advantage of the present consumers of gas, because the capital of the Company is to this extent reduced at the present time. With regard to the desire of the Corporation to be represented on the Board of the Company, I consider it to be an unheard-of thing. I should think they have quite enough to do in Dudley to mind their own business. The price of gas in Dudley is 3s. per 1000 cubic feet for a consumption of 100,000 feet and upwards per quarter; below this quantity it is 3s. 3d. per 1000 feet. In Gornall, Sedgley, and Tividale, it is 3s. 6d. under 10,000 cubic feet. In Netherton, 3s. 9d. under 10,000 cubic feet; under 100,000 cubic feet, 3s. 6d.; and above this quantity, 3s. 3d. This is a differential rate of price which ensures Dudley being fairly represented.

Cross-examined by Mr. STEPHENS: Inasmuch as the Company have not asked to capitalize the money expended out of revenue, I do not think it comes under the purview of Parliament at all. The accounts of the Company which were placed before me were those furnished to the Shareholders by the Directors, and prepared under the Act of 1847. The accounts prescribed by the Act of 1871 have not been furnished, and this caused a contest between the Corporation and the Company, and I think the Company were quite right in the course they adopted, and I do not agree with the decision of the Court of Queen's Bench, and am sorry the Company did not take the matter to the House of Lords. I recommended the erection of new works on land to be acquired for the purpose,

but I do not propose to give any information to Parliament about the land at present. I am aware of the Standing Order of the House of Lords which says that in the case of Bills for constructing gas-works, &c., the notices shall set forth the limits within which such works are to be constructed, and the Company are going to apply next session for additional land. If Parliament this session gives us the capital we ask for, it will be applied to the works, or a portion of them. We require £10,000 this year, and we may as well, if we can get it, have the additional capital, which will enable us to erect works upon lands which will have to be authorized hereafter. A Bill next session is inevitable if the Company act upon my advice not to extend their manufacture on the present site. Of course the works and their requirements would depend upon the consumption of gas; and supposing the Company were relieved of the necessity of supplying a particular portion of the district, to that extent the expenditure would be so much less; but I imagine the consumption in Sedgley is very small indeed. With regard to the testing-place, I am aware that under the general Act, if the gas is tested away from the works it is provided that the company are to be represented, but it is inconvenient to fetch the manager away from his post. The tester could easily go to the works, but the manager has many things to look after, and cannot absent himself without detriment to his employers. In London the gas has to be conveyed eight miles, and therefore it is correct to test it in the district where it is consumed. In Dublin also, I believe, the gas is tested away from the works. In Dudley the bulk of the consumption is in the immediate neighbourhood of the works.

Cross-examined by Mr. SHIRESS WILL: I cannot offer an opinion as to whether Upper Sedgley is within the district of the Dudley Gas Company, because the limits are very wide—they comprise "the town of Dudley in the county and suburbs thereof." Under the powers of the present Bill I should think Upper Sedgley would get a better supply of gas. It is not so convenient to supply this district from the present works as it would be from a lower level, but it is supplied. I consider it is justifiable to make a differential charge of 3d. per 1000 cubic feet, because it is always more costly to supply a small population at a distance from the works than it is a large district near to the works.

Re-examined by Mr. RICHARDS: I am aware it is proposed that the Company shall be compelled to sell all their plant lying in Sedgley to the Local Board of the place; and I have known of such a thing being done, but not compulsorily. It would be quite reasonable to insert a clause that it might be done by agreement.

Mr. SHIRESS WILL said he did not ask that the Company should be compelled to sell their works if they did not wish it; but what he meant was that the Local Board should be entitled to supply themselves if they desired, and if this took place they would be willing to buy the Company's mains.

Re-examination continued: When the Bill was deposited the decision of the Court of Queen's Bench which had been referred to had not been given; and as the Company had the power to acquire six acres of land, it was imagined they had nothing to do but to purchase those six acres and build upon them, but it was subsequently ascertained that the land must be scheduled. The whole of the capital at present asked for could be advantageously expended upon the present site, but not so advantageously as upon another site.

In reply to a member of the Committee, Mr. RICHARDS said the purchase of land was a thing that had to be managed with considerable judgment, because as soon as a vendor had the slightest suspicion that a gas company required his land, it immediately jumped up in value. It was therefore a judicious plan to raise the capital first, and then, having found a site, to buy it.

Mr. J. E. Lloyd, examined by Mr. LUMLEY SMITH.

I am the Resident Engineer of the Dudley Gas Company. At present the works are not sufficient to meet the demands upon them. We require a new gasholder immediately, and also additional retorts, for all of which there is ample room on the present land of the Company. We are greatly crippled for storage room; it is only about 350,000 cubic feet, while it should be 850,000 cubic feet. The works require reconstructing altogether; the plant is old, and a great deal of it is obsolete in pattern. In consequence of the want of storage room we have been put to very great trouble and expense. In winter time we have been obliged to keep four or five settings of retorts ready to work at a minute's notice, and this means wear and tear, and wages for looking after them while they are not earning money. The gas supplied is of very fair quality, and is tested by the Metropolitan Gas Referees' standard. It has been close upon 16 candles during the last twelve months.

Cross-examined by Mr. BIDDER: There has been a great deficiency in the storage for a very long time, and I impressed the fact upon the Directors in a report I presented to them, but no ground was assigned to me for not providing the necessary funds. There have been complaints by the public of the quality of our gas, and four or five years ago the Corporation purchased a photometer, which was fixed in the Town Hall, and I believe the results were published weekly. I am not aware what the average was, but I have seen it frequently published for days in succession as 11 candles. I examined the instrument to see whether the results were truly recorded, and I saw, from the state in which it was kept, that the observations could not possibly be reliable; it was in a very dusty condition. The instrument in use by the Company gave a materially different result—3, 4, and even 5 candles. The gas is taken from the outlet of the mains in the street, so that it is precisely the same gas as that going to the consumers.

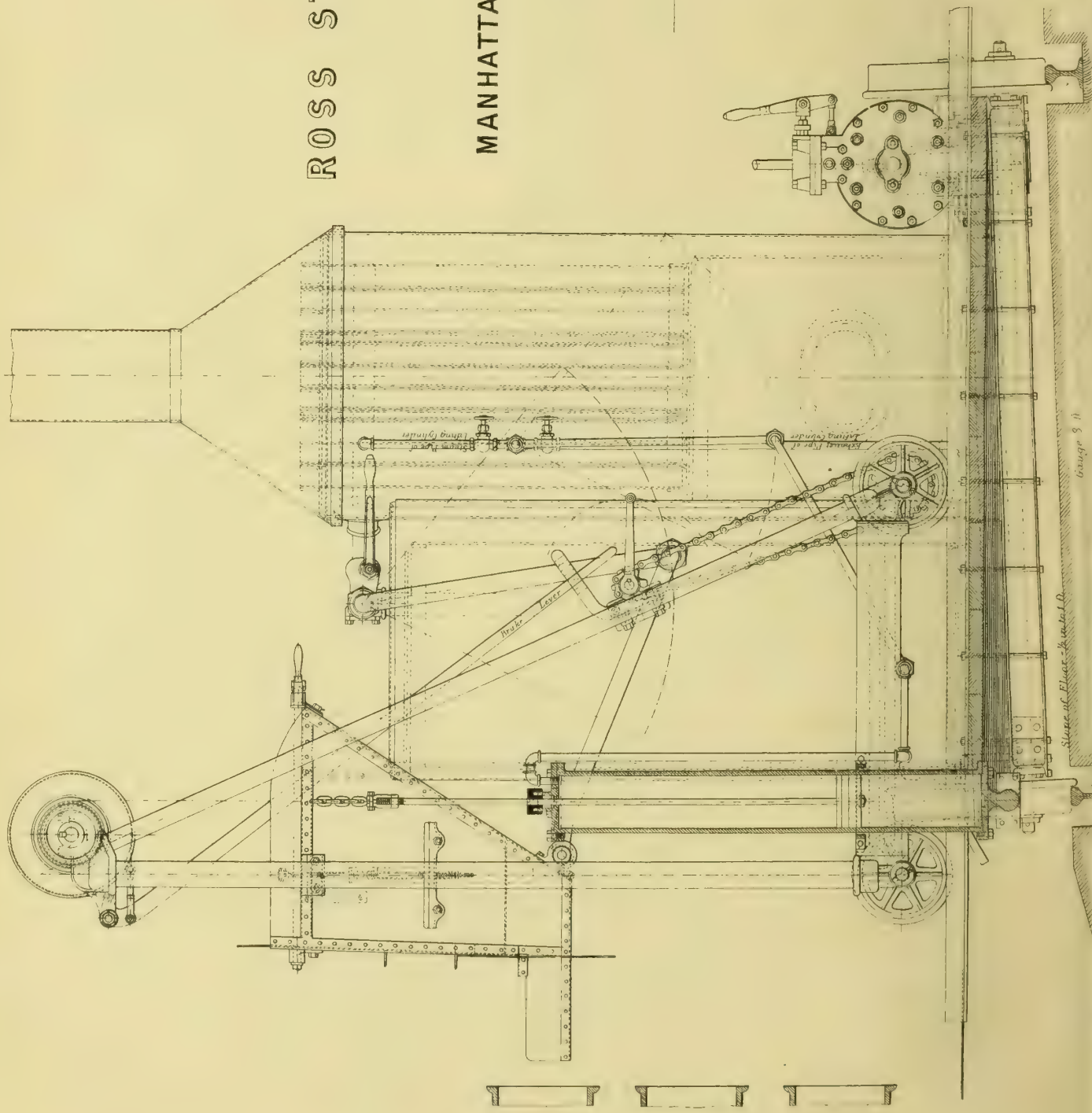
Cross-examined by Mr. SHIRESS WILL: I should consider Upper Sedgley to be a suburb of Dudley, and therefore within our district, so that any person there could compel us to give a supply of gas.

Re-examined by Mr. RICHARDS: The defective supply of gas will be remedied by an increase of our storage and manufacturing power; and if our Bill is passed, the complaints will probably cease. Many of them, however, arose from defective fittings, and so forth, and I have had several letters from persons acknowledging this fact.

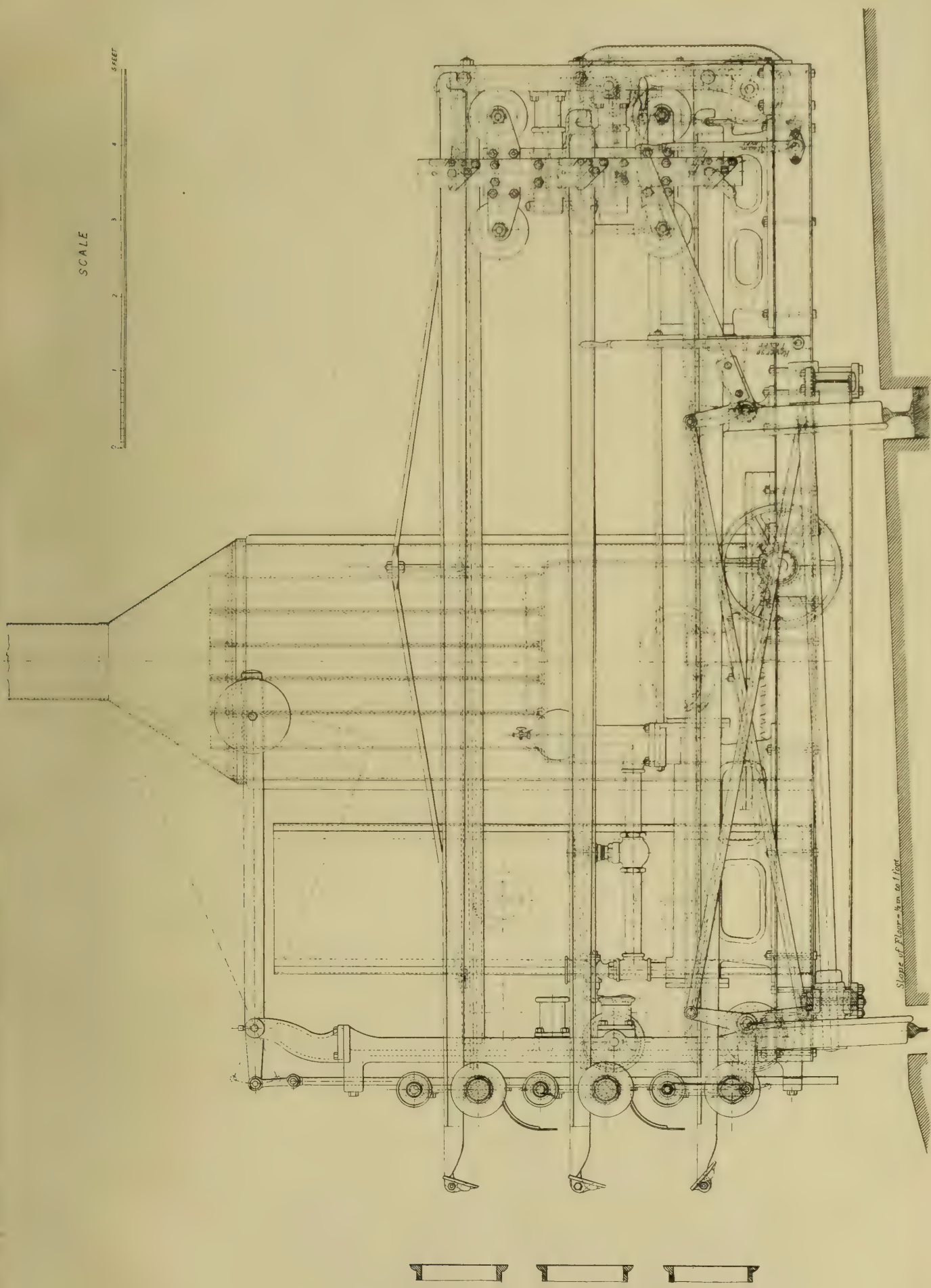
Mr. Thomas Collett, examined by Mr. RICHARDS.

I have been Secretary of the Dudley Gas Company since 1863. When I was appointed they were in the habit of putting aside 2½ per cent. as a depreciation fund, and this continued until 1866, in which year it was only 2 per cent.; but nothing has been placed to this account since 1867. In gas companies' property, more perhaps than in any other, continual depreciation is going on—the life of retorts is but short, and they have frequently to be renewed. We have expended on the whole £54,000 in capital, and also £2000 borrowing powers. In addition we have expended the difference between this amount and £81,000, in renewals, extensions, and so on, but the public have received the benefit of the whole of the money so expended. If we had not done this, we should have had to apply to Parliament for further capital. In the present Bill we do not ask for any return for the money so expended. I have examined the books of the Company with reference to the cost of the extensions to the suburbs mentioned in the Act of 1853, and I am prepared to say that the extension to Sedgley has been remunerative as a commercial matter. The Company were originally applied to in 1857 by the inhabitants of Sedgley for a supply of gas, and a canvas of the district was ordered, to

THE
ROSS STOKING MACHINES,
AT THE
MANHATTAN GAS COMPANY'S WORKS,
NEW YORK.



SCALE



Slope of Floor - 4 in to 1 ft

ascertain whether it was expedient to make the extension, and a few months later instructions were given for the same to be carried into effect. The number of consumers in Gornall and Sedgley is 228, and in Tivdale 106. We used formerly to light the turnpike road between Dudley and Sedgley, but this was discontinued in 1876, when the road was "dis-tur-piked." When the toll-gates were abolished the repair of the main roads was thrown upon the owners, and the lamps were paid for by the Toll Commissioners. The distance between Sedgley and Dudley is about two miles. The price charged in the town of Dudley is 3s. 3d. under 100,000 cubic feet per quarter, and 3s. above this quantity. In Sedgley and Tivdale it is 3s. 6d. under 10,000 cubic feet; 3s. 3d. under 100,000 cubic feet; and 3s. above. Considering the concentrated nature of the one area and the more diffused nature of the other, I think the difference is fair.

Cross-examined by Mr. BIDDER: The money expended for capital purposes came out of the balance of profits of the Company from time to time. Full dividends were not paid to the Shareholders, but sacrificed by them to form a depreciation fund. Back dividends have been unpaid to the extent of £10,000. As regards the other £15,000 expended on renewals, &c., it ought, perhaps, to have been applied in reduction of price; but the public had the benefit in another way.

Mr. BIDDER: The consumers, in point of fact, have not had that which the Gas-Works Clauses Act, 1847, said they must have—viz., a reduction of gas rates?

Mr. RICHARDS: That depends on the construction of one of the sections of the 1871 Act.

Mr. BIDDER: It has nothing in the world to do with it.

Cross-examination resumed: The last annual account was furnished under the Act of 1871. I have here a copy of the annual accounts for 1877 and 1878, which were deposited with the Clerk of the Peace; but they do not refer to capital account—simply income and expenditure.

Mr. BIDDER: Where is the item which shows depreciation? You put by every year 2½ per cent., for what you call depreciation, out of your working account, but you never charged it to this account, so that the public might know you were doing it?

Witness: No. It was included in the general item of maintenance of works.

Cross-examination continued: The accounts for the year 1880 have been furnished to the Local Authorities since the decision of the Court of Queen's Bench. The Mayor applied for copies of all the accounts since 1871, but they have not been furnished, because it would have been a work of considerable time, and my instructions were such that I did not commence on them. The accounts for 1879 were deposited with the Clerk of the Peace, but I refused to supply them to the Mayor, because I considered that those for 1880 were the only published accounts of the Company.

Mr. BIDDER: What is the reason you are so very coy about allowing the Corporation to have any knowledge of your accounts?

Witness: It cannot be that we have anything to conceal, because the investigation by the Corporation's own Accountant divulged everything as it stood in our books for the last 80 years.

After some further questions with reference to the accounts for the year 1879,

Mr. BIDDER said he wished to draw the attention of the Committee to the fact that the Company had suppressed entirely all reference to contingency and depreciation, £17,000, and made it appear as if £50,000 was the only sum which had been expended on capital account.

Witness explained that this was occasioned more by the manner of keeping the accounts than anything else. The amounts written off for depreciation, as a rule, would be deducted from time to time on the same page in the ledger as that on which the cost of the works stood; but instead of this the depreciation fund had been kept on a separate page.

Mr. BIDDER: Therefore, if this system were adopted, there would be no item in the accounts under which it was placed *eo nomine*, but always under the head of repairs?

Witness: It is really repairs, although not set aside for the purpose, but actually expended.

Cross-examination continued: A large amount of new capital was called up at the time of our extension to Sedgley and Tivdale. We always charged repairs against revenue, unless they were too large an amount. For instance, the renewal of a gasholder could not be charged against the revenue of one year. In the days before we published our accounts we provided the income-tax on our dividends out of the working capital. This would be on anything under 10 per cent., because on that percentage it would have been illegal. We have paid a dividend of 10 per cent. since 1874, but there was a breakdown in that year. An Accountant was ordered by the Court of Quarter Sessions to examine into our accounts, but I did not check his figures.

Mr. BIDDER: Under the head of "wear and tear" the Accountant says that the amount expended in 1880 was £2488, while the average of the previous year was £895, the greatest being £1240, and the least £318. How is it there is such a startling increase?

Witness: It is owing to extensive renewals of plant.

Of course the effect of this increase in the charges against revenue is to swallow up what otherwise might have been available for reduction of rates?—Not if the repairs were necessary. I know there were some new boilers, and also repairs to the engine.

Cross-examination continued: In 1878 a sum of £2723 was received from the Great Western Railway Company for the purchase of some land sold to them, and this amount was passed to the common fund of the Company, paid into the bank, and used for general purposes. It is an account which stands by itself.

Mr. BIDDER: In the accounts for 1879, which show a total expenditure of £57,000, has any notice been taken of this £2700?

Mr. RICHARDS said it was in the Company's books as an open or suspense account; there was no concealment about it.

Witness said it appeared in the balance-sheet for 1880, but in the previous year it had not been transferred to its proper place.

MONDAY, MAY 23.

Mr. Collett recalled, and further cross-examined by Mr. BIDDER.

At the Epiphany Sessions in the present year the Company were summoned by certain ratepayers to appear at Worcester, under the provisions of the Gas-Works Clauses Act, 1847, and an Accountant was appointed by the Court to investigate our books and make a report. This having been done, an application was made for a reduction in the price of gas. The Company contended that a reduction ought not to be made, because the reserve fund was not filled up, nor the dividends fully paid, and this was confirmed by the Chairman of the Court. The back dividends really amounted to over £10,000, and the reserve fund of 10 per cent. on our nominal capital to £5400—altogether about £16,000, I should say.

Mr. BIDDER: If the money used for capital purposes had not been so applied, all the back dividends would have been paid, and the reserve fund made up, so that you availed yourself of your own wrong-doing to resist the claim of the gas consumers to have the price reduced?

Witness: I do not see that they had any claim. There would not have been any balance of funds to give to the gas consumers.

It was owing to your expenditure for wear and tear and maintenance having arisen from an average (as the Accountant said) of £895 to £2488 in the year, that you did not show a surplus?—Certainly; but this would not have affected the Chairman's decision, because he went on other grounds.

Who decided that this exceptionally large sum should be so charged?—Myself, to a great extent. I might have spoken to the Engineer about one or two items before definitely charging them.

Cross-examination continued: We had not bought a new boiler previously during the years I have acted as Secretary, although the Company have had to renew expensive machinery. [Witness was cross-examined with reference to the various renewals, repairs, &c., which had taken place, but the books not having been produced he said he could not satisfactorily reply to the questions.]

Cross-examined by Mr. SHIRNESS WILL: I should certainly say that Upper Sedgley is within the limits of our Company, because we are unlimited as to where we shall go. I am aware that Lower Gornall is in the Local Board district of Upper Sedgley, and that there is a gas company there. We have not taken any measures to prevent this, because we do not wish to go into the part of the district which they supply. The portion of Upper Sedgley which we supply is, however, a source of profit to us; and the inhabitants there were only too pleased to welcome the Company. I could not answer the question as to whether our works are sufficiently large to supply the whole of the district of Upper Sedgley, unless I knew the extent of the district, which I do not. Mr. Wilkes has frequently complained of the supply of gas to his house in Upper Sedgley, and I suggested he should have a separate holder, in order that he might collect the gas during the day. This suggestion, however, only referred to his one house, which is situated lower than any other part of the parish. There have not been general complaints of the want of pressure in the district, because it is very good. The total quantity of gas supplied to the district of Upper Sedgley is about 7 million cubic feet per annum.

Mr. A. H. Gibson, examined by Mr. RICHARDS.

I am a professional Accountant, and have audited the accounts of the Dudley Gas Company every half year since 1877, or thereabouts. Prior to the late decision the accounts kept by the Company conformed to the requirements of the Act of 1847, although they were confessedly very bare. I agree with the statements made with reference to the totals—viz., that while the authorized capital is £54,000, plus £2000 borrowing powers, there has been expended a sum of £81,000 upon the works. The sum, which has been, as it were, added to the parliamentary capital and written off for depreciation since 1853 has been £17,000, in round figures. Each year a certain sum has been laid by for wear and tear, but the actual expenditure is very fluctuating. There is no doubt that all the money alleged to have been spent has been expended upon the plant, or upon renewals and repairs. I have not been able to trace the books previous to 1853, and therefore have taken the totals only. There was no suggestion by the Accountant appointed on behalf of the Corporation of Dudley that the money had been improperly expended. I quite agree with the statement regarding the £10,000 of back dividends, but from this the income-tax must be deducted, leaving about £8500 as owing to the Shareholders.

Mr. RICHARDS: With respect to the sale of land to the Great Western Railway Company, which produced £2320, it appears from the last witness that it is entered in the books as an open or suspense account. Has it been carried to capital?

Witness: It is merely a matter of book-keeping. The money has been received and has been expended. I have received instructions to remodel the accounts, and when I do so I shall write it off the £58,000 of expenditure, and it will therefore reduce this figure.

Examination continued: There is a small item of £431, premium on the sale of shares, which is kept in a suspense account for the present, but which will be treated in the same way. The accounts for 1880 have been rendered in the way required by the Act of 1871, in accordance with the decision of the Court of Queen's Bench.

Cross-examined by Mr. BIDDER: If I had thought any item had been wrongly treated in the accounts, I should have reported the same to the Directors. The accounts presented to the Committee were compiled by the Secretary from the audited accounts, but they were not made out in that form.

By the COMMITTEE: My statement of account goes to the Directors, in compliance with the Act of 1847, and the books are constructed for the purpose. The Secretary then has to reconstruct the accounts in accordance with the Act of 1871, since the Court of Queen's Bench has decided he must do so.

Cross-examination resumed: I analyzed the accounts since 1853 for the purposes of the case before the sessions, the borough Accountant's report being wrong in some respects. One implication in his report was that the £17,000—which he called a depreciation fund—really represented accumulated profits; but I was prepared to show, had the Justices considered it necessary for us to call evidence, that fully £7000 had been already expended on proper revenue charges, and it had been allowed to be charged to capital because we had provided for it, by anticipation, in the depreciation fund.

Mr. BIDDER: I see "a water well since disused." Why is not this a capital charge?

Witness: It is like a horse that has died, or anything else, so far as the balance-sheet is concerned.

If you found, in going back, that the Company had executed some new work, such as the sinking of a well, or the erection of a building which had subsequently become disused, you would say it was not capital expenditure at all?—That would be one principle. The cost of replacing such things as gasholders is chargeable to revenue, or would be if it had not been provided for beforehand by depreciation.

When you find work in the engine-house, or drains in the yard, how do you know that these are renewals, and not new works?—From seeing the nature of them, whether they are permanent works; and also from the books and vouchers.

One item is "Cost of connections to caverns, Dudley Castle, since disused, £43." This was a new connection, was it not?—Yes; but it is now perfectly valueless.

If you found, putting an extreme case, that the Company had laid a large main to a district for the purpose of supplying gas, and that, from change of trade, or from the population going away, gas had ceased to be supplied, you would call that an expenditure of revenue?—I should write it out of capital, and should look on it as part of the £81,000 which was no longer represented as plant.

Cross-examination continued: I have no details with me of the sum of £2448 spent for repairs and renewals last year, but I am satisfied as to the expenditure.

Cross-examined by Mr. SHIRNESS WILL: I am not in a position to say what profit is derived from the Upper Sedgley district.

Mr. Collett was recalled, and in answer to Mr. BIDDER said the Company had not selected the site for their proposed new works, neither had they

been negotiating for any land. In 1879 some new mains and extensions were made in the town, amounting to £320—not renewals, but mains laid in new streets.

In reply to the COMMITTEE, witness said this outlay was paid for out of capital. There was also £950 charged in that year as the proportion of an outlay in replacing smaller mains by larger ones in different parts of the town, the difference in the capacity of the two sized pipes being placed to capital, and the same principle applied to the erection of a new station meter and house. Then there was also a new engine and exhaustor, £473, and likewise £466 for the expenses of a professional Engineer called in at the time to advise as to an important extension, and also with reference to the new works. These services, he believed, extended over three years altogether. The last issue of shares by the Company was in 1877, and the last call was made in 1879.

Mr. John Clark, examined by Mr. LUMLEY SMITH:

I am Engineer at the St. Pancras station of The Gaslight and Coke Company, also Consulting Engineer of the Dudley Gas Company, whose works I have been in the habit of visiting since my appointment. I am well acquainted with the works, which are barely equal to the supply—certainly not to any increase, which I calculate at 6 per cent. per annum. The capital asked for will, according to my calculation, only last nine years. The Company cannot go on for another year without an increase of capital, if they are to supply the consumers properly. As regards gas-holder capacity, they are working at very great disadvantage; it is not anything like enough. We consider 100 per cent. is the right proportion, but theirs is only about 40, I think. Increased expense and trouble are also involved. In building gasholders it is not sufficient to erect them of the size required, but it is advisable to make them larger than is wanted for immediate purposes. There is room for additional works on the ground already possessed by the Company, but I have always advised the Directors to hold back as long as possible, with a view to cheapen manufacture by changing their site, because on the present site considerable renovation would be required. If land could be obtained at a lower level, it would be an advantage, but not the greatest. The Company are very badly off for railway and canal communication and water supply. They have no means of obtaining their coals and removing their coke and other residuals except by cart; and there is also a great nuisance in carting the refuse lime and so on through the streets. If they could do it by barges they might do it more conveniently and economically. I think they might remove the manufacturing plant, but it might be advisable to leave the storage plant where it is. The present site occupies about two acres, I think; the Company's Act says they shall not hold more than six acres, and if they were legally entitled to buy three or four acres without coming to Parliament they could acquire a site for themselves. The residual products are not manufactured at the works, but are carted away at very great expense. The Corporation have been in the habit of testing the gas with a jet photometer, but at the Company's works there is one of the pattern insisted on by the Metropolitan Gas Referees. I once went to check the photometer employed by the Corporation, and found it would not register 11 candles; I then tested the gas coming from the gasholder which had been supplying the town all day, and found it to be 15.75 candles. The jet photometer is not of the slightest use unless it is kept in good condition. The opening is supposed to be exactly the 100th part of an inch, and unless this is correctly maintained it is of no use whatever. I never had any doubts about the Company's photometer being correct. I have had reports every week since I have been engaged by them, and according to the average the illuminating power has been 16.24 candles, or more than I made it myself. I have worked out the item of wear and tear for the year 1880, which was put down at £2448, and find it amounts to 4d. per 1000 cubic feet exactly, while the average of the London Companies is rather over 7d. It is not the fact of this expense being so high, but it is the other expenses being ridiculously small, because of the works having been allowed to get into such a state of dilapidation, which makes the amount appear so large.

Cross-examined by Mr. BIDDER: It is of no use relying upon the jet photometer used by the Corporation as an indication of the illuminating power between the Company and the Corporation. It was covered with dirt, and I should think had not been touched for four or five years. I was about to submit to the gentleman trying it that it would be advisable to clean it out, but it was considered both by himself and me that it had better be left alone. I looked at it through the glass door, but did not interfere with it. There might be a loss of illuminating power after the gas had passed through the mains, but I should think not more than a quarter of a candle in such a distance as that in question. The observations I made were on Easter Monday of the present year. I saw dust on the bracket supporting the burner, and therefore reckoned pretty surely it would be on the burner also. There was a glass shade. I could not possibly say that the burner produced is the identical one, because they are alike. [A burner was handed to witness.] A certain amount of dirt is formed inside by the combustion of the gas, but it does not appear to be in very bad condition. I cannot say whether it has been cleaned lately, nor whether this was the condition it was in when I saw it. I have no doubt, however, that the Company are practically supplying 16-candle gas.

Mr. BIDDER: Then I suppose it would be no hardship upon the Company to insert a provision that they should supply 16-candle gas?

Witness: I think it would. To ensure a supply of 15-candle gas it must invariably be manufactured three-quarters of a candle beyond.

In reply to the Chairman, Mr. SMITH said 15 candles was proposed by the Bill.

Cross-examination resumed: I should think the new holder—which is required at once—would cost £10,000; but any further expenditure within the next few years would depend upon whether the works were removed or not. My calculations are based upon a normal expenditure of £300 per million feet of gas made in a year.

Mr. BIDDER: I suppose you agree with Mr. Stevenson that it will be necessary to come to Parliament for powers to take land before the new gasholder can be built?

Witness: Not at all, I should say, on the two acres they now hold.

But Mr. Stevenson is a very good authority on the subject. Do you agree with his advice that, as a matter of propriety, the Company ought to erect new works in a different situation?—Yes; I agree with that.

And that it would not be a wise thing to attempt to erect any other gasholders on the present site?—The Directors have not decided this yet, but I think part of the present site might very well be left for a gasholder station.

By the COMMITTEE: Supposing the works are removed for the purpose of manufacture, an additional gasholder would still be required on the present site.

Re-examined by Mr. LUMLEY SMITH: I do not think there is any doubt that the Company are entitled to erect further works on the present site, and that they might have purchased additional land up to the extent of six acres, and still be within their parliamentary powers.

In reply to further questions, witness described the difference between the standard and the jet photometers, adding that the latter, although enclosed in a box, were roughly-made instruments, into which air must find its

way to some extent. They ought to be constantly cleaned out, but even then he did not consider they gave proper tests of the illuminating power of gas.

Mr. RICHARDS said this was the case for the promoters of the Bill.
(To be continued.)

Miscellaneous News.

STAFFORD CORPORATION GAS SUPPLY.

The Accounts of the Gas Department of the Borough of Stafford, for the twelve months ended March 25 have just been issued. From them it appears that the total capital engaged in the concern is close upon £178,500. The principal part consists of about £5000 of 4½ per cent. debenture bonds; £52,500 of loans on mortgage, at 4½ per cent.; £3500 of debenture loans at 4 per cent.; and £14,150 of 4 per cent. perpetual annuities. The additions to capital account during the past year amounted to £225 only. There were carbonized and used in manufacture in the twelve months 7115 tons of coal and cannel; the residuals produced being 4269 tons of coke, 381 tons of tar, and 914 tons of ammoniacal liquor.

Dr. Revenue Account for the Year ended March 25, 1881.		£s.	d.
Manufacture of gas—			
Coals, including dues, &c.	£3,346 17 3		
Purifying materials, &c.	125 18 0		
Salaries of Engineer and Officers at works	450 0 0		
Wages and gratuities	662 5 5		
Repair and maintenance of works and plant	1,181 18 6		
Distribution of gas—			
Salaries of Inspectors, &c.	127 4 0		
Repair & renewals of mains and services	259 8 7		
Repairing, renewing, and refixing meters	238 3 1		
Lighting and repairing public lamps	293 7 4		
Rents, rates, and taxes	633 6 2		
Management	238 4 4		
Depreciation-fund	782 0 0		
Bad debts	87 18 5		
Total expenditure	£8,426 11 1		
Balance	5,694 16 2		
	£14,121 7 3		
		£14,121	7 3

Dr.—Profit and Loss Account (Net Revenue).		£s.	d.
To Income-tax	£139 8 2		
Interest on temporary loans, to March 25, 1881	86 3 10		
Do. loan account, to Dec. 31, 1880	2,210 4 10		
Do. debenture bonds, to Dec. 31, 1880	219 1 9		
Do. perpetual annuities, to March 25, 1881	566 0 0		
Do. loans on debentures, to Dec. 31, 1880	138 0 0		
Sinking fund	2,408 18 0		
Balance	£5,767 16 7		
	1,325 18 8		
	£7,093 15 3		

Cr.—Profit and Loss Account (Net Revenue).		£s.	d.
By Balance of net profit, brought from last account	£2,898 19 1		
Less amount transferred in reduction of rates	1,500 0 0		
	£1,398 19 1		
Revenue account balance, profit for year ending March 25, 1881	5,694 16 2		
	£7,093 15 3		

STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.

The Thirty-fifth Ordinary General Meeting of this Company was held at Hanley, on Friday, the 27th ult.—Mr. J. ALCOCK in the chair.

The SECRETARY (Mr. J. B. Piercy) having read the notice convening the meeting, the following report was presented:—

Your Directors have to report an increased rental for the year ending March 25, 1881, exceeding that of the previous year by the sum of £749 9s. 3d. The balance of the year ending the 25th of March last, and the previous undivided balance of £637 18s. 7d., make a total of £6294 13s. 3d., out of which your Directors recommend that a dividend be declared at the rate of 6 per cent. per annum. This will absorb the sum of £6090, leaving a surplus of £204 13s. 3d. to be carried to next year's account. The reserve fund account, after payment of law costs in the case of Messrs. Tatton and Hammersley and the Company, now stands at £5609 5s. 1d.

The pumping stations, reservoirs, and other works of the Company are being maintained in good working order, but the damage arising from the severity of the weather during the past winter has been exceptionally great, and consequently the expenditure for repairs to mains has been unusually large, but where practicable they have been relied at greater depths, and beyond the reach of frost. During the past year the cruts at the Meir have been completed, whereby the supply of water has been increased to such an extent as to justify the erection of permanent plant, for which purpose the Directors have agreed with the Duke of Sutherland for purchase of the site, and have entered into contracts for the erection of an additional permanent engine. One of the existing boilers has been replaced, and also an additional boiler put down at this station. An additional engine has been erected at the Tunstall station, and the mains laid for the supply of Chell, Fegg Hayes, and Brindley Ford, which are now supplied by the Company. Experiments have been made at Stockton Brook for testing the supply of water to be expected in that district, which have been so far satisfactory as to justify your Directors in entering into a contract for sinking a well there.

The Company have been requested by the Sanitary Authorities of Chesterton and Silverdale to supply those districts with water, which your Directors have agreed to do, upon the authorities or property owners entering into the usual agreements. The mains have been extended for the supply to Milton; but, owing to a portion of the pipes having to be laid under the canal, a few weeks will elapse before the connection is made.

Proposals will be submitted to the Proprietors, at an extra-ordinary meeting, to enable the Company to raise additional capital by the issue of £2500 four per cent. permanent debenture stock, and £21,000 new ordinary stock, under the powers of the Staffordshire Potteries Water-Works Act, 1862, for the purpose of carrying out the new works and extensions now contemplated.

The CHAIRMAN said although the report was not quite so favourable as usual, owing to the large outlay caused by the severity of last winter, all the expenses had been paid out of the revenue; and, notwithstanding this, the Directors had been able to recommend the usual dividend of 6 per cent., free of income-tax. He was not aware that there was anything in the report which called for notice on his part. It gave a full account of the Company's proceedings during the past year, and their prospects for the future. He would therefore content himself with moving its reception and adoption.

Mr. W. M. EDGE said he notified that the income of the Company showed an increase of £749 compared with the previous year. To obtain this increased income there had been an increased expenditure of £1900. He wished to have a little light thrown on the subject.

The CHAIRMAN said he should have stated that the expenditure for last year also included a new boiler and the cost of fixing it at the Meir, which amounted to £431. This and £1847 spent on repairs to mains, fire-plugs, meters, &c., had been a serious drawback upon the resources of the Company, and would account for their not having as large a surplus as usual.

Mr. C. ADAMS seconded the motion, and it was carried *nem. con.*

On the motion of Mr. W. STUBBS, seconded by Mr. S. BDOE, a dividend at the rate of 6 per cent. per annum (free of income-tax) on £203,000 consolidated stock of the Company was declared.

Messrs. O. Keeling, R. Heath, J. Edge, and B. Boothroyd were re-elected Directors; and Mr. R. E. Narramore was re-elected Auditor; and to Directors and Auditors the thanks of the meeting were given for their past services.

An extra-ordinary meeting was then held, as notified in the report, and the Directors were empowered to issue £4250 of permanent 4 per cent. debenture stock, or such portion thereof as might be required; also to raise £21,000 by the creation of 4200 new £5 shares, or an equivalent amount of stock, to be allotted *pro rata* among existing Stockholders.

The CHAIRMAN thanked the Shareholders for the handsome manner in which they had recognized the services of the Directors, which, he said, would stimulate them to further efforts on behalf of the Company. The Directors were anxious to conduct the Company successfully, both as regarded the interests of the Shareholders and the public. They had had very few complaints during the past year, notwithstanding the trying time they had had to go through. With respect to the debenture stock which they were about to issue, they would advertise for tenders. Hitherto it had been usual to allot the debentures as applied for; but, considering that other companies had a premium upon 4 per cent. debenture stock, it was advisable to take advantage of the same, seeing the low rate of money at the present time. The Directors did not propose to call up the new capital all at once, but only as it was wanted.

The proceedings then terminated.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, 30, Gracechurch Street, E.C.—Mr. T. HUGHES, Q.C., in the chair.

The SECRETARY (Mr. Alfred Lass) read the notice convening the meeting, and the following report and accounts were presented:—

The Directors have much pleasure in submitting to the Shareholders the accounts of the Company for the half year ending Dec. 31, 1880. These, with the annexed report of the Engineer, show the progress of the Company.

The Directors have to state that the profit for the half year has amounted to £1225 6s. 8d., which, added to the balance brought from the last account, makes £2700 10s. 11½d., and that after paying the dividends to June 30, 1880, and the interest on debentures to Dec. 31, 1880, there remains an available balance of £1291 15s. 4½d., out of which the Directors recommend the declaration of a dividend for the half year ending the 31st day of December last, on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 7 per cent. per annum, both less income-tax (except upon those dividends payable to the local Shareholders), leaving a sum of £124 7s. 4½d. to be carried forward to the next half year's account.

The Directors retiring by rotation are Quintin Hogg and Robert Pate Drysdale, who, being eligible, offer themselves for re-election. The retiring Auditor is Robert King, who, being eligible, offers himself for re-election.

Engineer's Report.

Georgetown, March 24, 1881.

To Thomas Hughes, Esq., Q.C., Chairman, and the Directors of the Georgetown (British Guiana) Gas Company, Limited.

Gentlemen,—The whole of the half-yearly returns to Dec. 31, 1880, have been forwarded. I hope they will be found correct, and that the working will be considered satisfactory.

The demand for gas during the past half year has been maintained. Coke, breeze, and tar have realized fair prices. The gas-fitting department has not been so good as in some previous half years. I am, however, glad to tell you that at the present time we are very busy. The whole of the buildings are in a most satisfactory state of repair.

During the half year, seven houses have been fitted with 81 lights, and old consumers have had 76 added, making a total of 157 lights, to which must be added 1 stove and 10 public lamps. My monthly reports and returns have kept you fully informed of the Company's business here. The money expended on capital account during the past half year is for laying 3-inch and 2-inch mains in the Werk-en-Rust district, and the erection of an additional purifier.

In conclusion, I beg to thank you for the care and attention which you have given to our requirements. (Signed) T. B. YOUNGER, Engineer and Manager.

Dr.	Balance-Sheet, Dec. 31, 1880.	Cr.
Share capital—		
6200 fully paid £5 shares	£31,000 0 0	
412 fully paid £5 preference shares	2,060 0 0	
Debiture bonds	6,950 0 0	
Insurance fund account	22 15 1	
Retort renewal fund account	160 11 6	
Bad debt fund	209 18 4	
Reserve-fund	750 0 0	
Bills payable	558 3 1	
Sundry amounts owing	450 12 6½	
Suspense account	50 10 5	
Profit and loss account	1,291 15 4½	
	£43,504 6 3½	£43,504 6 3½

Revenue Account, for the Half Year ending Dec. 31, 1880.

Coals	£988 14 4	Gas and rental of meters	£3,503 1 1
Purifying account	48 5 3	Residual products and fittings, &c.	638 6 8½
Wages account	619 7 10½		
Repair and maintenance of works and plant, &c.	241 6 0½		
Salaries	618 6 8		
Rent, rates, and taxes	50 10 5		
Directors' and Auditors' fees	158 8 0		
Trade and general charges	168 15 10½		
Bad debts and allowances	122 6 8		
	£2,916 1 1½		
Balance carried to profit and loss account	1,225 6 8		
	£4,141 7 9½		£4,141 7 9½

Profit and Loss Account (Net Revenue) on Dec. 31, 1880.

Dividend, &c., to Shareholders to June 30, 1880	£1,167 8 0	July 1, 1880—	
Interest on loans, &c., to Dec. 31, 1880	241 7 7	Balance brought from last account	£1,475 4 3½
Balance carried forward to the next account, subject to half year's dividend to Dec. 31, 1880	1,291 15 4½	Revenue account, balance brought down	1,225 6 8
	£2,700 10 11½		£2,700 10 11½

The CHAIRMAN said the Shareholders would have seen from the reports of the Directors and the Engineer that the business of the Company continued in a favourable position, and that the works were in a satisfactory state of repair. The business, although not quite so good as it was in the preceding half year, had practically maintained itself, and the Directors had the pleasure, as usual, of proposing the dividends which had been so long maintained—viz., 8 per cent. on the preference, and 7 per cent. on the ordinary shares. He had nothing special to bring before the Shareholders, and therefore would at once move the reception and adoption of the report and accounts.

Mr. WILLIAMS seconded the motion, and it was carried unanimously.

The CHAIRMAN then moved the re-election of the retiring Directors, remarking that Mr. Hogg was very largely interested in all matters connected with Georgetown and Demerara, and was a man whom his colleagues felt to be very useful to have amongst them, while Mr. Drysdale was a valuable local Director in Georgetown.

Mr. H. P. STEPHENSON seconded the motion, and it was carried.

Mr. Robert King having been re-appointed Auditor, the dividends recommended in the report were unanimously declared, and the meeting closed with a vote of thanks to the Chairman and Directors.

ALEXANDRIA WATER COMPANY, LIMITED.

The Third Ordinary General Meeting of this Company was held at the Offices, Delahay Street, Westminster, on Saturday, the 28th ult.—the Hon. E. CHANDOS LEIGH, Q.C. (in the absence of the Chairman of the Company, the Duke of Sutherland) presiding.

The SECRETARY (Mr. F. Sanders) read the notice convening the meeting, and the following report was presented:—

The Directors beg to place before the Shareholders the results of the second year's operations of the Company. The profit and loss account shows that for the twelve months ending March 31, 1881, the total profits amount to £24,378 1s. 4d., including the profit on the Ramle works, as against the sum of £25,608 15s. 5d. in the first year's working. The anticipations of a satisfactory revenue from the Ramle Water-Works have been fully realized. The gross income from these works for the twelve months ending March 31, 1881, was—Water-rates collected, £4339 9s.; ditto outstanding, £355 0s. 9d.—total, £4694 9s. 9d. The working expenses were £1768 15s. 11d., leaving a net profit of £2925 10s. 10d.; equal to nearly 7½ per cent. upon the amount of the outlay on these works—viz., £37,771 10s. After deducting the Ramle profit, £2925 10s. 10d., from the total net profit earned by the Company, the balance is £21,453 1s. 6d., which the Directors regret to say compares unfavourably with the results of the first year's working, in consequence of the greatly reduced revenue derived from the water-supply to the Egyptian Government establishments, which only amounts for the twelve months to £5931 13s. 3d., as against £11,149 9s. 5d., or a reduction of £5217 16s. 2d. on the Company's income from that source.

It will be remembered that in the previous report it was stated that the Egyptian Government, in view of conceding the freehold of the water-works to the Company, would for the future, subject to the approval and sanction of the Shareholders, only take so much water as they might require for the supply of the Government establishments. The result of this agreement, which was confirmed at the extraordinary general meeting of the Company on May 28, 1880, has been that through the economies introduced into the Government expenditure, the Company have suffered from a serious falling off in their revenue. The Directors much regret the circumstance, but, at the same time, wish to point out that had the Company insisted upon the Government paying them the minimum rental of £9000 a year, a real injustice would have resulted, seeing that the value of water actually consumed by the Government establishments has been considerably less than was anticipated.

The Directors, on the other hand, have the satisfaction to call the attention of the Shareholders to the steady increase in the revenue derived from the private consumers in Alexandria during the past twelve months, the amount for the present year being £18,376 16s. 8d., as compared with £17,084 13s. 2d. in the previous year, or an increase of over 7½ per cent., which is greatly encouraging; and, from the number of new services which are still being put on, and the rapid growth of the town, there is every expectation that this increase will be continued. The revenue from the Sakaas has also slightly increased during the present year, which shows that the contracts with these people are working satisfactorily.

The working expenses of the Company are in the aggregate about the same as in the previous year, after allowing for Ramle expenses, income-tax, and increased consumption of coal and stores due to the greater quantity of water supplied to the consumers.

The balance at the credit of the profit and loss account on March 31, 1880, was £13,356 6s., out of which the debenture interest, £6516 8s. 4d., due April 30, 1880, was paid, as also the dividend of 4 per cent. on 9705 shares, amounting to £7416 8s., leaving a balance of £1423 9s. 8d. applicable to payment of debenture interest and dividends in the current year. This sum, added to the profit of £24,378 12s. 4d. for the past twelve months, equals £25,802 2s., out of which the Company have already paid debenture coupons, due Oct. 31, 1880, £7000, and an interim dividend of 3 per cent. on 10,000 shares, £6000, leaving a sum of £12,802 2s. applicable to the payment of debenture interest and dividend to March 31, 1881. After providing for the proportion of debenture interest due to that date, there remains a sum sufficient to pay a final dividend for the year of ¾ per cent., free of income-tax, which the Directors propose to declare, carrying forward a small balance.

Since the balance-sheet of March 31, 1880, was submitted to the Shareholders, the Directors have to report that the new works have been proceeded with in a satisfactory manner, under the superintendence of their Engineer, Mr. Edward Easton. The new engine-house has been completed, a second engine and pumps have been added, of equal capacity to the first ones supplied by Messrs. Easton and Anderson; an enlarged wrought-iron reservoir has also been added in lieu of the old concrete reservoir, which has greatly improved the supply to the town, and new mains have been laid where needed, including the connection between the Ramle and Alexandria mains; the present cost of the new works, with the addition of the second engine and pumps, being within the original estimate of Mr. Edward Easton.

It has been proposed by some of the holders of the debentures to convert their securities into ordinary shares, to be issued at such a premium as may be mutually agreed upon between the holders and the Company. This proposal appears to the Directors to be advantageous to the Company, as at the present value of the shares, or at a price approaching it, which would be the basis of the exchange, a considerable reserve fund could be thus established, and they propose to put a resolution to the Shareholders at the meeting, authorizing them to make the exchange contemplated, in the event of their negotiations with the bondholders being successful.

The CHAIRMAN, in proposing the reception and adoption of the report and accounts, said with regard to the Ramle Water-Works, the matter was a sort of after-thought—after the Company was started—and its working had shown how right Mr. Easton was as to the return it would give, yielding nearly equal to 7½ per cent. last year. He then referred to the falling-off in the revenue derived from the water supplied to the Government, and explained how this had arisen, as set out in the report. In order to make the works freehold instead of leasehold, the Directors had consented to pay the Government £7000, and to release them from the liability of paying a minimum of £9000 a year for water supply, and agree to be paid only for what the Government took. He was informed that last month, now that the Khedive was there, much more water had been taken, and he hoped at the next meeting of the Company to find that the Government had considerably increased the quantity. The Directors had a very satisfactory return as regarded the private consumers, the increase in the private consumption last year having been considerable as compared with the previous year. He wished particularly to call the attention of the Shareholders to this fact, as it was another reason why he should ask them to sanction the issue of a small amount of additional share capital. The Company had had to lay down more mains in order to meet the demand. The consumption increased week by week, and he believed in another twelve months there would be a considerable increase even on that of the previous year. The Directors proposed to raise £12,000 of additional capital, which would produce £18,000, as, although the Company had not been in existence two years, their shares were at 50 per cent. premium. Of course the amount on which dividends would be payable would be only £12,000. The Directors would have placed the whole of the amount in London, but that they were obliged to give the Shareholders in Egypt a preferential right to subscribe for one-third of the issue. The Directors wanted £11,000 immediately, and therefore what they proposed was to issue £8000 in London, which would produce £12,000. The remaining £6000 they would not be in any particular hurry for; and he believed he might say that this £18,000 would be absolutely sufficient for their wants for some time to come. The reason for their wanting £11,000 at once was to pay the Government the £7000 referred to, and £4000 for the extra mains they were laying in Alexandria and the suburbs.

Mr. BOUVIER seconded the motion, which was carried unanimously.

and it was decided that the additional capital referred to should be raised by an issue of part of the unissued original capital.

The CHAIRMAN next moved—"That a dividend at the rate of 3½ per cent., free of income-tax, be and the same is hereby declared, payable on and after the 15th of June next, at the Company's bankers in London and Alexandria, making with the interim dividend of 3 per cent. paid on the 30th of November, 1880, a total dividend for the year at the rate of 6½ per cent. per annum."

Mr. DICKINSON seconded the motion, and it was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. R. B. HUTH, Mr. C. C. Davenport was re-elected Auditor.

The CHAIRMAN next moved a resolution as to holding the general meetings of the Company in May or June in each year, at such time and place, either in London or Alexandria, as the Directors might determine, and approving and confirming the holding of the present meeting in May.

Mr. H. G. H. NORMAN seconded the motion, which was carried unanimously.

PRESENTATION TO MR. JAMES RANDALL, OF TOTTENHAM.

A very interesting meeting took place at the new offices of the Tottenham and Edmonton Gaslight and Coke Company, on Saturday, the 28th ult., the occasion being the presentation of a testimonial to Mr. James Randall, in recognition of his services as Secretary of the Company extending over many years. The Chairman of the Company presided; and he was supported by the Deputy-Chairman and a fair attendance of Shareholders.

The CHAIRMAN said when the project of presenting a testimonial to their respected Secretary was submitted to the Board of Directors, they at once expressed their willingness to assist the matter in every way, because they were aware that Mr. Randall was deservedly held in the highest regard, not only by the general body of Proprietors, but by all the officials of the Company. As far as he (the Chairman) was concerned, Mr. Randall was no stranger to him. Indeed, he was one of the oldest, if not the oldest of his friends, having known him more than 40 years—consequently from his childhood. Having had ample opportunities of judging of the abilities and assiduity of Mr. Randall during the many years he had filled the position of Secretary to the Company, he (the Chairman) had no hesitation in saying that, from the commencement, he had performed his duties earnestly, faithfully, and most advantageously for the benefit of the undertaking. With him the interests of the Company took precedence of everything else, personal or otherwise; and it was gratifying to find that so large a number of the Shareholders had subscribed to the testimonial. Time had not permitted the address which had been prepared to be engrossed; but it was intended to have it placed upon vellum, and framed in such a style that it would not disgrace any gentleman's drawing-room. The Directors knew nothing of the proposal until they received a letter from one of the Auditors, stating that several Shareholders were desirous of presenting a testimonial to Mr. Randall, and asking the Board's co-operation. The Directors, fully appreciating the spontaneous act on the part of those Proprietors who had originated the proposal, cheerfully responded to the request which was made to them, and they were pleased that some one had started the testimonial. He then read the address as follows:—

The Directors and Shareholders of the Tottenham and Edmonton Gaslight and Coke Company desire to express their high appreciation of the admirable manner in which their Secretary (Mr. James Randall) has always acquitted himself of his responsible duties. During the 30 years he has been in the service of the Company in many capacities, he has gained the esteem of all, and they have every reason to feel proud that he holds his present position.

The Directors and Shareholders desiring further to show their respect for this gentleman, present to him, with this address, a purse containing £100, trusting that he will accept it as a token of their best wishes for his future prosperity and happiness.

Still further the Directors and Shareholders hope that Mr. Randall may enjoy long life, not only for the sake of his family; but also, that he may long fill the position which he has so creditably held for so many years. They feel assured that he will perform his duties as faithfully and honourably in the future as he has done in the past, and that he is well worthy of the trust which is unanimously reposed in him.

He (the Chairman) then remarked that it was 30 years the previous day since Mr. Randall came into the service of the Company, and that he was approaching 16 years of age at the time. In giving over to Mr. Randall a beautifully engraved purse, edged with silver, containing a £100 Bank of England note, and the address, he said: It affords me great pleasure indeed to hand you this testimonial. It is strong evidence of the very high esteem entertained towards you by the Proprietors of the Company; and I can endorse every word of praise which the address contains, while my brother Directors agree with me that your conduct has been uniform, and that your anxiety to perform your duties to the Company in an efficient manner has been unceasing. I sincerely hope that you will long be spared to discharge your duties in the future as you have done in the past.

Mr. RANDALL, who was most cordially greeted, said it was the greatest pleasure he had ever experienced to have received this testimonial. No gentleman connected with the Company knew so much of him as the Chairman, still his language had been too eulogistic—it was almost overwhelming; and while he was speaking he (Mr. Randall), as one of her humble subjects, felt, as Her Majesty expressed it, in her "Life in the Highlands," a lump rising in his throat. He could, however, honestly say that he had always endeavoured to do his duty, and how far he had succeeded was clearly shown by the substantial and munificent testimonial which had just been presented to him. He should continue in the course he had previously pursued; and if it was possible for him to do more in the future than he had done in the past, he would cheerfully undertake the labour. At all events, as long as God spared his life, he would do his best for the interests of the Company. The expressions which had been addressed to him would, he was sure, act as an incentive not only to himself and his children, but to every official of the Company, for if they did not all receive a reward in the form of the handsome testimonial with which he had been presented, he felt confident they would perceive that the performance of their duty and gaining the praise of men were worth striving for.

Mr. W. H. BROADBERRY (the Company's Engineer) felt that, working as it were shoulder to shoulder with Mr. Randall, and knowing him better than all the other officers put together, he could not refrain from testifying to his great value to the Company. He (Mr. Broadberry) believed that the sole wish of Mr. Randall was to discharge his duty to the Company, and he was very glad the testimonial had been presented.

The CHAIRMAN said he believed the honour of inaugurating the testimonial rested with Mr. Nicol, one of the Auditors; and the least the meeting could do was to pass a vote of thanks to him for the exertions he had employed.

Thanks having been accorded by acclamation, Mr. NICOL acknowledged the compliment, and said he had done the best he could in a very good cause. The list of subscribers contained about 80 names, and he was quite certain Mr. Randall deserved all that had been said of, and done for him.

A vote of thanks to the Chairman for presiding having been adopted, the proceedings terminated.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

The Annual Meeting of this Association was held on Thursday, May 5, in the Religious Institution Rooms, Glasgow. Mr. R. S. CARLOW, of Arbroath, occupied the chair.

The SECRETARY (Mr. Johnston) read the minutes of the last half-yearly meeting, which was held at Port-Glasgow, as well as the minutes of the various Committee meetings; and these were approved of.

ADMISSION OF NEW MEMBERS.

The following gentlemen were admitted members of the Association:—Mr. James Kelly, Chemist, Clippens Oil-Works; Mr. A. C. R. Dow, Linlithgow; and Mr. Hamilton, Inspector of Public Lighting, Glasgow.

APPOINTMENT OF OFFICE-BEARERS.

The PRESIDENT said he had in his hands a list of the Office-bearers of the Association for the ensuing year, recommended by the Committee; but it was clearly to be understood that the meeting had power to nominate for office any gentleman whom they thought fit. The recommendation of the Committee was that Mr. Samuel Dalziel (Kilmarnock) should be appointed President; Mr. Niven (Dunoon), Vice-President; Mr. Napier (Crieff), Secretary; and Mr. W. Smith (Helensburgh), Treasurer.

The meeting unanimously approved of the recommendation of the Committee.

The PRESIDENT said that hitherto the offices of Secretary and Treasurer had been separate, and the question had been raised in committee as to whether these offices should be conjoined. He should like to have the opinion of the meeting on the subject.

After some discussion, in which counter motions were proposed and seconded that the offices be combined, and that they remain as at present, the latter motion was carried by a large majority.

AUDITORS' REPORT.

The PRESIDENT next submitted the Auditors' report for the year, which showed that the finances of the Association were in a highly satisfactory condition.

The report was adopted.

The PRESIDENT said that although during the past half year there had been two or three demands on the Benevolent Fund, it was still in a healthy state.

ALTERATIONS IN THE RULES OF THE ASSOCIATION.

The PRESIDENT said that, with respect to rule 5 of the Association, it had been thought proper to eliminate the clause which limited the membership of the Association to managers whose annual make did not exceed 30 million cubic feet, because a large number of the members had an annual make considerably in excess of this figure. Then, as to the period of admission, quarterly had been substituted for half yearly. Again, it was proposed to alter rule 9 with reference to the appointment of Office-bearers and Committee of Management; rule 14 as to the contributions of ordinary and extra-ordinary members; and that rules 15 and 16 be excluded altogether. With these alterations, which were recommended by the Committee, they proposed that the rules be reprinted, and sent out to members in the adjusted form. There was this further recommendation, that three of the Committee should yearly retire in rotation.

Mr. FULLERTON (Motherwell) moved that effect be given to the recommendation of the Committee.

Mr. NAPIER (Crieff) desired an explanation with reference to rule 3. He wanted to know whether the Association had been in the habit of giving relief to persons who were not members, or who had no claim upon it.

The PRESIDENT said that whenever they found in poor circumstances a person who had been connected with the gas trade, a Committee was appointed to consider the case, and if in their opinion there were good grounds for giving relief, a grant was made from the Benevolent Fund. This was done whether the person was a member of the Association or not.

Mr. NAPIER did not think the Association should stretch its generosity so far. He moved that the words "or others," in rule 3, be deleted.

The PRESIDENT thought it right to mention that subscriptions to the Benevolent Fund were received, not from members of the Association alone, but also from outsiders; and it was because of this latter circumstance that the Committee had hitherto thought they were entitled to go beyond the roll of members to afford relief.

Mr. NAPIER said there was nothing to prevent most of the subscribers becoming members of the Association, and thus having a direct claim upon it. As the rule stood, it opened a wide door for spending the funds.

The PRESIDENT remarked that there was no doubt of this; but still it was understood, when the subscriptions were obtained, that the Association should give relief when they found a person actually in need.

Mr. NAPIER pointed out that the Association never had any information as to who received aid from the funds.

The PRESIDENT answered that it had always been considered desirable to keep private the names of those obtaining relief.

Mr. WILSON (Coatbridge): You do not go out of the gas profession?

The PRESIDENT: No; not in any case.

Mr. NAPIER said if the words "and others" were struck out of the rule, it would then be in conformity with the practice of the Association.

Mr. BLACK (Alexandria) moved as an amendment, that the rule stand as at present; and this was seconded by Mr. WILSON (Coatbridge).

After some further discussion, a vote was taken as between the motion and the amendment, when, by a majority of 14 to 11, the motion was carried, and the words "and others" were deleted from the rule. Mr. Napier, however, adopted a suggestion made by Mr. Niven that the words "or others who have been or are in connection with the gas profession," should be substituted.

The PRESIDENT then delivered the following

VALEDICTORY ADDRESS.

Gentlemen,—The time has now come when it is my duty to cease to hold the reins of office, and when I must return the trust which a year ago you reposed in me. It is for you to say whether or not I have been a faithful steward. Were the question left to my own decision, I would unhesitatingly arrive at the conclusion that I had failed in the proper discharge of the duties devolving upon me as President; but, at the same time, I would add that this failure has been occasioned by circumstances over which I really had no control. I had set before myself a high standard, to the utmost pinnacle of which I had determined to reach ere this hour should approach; but, as you all know,

"The best laid schemes o' mice and men

Gang aft agley."

You are all aware of the changes which have taken place in the management of gas-works in Scotland since the date of our last meeting. An ex-President of this Association has made two important changes—first, from Coatbridge to Glasgow, and then to Edinburgh—and the vacancies thus created have caused a re-arrangement of offices which has brought men from the south-west and the north into our midst, and driven others from amongst us to greater distances from the common centre. I merely mention this in the way of apology for the non-delivery to-day of an address which should be worthy of the office I hold, and to which it might be worth your while to listen. Changes, and preparations in anti-

cipation of changes, necessarily prevent a man from devoting that time to careful consideration of any special subject which would enable him to offer practical suggestions as to the best mode of overcoming difficulties which a manager encounters in his daily work, or in experimenting with the view of introducing greater economy in the make and distribution of gas. While I have never lost sight of the duties attaching to the presidential chair, and while I have done all that in me lay to keep the wheels of the Association moving smoothly and sweetly along, I confess that in the departments of experiment and research I have not been able to accomplish the work which it was my earnest desire to overcome.

I want you for a moment to consider the position in which we, as an Association, are placed. I need not tell you what are the results of co-operation and united action, nor is it necessary for me to point a moral by reminding you of the inevitable results of divisions in a house. Our Association was instituted with the main object of forwarding the interests of the profession, and thereby the interests of its individual members, and I do not think that any one can say he has not, by his connection with the Association, received benefit. But then in the past we have had important subjects under consideration, and these have been discussed with great ability, and have often led to decided improvements in our various works. If this has been characteristic of the past, there is no reason why it should not continue in the future. The eight years of the Association's existence have by no means exhausted the subjects capable of discussion, and there are yet, even in the best-constructed gas-works, little matters of detail which do not bulk very largely to the eye, but the proper arrangement of which is fraught with importance. Admitting, then, that there is an abundance of subjects, the next question is—Where are we to get the gentlemen to deal with them? I will not offer any insult to the intelligence of my brethren by even seeming to hint that it is necessary to travel beyond the limits of the roll of members. We have the subjects, and we have the professional gentlemen capable of treating them; and from this chair I would impress upon every one to exert himself even a little to prevent decay making its appearance in the Association. Union is strength, and a united Association, endeavouring with all its might to advance the science of gas lighting, is an irresistible power for good. I am persuaded that I have only to draw attention to the great difficulty there has been to obtain papers for this meeting to ensure that our next gathering, under the presidency of Mr. Dalziel, will be up to, if not above the average of any of the many successful meetings of the past.

I will now, with your permission, read the few general remarks which I have prepared as an apology for an address. In anticipation of this meeting in Glasgow, a gentleman was kind enough the other day to allow me the use of the "Report of the Committee appointed by the Subscribers to the Glasgow New Gaslight Company," which is dated the 6th of November, 1819, and from which some information of a rather curious nature may be gleaned. Prior to the above date the Glasgow Gaslight Company had been in existence; but the promoters of the new concern, in the preamble of the Bill which was to be brought before Parliament, said: "And whereas the city and suburbs of Glasgow and places adjacent are large and populous, and it is for the interest of the inhabitants thereof, and manufacturers therein, that they should have a plentiful supply of gas or inflammable air at a reasonable rate for lighting the streets, squares, market-places, and other places within the said city and suburbs and places adjacent, and for lighting their private houses, shops, counting-houses, warehouses, and other buildings; and whereas this can be best procured by there being another Company established and incorporated for supplying the said city and suburbs and places adjacent with gas or inflammable air. May it therefore please," &c. The Committee estimated that there were about 3000 shops in Glasgow and suburbs, of which only about 1600 were lighted. The 500 not then lighted were supposed to average 80s. each a year, and would yield a revenue of £750, and this supposed increase, taken with those already lighted (£500) would give in all £1250. Without following the Committee through all the figures they give, I would merely mention that the total revenue was estimated at £16,387 10s., and that from this revenue a return of nearly 10 per cent. would, it was calculated, be received upon the capital employed. By the Bill which was presented to Parliament it was enacted that the Company should not erect any apparatus for the purposes of making and purifying gas within at least 400 yards of the River Clyde or the now classic Mollindinar Burn; nor was it to be lawful for them to let run into the river or into any stream any of the water, oil, tar, ammoniacal or any other liquor produced by the distillation of coal, nor any water or liquid used in washing or purifying the gas, but they were to have liberty to run off the water from the purifiers or other apparatus by means of drains, provided the water should not contain oil, tar, or ammoniacal liquor. It must be borne in mind that these provisions were framed more than 60 years ago, when gas lighting, like the city in which we meet, was yet, comparatively speaking, in its infancy. At this early period water from the purifiers meant water *plus* lime and *plus* sulphuretted hydrogen, popularly known as "blue billy;" and every one who now hears me can fancy what the consequence would be of running such a compound into a drain. Then, too, chemistry, whether analytical or synthetical, had not sufficiently emerged from the surrounding gloom to tell those having the management of gas-works that in the tar and ammoniacal liquor they had valuable compounds, and a source from which their revenues could be largely increased. Companies had not then come to regard the by-products of coal distillation from the commercial point of view which now reigns supreme.

There is no necessity now-a-days to introduce into Acts of Parliament restrictive clauses with reference to the disposal of the heavy oils and liquors. Their value is too well known and too highly appreciated by those whose business it is to make and sell gas; and it is my firm conviction that just as gas companies and corporations introduce the requisite machinery to break up and convert these liquors into their various marketable substances, so will be the measure of profit realized. It is in this direction almost more than any other that we are to look for the aid which will enable us to reduce the price of gas in Scotland to a greater extent than has hitherto been the case, and in this way to render still more popular and extensive the use of gas.

I have said that at the time this Bill was framed the city of Glasgow was yet in its infancy, and although I have not at hand the statistics of the population of the city in 1819, one can judge of the extent of its boundaries from the figures as to the additional number of public lamps which the Committee computed would be required. From the same report, to which I have already referred, it was calculated that in the burgh of Calton there would be required 200 jets; in the burgh of Gorbals, 200; for the bridges, 50; for the portion of the city of Glasgow not yet lighted, 250; or a total of 700 jets—which, taken at 25s. each, were estimated to yield a yearly revenue of £805. Since 1819 Glasgow has made gigantic strides, and now it is regarded as the second city in the empire.

When I say this, I speak of its material growth, of its wealth, and of its population, but not of its gas supply. In this latter respect it stands second to none. I have not the data upon which to draw a comparison between the quantity of gas made sixty years ago and at the present time, but as the new company anticipated a revenue of only some £16,000 odd, it may be conjectured that the quantity of gas actually made and sold

was very small. At the present time the quantity of gas made at the different works under the direction of Mr. Foulis amounts, roughly speaking, to about 2 billion cubic feet, and the gross revenue last year was upwards of £341,000. The price at which gas is now sold in the city (3s. 8d. per 1000 cubic feet) would astonish the promoters of the new gas company if, like the ghost in "Hamlet," they should be permitted to visit the scenes of their former labours.

So far as I am able to gather from general reading, the prosperity of Glasgow from a gas point of view is not exceptional. All over the country progress—steady, and often rapid progress—marks the career of gas corporations and companies. Occasionally we may hear the triumphant note of some imaginative electrician who has rather rashly jumped to the conclusion that he has discovered the philosopher's stone, and henceforth there is to be no further use for gas, except it may be to supply motive power for dynamo-electric machines. Familiarity, it is said, "breeds contempt," and in the matter of public lighting there is now perhaps too great an inclination to sneer at the electric light and the progress it has been making. That it has progressed in recent years, no one will be foolish enough to deny; but that it has taken the position claimed for it by its admirers, I am quite prepared to dispute. A parallel has been attempted to be drawn between the early history of gas and the present and too greatly overwritten history of electric lighting, and an endeavour has been made to show that the opposition to gas was much the same at the beginning of the century as the opposition to electric lighting is towards its close. But it is entirely left out of sight that from the outset of gas lighting the material to be used as an illuminant could be stored in quantities, and the supply drawn as required, and further that it could be subdivided into as many minute points as the exigencies of the case demanded. Wherein have we any parallel in electric lighting? It has been found impossible to subdivide the light except with the loss of great power, and that where such subdivision occurs, the light, leaving aside its novelty, is no better than that supplied cheaply and conveniently by gas. Priority is claimed for the new light where immense spaces require to be illuminated, or where there is a desire to concentrate a powerful body of light upon a particular spot, and perhaps there are some grounds to be urged in favour of this contention. Indeed, it would seem as if electricity were preferable to gas in such circumstances, because all over the country, from London down to some less significant towns, the light may be seen every night in all its brilliancy. It has often occurred to me, that with so many spaces to light up, and with such a tremendous demand upon the resources of the various electric light companies which have been established, good profits must have been realized, and large dividends divided amongst the fortunate holders of shares. With this idea in my mind, I have carefully scanned all the literature on the subject that has fallen into my hands; but I have not been able to trace any information pointing in the direction of a division of profits. On the contrary, I have seen a paragraph to the effect that certain unfortunate shareholders were called upon to pay up their shares in order to enable operations to be continued.

Turning to the history of gas companies for the past year, I find everywhere the record of increased prosperity. The great London and provincial English gas companies have been doing immense business. Profits have been realized not by the thousand, but by the hundreds of thousands in places where the works are in the possession of corporations such as that of Manchester. Sums like £50,000 have been taken from the profit side of the account, and placed to the credit of the town, so as to carry out or complete improvements. Even in the city in which we are met, after making a liberal allowance for all claims, there was a surplus on last year's operations of well-nigh £14,000. Of course it is not always safe to judge of the prosperity, or want of prosperity, of a company by the amount of profit which has been realized at the expiration of a fixed period; but in this case I think I am amply justified in reaching the very moderate conclusion that the success claimed for electric lighting has yet to be obtained; and, so far as I am able to judge, no member of this Association need hesitate to carry out reforms or improvements in his works on the ground that they may soon be rendered of no avail through the introduction of electricity. If at the end of the day electric lighting does not become general, its advocates will never have occasion to say that it has not received every encouragement. The wealthy millowner, the land proprietor, and the moneyed coal master have all put their shoulders to the wheel and their hands in their pockets; and corporations, if not from Land's End to John O'Groats, at least over a considerable section of the country, have come forward with thousands of pounds extracted from the pockets of the ratepayers to help on the movement. Personally I have no desire to see the movement stopped. It has done much good in a variety of ways, and not the least important has been the incitement of gas engineers to show to its full advantage the inherent power of gas, whether as a heating or a lighting power.

In the comparative statements which are made respecting lighting by gas and electricity, I desiderate that more of accuracy should have been observed. We are often told that the cost of lighting a given space by electricity is so much, and by gas so much more for the same amount of light; but we are not told that in the former case any provision is made for a margin of profit, while in the latter case the figures given as the cost of gas include, as a rule, the percentage of profit upon which companies and corporations work. Were the amounts which are annually paid by corporations out of gas profits, for the improvement and embellishment of cities or in diminishing rates, taken into account, gas would, from a commercial point of view, bear still more favourable comparison than it does with electricity. But the idea that the lights are competing lights is now pretty well washed out. The impetus which the rather sudden development of electricity gave to gas lighting has done a world of good in many respects, and the public are now beginning to thoroughly realize the value of the agent which has long been at hand. Not very long ago Dr. Siemens showed to an audience in this city that by a very simple yet ingenious apparatus of his own invention, the light obtained in the consumption of a given amount of gas might be increased by 40 per cent., and that in this large proportion the deleterious influences said to be connected with gas lighting might be diminished. Other engineers of eminence, working in the same direction, are succeeding in raising to the highest state of incandescence those carbon particles which, under the old system of lighting, were allowed to pass away unaffected by the heat, and thus for the same money the consumer is able to make a better use of the gas supplied.

I often think it is unfortunate that the novel and ingenious contrivances for checking and regulating the flow of gas to the point of ignition should not be produced and sold at a less cost to the consumer. If by any means this could be done, many complaints would be removed as to the quality of the gas, when really the gas is not in fault at all. Consumers have far too long been in the habit of using the common union jet, which can be bought for a mere bagatelle, but which should now be relegated to antiquarian museums. Consumers are wedded to the old iron burners, and when a gas manager uses such oratory as he is able to command to show the false economy of their use, he is often accused of having interested motives. In one point of view this is quite true, because every manager desires to see the material he manufactures put to its best use,

and the more he agitates for reform in gas consumption, the more he will forward the interests of the company or corporation he is serving, and of the consumers themselves.

When I said it was unfortunate that improved burners were sold at so high a price, I trust I shall not be misunderstood by those who make a specialty of this department. The labourer is always worthy of his hire, and if the labour on a piece of mechanism is great, it must be paid for by the parties taking the benefit through its use. All I meant to say was that the increase in price from the old union to the latest and most improved regulator burner is such as to daunt consumers; but if they could only be persuaded that they are yearly blowing into space more gas than would pay for the higher-priced burners many times over, reform would speedily ensue. In order to achieve this, it is the duty of gas managers on all occasions to impress upon their consumers the necessity of attending to the gas at the point of ignition. When once thorough attention has been aroused on the subject, there can be but two results—first, that the consumers will be better satisfied with the gas supplied to them; and second, and almost as a necessary consequence, there will be an increased demand for gas.

There are other modes by which the demand for gas may be increased, which is by companies and corporations doing all that in them lies to encourage the sale of gas in the departments of heating and as a motive power. Of late we have heard a great deal upon the subject of supplying gas at a cheaper rate for the purpose of heating. This question has arisen out of the other question how best to prevent the occurrence of fogs in large cities. It has been shown that the smoke escaping from the ordinary coal fire has a great influence, especially in certain atmospheric conditions, in increasing the density and disagreeableness of the fog; and, in order to mitigate the evil as far as possible, Dr. Siemens, to whom I have already referred, has brought forward a system which gives all the advantages of radiating heat from an open fire with an entire absence of smoke, this being effected by the combined use of coke or anthracite and gas. For such a purpose it has been argued that the gas does not require to have a high illuminating power, nor does it require to be so free from sulphur impurities as when used solely for illumination, and it has therefore been proposed that the first and last of the distillates of coal should be conveyed away by separate pipes to consumers who might be inclined to use it more largely as a heating agent. This compound could be sold at a very low figure, and the loss, if any, upon its sale would be more than compensated by the increased price that could be obtained from the intermediate make, which would be of a high illuminating power. Such a proposal is open to various objections. First of all, a gas would be used in the grate which might contain a heavy percentage of sulphur. Now, the primary object of the invention is to purify the atmosphere; but I fail to see wherein there would be any advantage in substituting the sulphur in the impure gas for the smoke caused by burning coal. By the liberation of sulphur in an aqueous atmosphere there would be a speedy formation of sulphuric acid, and I need not say how prejudicial this would be to vegetable if not to animal life. Or, again, the occurrence of a down-draught might blow more sulphur into the room than would be at all agreeable to the occupants. But supposing these difficulties to be overcome, companies and corporations would require separate mains and services to convey the gas, and there would necessarily be an amount of expense incurred which would go far to increase the price of the impure article. I am greatly taken with the idea of the gas and coke fire; but I think the gas should be that which is supplied for lighting. In order to encourage the use of such fires, however, I would in all cases, where a consumer used gas for both purposes, allow a certain deduction on the price. This could be easily done, because at a comparatively small increase in the cost the additional gas supply could be given, and by it the result might come about that our works would be more regularly and fully employed all the year round.

Mr. NIVEN said that he had great pleasure in proposing a hearty vote of thanks to the President for his very able address. He had not only dealt with things present; but, with the spirit of the antiquary, had gone back upon the things of the past, and had given information regarding the great city of Glasgow which would take nothing away from the interest of the present meeting. He also proposed this vote to the President for the ability he had shown while acting in his official capacity; and he trusted, now that the Association had conferred its highest honour upon him (Mr. Carlrow), he would not throw it off, but would still continue to have a warm interest in its progress.

The PRESIDENT said he had to thank Mr. Niven and the meeting for the vote of thanks which had just been awarded to him. He had always had a deep interest in the welfare of the Association. After he had been appointed to Port-Glasgow he had been made a member of the Committee of the Association; for three years he had acted as Secretary; and finally he had been elected President. During all these years he had ever had the interests of the Association at heart, and he should be glad if in the future he could still be of service to the members.

(To be continued.)

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

[From the "Official Report" in the American Gaslight Journal.]

(Continued from p. 707.)

In the course of the conversational proceedings at the close of the recent meeting of this Association, one of the subjects brought before the attention of the members was that of

GAS-STOVES.

Mr. TABER said during the year 1879 they let and sold for cooking and heating purposes about 100 gas-stoves. He took off a record of 45 persons to whom they sold gas-stoves during the year; and found they had consumed, according to the meters, since they commenced using the stoves, 188,000 feet of gas. In the year previous these same parties consumed 50,000 feet of gas in four months. Granting, he said, that the stoves were generally in use for five months, the average consumption by each gas-stove during the summer was 2500 feet. He supposed that they had now every year about 150 gas-stoves at work, which at this rate would bring in a revenue of about 1000 dols. a year.

The PRESIDENT: Do you let the stoves?

Mr. TABER said they did, and he thought they were not in any way worse off for letting them. They let all sizes and descriptions of stoves; and received as rental for 64 gas-stoves 160 dols. per year. The depreciation of 10 per cent. would be 64 dols., and the interest and expenses would bring it up to 152 dols. Probably the gas-stoves did not bring in much as profit on the rental, but the consumption of gas was a little larger than the average consumption of each consumer in the summer months of the previous year. It was about equivalent to adding so many consumers during the summer months. Every one who had tried it seemed to be entirely satisfied with the result.

Mr. GOODWIN, being called upon by the President, said: I made some remarks at the last meeting of the American Gaslight Association, with reference to the heating power of gas-stoves.* During the recent cold

weather I verified some of the tests. I chose a day when the thermometer was below freezing point, with no fire anywhere about the room, so that the result obtained should be entirely from the gas; and I think I have demonstrated that the larger the stove the more heat you can get from a given quantity of gas. For instance, a stove 8 inches in diameter elevated the temperature of the room 13° in 80 minutes, while a 14-inch stove elevated it 28°. To be sure there was more gas consumed in the larger than in the smaller stove, but the percentage was decidedly in favour of the larger stove. Reversing the proposition, and taking a given quantity of gas, we found that 6 feet of gas in the 8-inch stove elevated the temperature 15° in 45 minutes, and that the same quantity of gas in the 14-inch stove elevated the temperature 24° in 22 minutes. As I have before remarked, in my judgment it is entirely wrong to undertake to heat a room with a gas-stove unless you have some means of carrying off the products of combustion. I have been asked what difference there is between a gas-stove using an atmospheric burner and one using a reflecting burner, which burns the gas in its illuminating form. I can only say that our tests have demonstrated so far, that the result is largely in favour of the illuminating form. The stoves we have recently made are constructed so that they give off three different forms of heat. First, they give off the heat of radiation. Gentlemen are probably familiar with the fact (or some may have forgotten it) that heat is radiated in straight lines. You can easily prove this by taking two mirrors, say 13 inches in diameter; place them 30 feet apart, and put in the focus of one of them any substance that will give off heat—a ball of heated iron, for instance—and then put some gun-cotton in the focus of the other mirror, 30 feet off. Just so soon as you bring the two mirrors in a position where a line will pass through the focus of both of the mirrors, the gun-cotton will explode. This certainly proves that heat goes in straight lines. That is one form of heat, and is the form of heat that you get by the use of the atmospheric burner stove. If you use a reflector with the illuminating gas you also get the heat of reflection. Heat is governed by the same laws as light—the angle of reflection is equal to the angle of incidence; and if your stove is so constructed that the light is thrown down on the reflector at a proper angle, it will be reflected in straight lines into the room, and you will feel the reflected heat a number of feet away from the stove. Another source of heat is called the heat of conduction. The stoves are constructed so as to carry in at the bottom a certain amount of air, and as it passes through the drum of the stove the air is elevated to a temperature of about 280°, and is then thrown out into the room. You therefore get from this particular kind of stove the three sources of heat, which you do not get in the atmospheric burner stove, unless it is constructed upon the principle of the Adams stove. I made a stove after this pattern recently, and not having the fire-clay burners, nor time to get them up, I constructed some brass ones. In attempting to use them, our brass burners were melted in a very few minutes—the heat was so intense. We are now having some clay burners made, and will put them into this stove and test it.

The PRESIDENT: Can you give us the theory of the combustion which produces such an intensity of heat?

Mr. GOODWIN: It is claimed that it is because of the large surface of the stove exposed to the heat. In the Adams stove there is about 45 feet of surface. It has several channels passing up and down and through it, which the other stoves have not; and, as remarked, the greater intensity of heat, it is claimed, is due to this larger surface.

After some further remarks, the discussion turned upon the question of the use of iron sponge in gas purification; and subsequently the various uses of foul lime in agriculture were dwelt upon. Nothing, however, of much moment was brought out in the course of the conversation; and at its close the Association adjourned *sine die*.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Monday.

The ancient town of Dundee and the cheap gas movement have for several years past been associated in the minds of those who take an interest in gas matters, and there is no question that hitherto the town has kept well in the van, and has been, and indeed is an example to other corporations; but unless things take "a turn and mend," there is reason to fear that its well-won laurels may fade. From the accounts which were submitted to the Finance Committee of the Gas Commission a week ago, it seems that the capital account stands at £121,809 16s., and the total debt, irrespective of annuities, at £133,080 10s. The revenue account for the year ending the 30th of April last amounted to £58,609 13s. 1d., and the expenditure to £44,952 9s. 1d., while the expenditure on interest of annuities, the sinking fund account, and the contingent fund, was £16,285 11s. 4d. On a balance of the whole accounts it appeared there was a deficiency in revenue as against expenditure of £864 0s. 9d. The had debts for the year amounted to 4s. 8d. per cent., being an increase of 2s. 10d. as compared with those of last year. On the other hand, the leakage, or unaccounted-for gas, amounted to 16·659 per cent., as against 15·162 per cent. last year. From the figures furnished, it further appears that 30,176 tons of coal were carbonized during the year, at a cost, including firemen's wages and haulage, of £32,560 7s. 11d., which is equal to £1 1s. 6½d. per ton. The estimated revenue for the current year was put down at £61,597 6s., and the expenditure at £62,350 0s. 4d., showing an apparent deficiency of £952 14s. 4d. The Committee propose that the price of gas should be the same as last year—namely, 8s. 8d. per 1000 cubic feet in Dundee; and 4s. 8d. in the districts of Harecraig, Invergowrie, and Downfield—subject to 5 per cent. discount if paid within 28 days. The rate for public lamps is fixed as before at 9s. 5½d. Two years ago, when the price of gas in Dundee was reduced to its present low figure, the total revenue from all sources was £61,117 5s. 10d., as against an estimated revenue of £59,598 0s. 8d., while the actual expenditure was £58,282 7s. 6d. During the year to which these accounts refer, 28,329 tons of coal had been carbonized, at a cost, including firemen's wages and haulage, of £31,172 14s. 6d., or £1 2s. per ton. It was on the occasion of the presentation of these figures that the Convener of the Gas Committee made the grand boast that, taking light for light in any other town in the kingdom, Dundee was the cheapest. This boast led to the exhibition of a good deal of feeling in Scotland, and to an exposure of what some managers thought to be the fallacy of such a statement on the part of the Convener, as all the circumstances affecting the price of gas, it was said, had not been properly considered by him.

Leaving "Bonnie Dundee," and coming to the "Fair City of Perth," I find that the gas accounts for the year ending the 30th of April last have just been published. The income, including a balance of £70 from last year, amounted to £18,713 12s. 9½d.; and the expenditure, including £700 set apart as a sinking fund, £200 for depreciation of works, and £55 18s. 8d. to meet bad debts, was £13,615 12s. 9½d., leaving a surplus of £100. The main items of income were—Gas and meter rents, less £196 0s. 0½d. of discount, £11,590 17s. 10d.; naphtha work, £1377 1s. 6d.; coke, £608 6s. 6d.; while the chief items of expenditure were—Coal, £3254 18s. 1d.; wages and salaries, £2491 13s. 1d.; annuities, £2812 10s. The estimated expenditure for the present year shows a slight excess for mains and service-pipes, but the estimated gas revenue is also slightly increased, though the naphtha

* See ante, p. 103.

and coke are not expected to produce so much as last year. The present price of gas—4s. 2d. per 1000 feet for Perth, with a discount of 5 per cent. to large consumers, and 5s. for Scone—will be unaltered.

The Gas Corporation of Arbroath met on Monday last, and disposed of a number of business items. It was reported by the Auditor that the books of the Corporation, as kept by Mr. Terrace, from May 31, 1880, to March 31, 1881, the date of his leaving the employment of the Corporation for Glasgow, had been carefully gone over, and were found to be correct, the money drawn by him having been duly accounted for.

The Directors of the Penicuik Gas Company met on Monday last to consider the applications for the office of Manager, rendered vacant by the removal of Mr. McGillivray to Musselburgh. There were no fewer than 104 applications. A short list was selected from this number, and eventually the choice lay between Mr. John Marshall, Bellshill, and Mr. Arthur G. Quigley, Assistant Manager, Greenock. Both gentlemen being well qualified and highly recommended, the Directors have rather a difficult task to perform. In connection with this appointment, I may narrate a somewhat amusing fact. One morning the Solicitor of the Company, who has his place of business in Edinburgh, was waited upon by a seafaring-looking man. In answer to the usual demand as to what he desired, he removed a quid from his mouth, and said that he wanted the appointment as gas manager at Penicuik. The Solicitor, puzzled beyond measure that a sailor should make such an application, asked whether he was in any way qualified for the duties, and the reply was ready and definite. He had been on board one of Her Majesty's vessels where gas was made to supply the officers' quarters, and he had, through careful observation, qualified himself, as he thought, to take charge of works on *terra firma*. It is almost unnecessary to say that the sailor was not placed in the short list. Strange though it may appear, quite as unlikely persons have been appointed as managers in Scotland.

The Directors of the Musselburgh Gas Company met on the 28th ult. for the purpose formally of relieving Mr. Andrew Scott, the retiring Manager, from the charge of the works which he has held for such a long period, and of handing the same over to Mr. Hugh McGillivray, the new Manager. This business having been accomplished, the company dined together, and among the toasts proposed was "Long life and happiness to Mr. Scott," and at the same time the new Manager received a hearty welcome. Both gentlemen acknowledged the compliments in appropriate terms.

Mr. Donald Farquharson, Treasurer of the Police and Water Commissions, died on Wednesday afternoon, at his residence at Newport. Mr. Farquharson had managed water affairs in Dundee ever since the works were acquired by the Corporation, and it is admitted on all hands that he conducted the business of the Trust in such a way as materially to contribute to the success of the undertaking. He leaves a widow and a family of eight.

The report of Mr. Stevenson, C.E., of Edinburgh, who was appointed by the Board of Supervision to investigate into the two schemes for the supply of Carnoustie—the Brax and the Crombie—has now been published. From this report it appears that the Crombie scheme was to cost more than the Brax, and that the water was inferior in quality. Mr. Stevenson having had some doubt as to the sufficiency of the supply from the Brax after long-protracted droughts, he suggested the propriety of obtaining, should it afterwards appear necessary, a supplementary supply from the Crombie reservoir; but this suggestion was not entertained. To meet the difficulty he had pointed out, the Engineer of the Brax scheme proposed that a supplementary supply, should such ever be found necessary, could be taken from Monikie Burn. Under these circumstances he had decided that it would be unwise to recommend the stopping of the works now under contract, and he was disposed to think that the supply of the district should be taken from the Brax, supplemented, if necessary, from the Monikie Burn. From a journal of gauges supplied to him, Mr. Stevenson had every reason to believe that the Monikie Burn would always yield a considerable supply.

The Board of Supervision has been in communication with the authorities at Macduff, Banffshire, with reference to the water supply of that town, and a reply has been sent to the Board to the effect that while the quality of the water is good there is a scarcity of it. A meeting of the Local Authority was held last week in order to decide upon what steps should be taken, when a suggestion was made that they should join with the neighbouring town of Banff in introducing a plentiful supply. Ultimately a Committee was appointed to consider the matter, and report to a future meeting.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At last Thursday's meeting of the Town Council of Glasgow, Mr. William Ure gave notice of the following motion for consideration at next meeting:—"That in view of the heavy responsibilities of the Corporation in connection with the gas supply of the city, and the progress which is being made in the practical application of the electric light, the Town Council agree to apply any surplus which has accrued from the manufacture and sale of gas during the past financial year towards the reduction of the capital account of the gas, and further resolves that previous to the price of gas being fixed for the current year, the Gas Committee be instructed to consider and report on the best means of reducing the liabilities of the Trust, and the propriety of imposing a differential rate on all consumers without the municipal boundary."

The question of the enormous accumulation of gas coke at the various works of the Glasgow Corporation Gas Commissioners—a matter to which I directed attention last week—was formally brought under the notice of the Town Council, on Thursday, by Bailey Colquhoun, who spoke of the material as becoming useless from having been kept so long on hand. He said there were many persons who were willing to purchase the coke, but not at the prices asked by the Corporation; and he suggested that the price should be lowered rather than that the stuff should be destroyed. At the Dalmarnock works the stock was upwards of 5000 tons. The Convener of the Gas Committee, ex-Bailie Walls, in replying to the remarks of Bailie Colquhoun, confessed that he was himself very much surprised with the amount of coke in stock. The matter, however, was before the Committee, and there was likewise a Special Committee appointed for dealing with the subject.

At the same meeting there were submitted the minutes of the Magistrates' Committee, which stated that on the 5th of May the reports by Dr. Wallace on the illuminating power of the gas supply, during the weeks ended the 16th, 23rd, and 30th ult., were submitted. Thereafter the Town Clerk submitted a letter from the Committee on Gas Supply, stating, with regard to the communication sent them in reference to the deficiency in the illuminating power of the gas on certain occasions during March last, that the Committee found that the illuminating power at the gas-works on the occasions referred to was considerably above the minimum statutory standard. The minutes were approved.

It may afford some indication of the cool manner in which the talk about progress in electric lighting is being regarded by the Glasgow Corporation Gas Committee when I mention that they have recently given instructions for the payment of the sum of £10,341 2s. 1d. as the price of a large additional area of ground required for the extension of the works

at Dalmarnock, and the legal expenses connected with the conveyance of the same. In this way it is seen to be evident that gaslight is not to be put out without a struggle. At the same time it may be stated that they have just received a sum of upwards of £12,000 in payment of the price of the ground forming the site of the late Partick Gas-Works.

An important west-end suburb of Glasgow, most of which is known as Kelvinside, which is chiefly occupied by houses of a very superior class and of large size, the tenants in most cases being wealthy business men, has hitherto been without any local government; but strenuous efforts are now being made, on behalf of the Burgh Commissioners of Partick and of the Kelvinside proprietors, to have the whole district annexed to that burgh. The proprietors of Kelvinside have hitherto looked well after the public lighting of their district, erecting lamps, supplying gas, &c.; and in the evidence now being taken before the Sheriff of Lanarkshire, before whom the applications for the annexation are being considered, some rather curious and almost incredible facts have transpired. At yesterday's proceedings in connection with the matter, the cashier to the Kelvinside Estate was under examination, and in the course of his evidence stated that he had rendered accounts to 35 feuers on a portion of the estate, for road maintenance, gas-pillars, gas, and lighting, which, up to April 21, 1880, amounted to £1254; and that out of this he had only recovered £11 11s. This was from one of the feuers, who afterwards sent a message saying he had made a mistake in paying the sum, which he wanted back. In the present year he had sent out similar accounts for £1267 7s. 3d., out of which was recovered only £21 1s. 1d. from five feuers. Considering the amount of money spent by the Kelvinside proprietors in erecting the gas-pillars, fitting and upholding the lamps, maintaining the lighting, &c., such conduct on the part of "West-end" *crème de la crème* (in their own estimation) quite justified the cashier in speaking of the feuers of Great Western Road as selfish in opposing the proposed annexation.

Business was done on Wednesday in Glasgow Corporation Gas 9 per cent. Annuities at £227, which marked a rise of £2.

The question of the leakage from the Knowesdean reservoir is again before the public of Galashiels in a practical form. On Wednesday the resolution of the Corporation to have the amount or extent of the leakage tested was put in operation by turning off the inflow and outflow of water, and allowing the reservoir to empty itself by the leak—the daily subsidence being marked at a given hour by driving in a stake. By this way it will be possible, with considerable accuracy, to measure the daily leakage as the water runs off. It is expected to settle a vexed question, which has been discussed with no little bitterness—viz., how much, if any, increase has taken place in the leakage during the winter and spring? The leak issues at the bottom of the gully, across which a measuring gauge has been placed, and no doubt exists that the flow of water over the gauge has somewhat increased; but the natural drainage finds exit here, and so soon as the reservoir is emptied the natural drainage can be measured by itself. The value of the new water-works depends in a large measure on the capability of this reservoir (the clear water basin) to hold a supply for the town, and the increase or decrease of the leak is a matter of first importance. The engineers made a close examination of the works before the water was run off, but reserve any report until a further examination is made after it is emptied. These operations are not made with a view to discover the cause of the leak, only to ascertain its extent, which will be quite possible; but the question of cure will remain as far from being solved as before.

There is now a strong disposition on the part of the Falkirk Corporation Water Committee to consider that their attempt to get a good and sufficient supply of water from Callendar Colliery has been a total mistake, the water not being such as the town requires either as to quality or quantity. They have recently resolved to go to Greencraig for an additional supply.

Notwithstanding that the additional supply of the Glenburn reservoir has been obtained, there is great fear of another scarcity of water occurring in the town of Paisley, similar to that of last year. The Water Commissioners have therefore issued notices to the effect that the water supply will be shut off on Saturday afternoons at four o'clock, turned on again for three hours on Sunday, and then shut off till Monday morning.

The Glasgow pig iron warrant market has been very irregular this week. On Monday the range of prices was from 46s. 4d. down to 45s. 9½d. cash, and somewhat similar fluctuations took place on other days. There were buyers at the close of Friday's forenoon market at 45s. 8d., and this price was accepted by sellers in the afternoon.

A further falling off in the demand for house and furnace coal has taken place this week, and the prospects of the summer trade look very gloomy.

MYSTERIOUS DEATH OF A GAS MANAGER.—An inquest was held on Monday, the 23rd ult., on the body of William Henry Johnson, the Manager of the Altrincham Gas Company, who died from poisoning by opium on the previous Saturday night. Two days before this, a doctor was called to the deceased, and found him in a complete state of coma, from which it was impossible to arouse him. A stomach-pump was applied, and the liquid brought out contained opium. The deceased regained consciousness the following day, but died on the Saturday. The Public Auditor appointed at the last Cheshire Quarter Sessions to examine into the accounts of the Company (as reported in the JOURNAL at the time) was going through the books, and the overwork seems to have affected the deceased, who, it was stated by the Superintendent, had been like a madman for a fortnight. The jury returned a verdict that the deceased died from an overdose of opium; but by whom administered there was no evidence to show.

INSTITUTION OF CIVIL ENGINEERS.—At last Tuesday's meeting of this Institution—the concluding one for the session 1880-81—it was announced that the Council has recently transferred Mr. Charles Gandon, of the Crystal Palace District Gas Company, to the class of Members. The monthly ballot resulted in the election of 8 Members and 38 Associate-Members; amongst the former being Mr. John William Hart, of the Shanghai Water-Works. During the past session there have been elected 47 Members, 185 Associate-Members (of whom 54 were previously Students), and 7 Associates; besides which 1 Member and 2 Associates have been restored to the register. On the other hand, by deaths, resignations, and erasures, the Institution has lost 13 Members, 8 Associate-Members, and 9 Associates. The net gain has been 67 Members, and 148 Associate-Members, while there has been a decrease of 3 Associates. In the same period the Council have admitted 178 Students; but as 54 have been elected Associate-Members, as previously stated, and the deductions from various causes have amounted to 26, the effective increase in this class has only been 99. The Institution now consists of 1276 Members, 1435 Associate-Members, 565 Associates, 18 Honorary Members, and 712 Students—together, 4006. Twenty-five years ago the total of all classes was under 800.

ACCIDENT AT THE LEICESTER NEW GAS-WORKS.—Last Tuesday night an accident of a singular character happened at the Leicester Corporation New Gas-Works in the Aylestone Road, which not only did considerable damage, but stopped the supply of gas to the town from this source. In

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

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The charge for Trade Advertisements is at the rate of Five Guineas per page, with discounts varying according to the number of insertions ordered; for particulars of which, apply to WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TO CORRESPONDENTS.

G. A.—Your letter came a week too late to have, if published, any useful effect on the discussion to take place at Birmingham. It will now be well to wait and see what result is arrived at.

W. I. E.—Your further letters received. The account we gave was of a machine absolutely made for use at a provincial gas-works. If, as you say, "the principle was old" at the date of your patent, we do not see why you should take exception, as it was not your arrangement that was described.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 14, 1881.

THE ADVANTAGES OF UNIFORM AND DIFFERENTIAL PRICES FOR GAS.

THERE is no subject of greater interest and importance in the whole question of gas supply than the method of apportioning the rental with reference to the different classes of consumers. The relative advantages of a fixed and uniform rate for large and small consumptions, as compared with a differential scale of charges, are frequently debated with much ardour from various standpoints, and there is so much confusion of opinion and practice in this regard, that a calm review of the general considerations which may be held to bear upon the issue will not be barren labour. As we have said, there is a great diversity of practice on this particular point, ranging all

down the scale from the absolute uniformity of the prices charged by the Metropolitan and other Gas Companies, to the very complicated systems of discount and allowances in vogue in some manufacturing districts in the North of England; and all have their supporters, who cannot see any good in other methods. It may at once be admitted that the question is mainly one of policy and not of principle, and may therefore be susceptible of diverse solutions in different places, where there is great variety of conditions; but, even in this regard, policy may sometimes run into such grave mistakes as to trench on the borders of positive wrong, and we shall therefore treat of this matter as fairly as may be from the point of view of strict equity. This preliminary proviso will necessarily limit our purview, and prevent us from enlarging on all the subsidiary qualifications which may locally influence the settlement of gas-rates. These must, however, always depend for right application on those responsible for satisfying the requirements of any particular district. It may also be premised that the incidence of gas-rates is a question more frequently brought under the notice of the administration of gas undertakings belonging to public authorities than before the directors of gas companies, since the former are often called upon to revise their rates, which they can do in the exercise of their ordinary powers, while the latter are always tied in this respect, except on the rarer occasions when the scheme of working of the concern is under revision.

To start with a uniform price, which is the London practice, it would appear at first sight as though this must be, where population is of the usual mixed character, a fair method of raising revenue. There is always a difficulty in finding a parallel to gas among other articles or services for which value is paid, because other than simple commercial principles enter into the causes which fix the price of gas in any particular place; but there is evident justice in requiring, for a necessity of town life, an equal value from all who may ask to be supplied with it, however that value may have been arrived at. By this means we at once get rid of all suspicion on the part of the public that one class is being served better than another, and that there is a kind of favouritism; by which it might be argued that the gas undertaking is intended for the chief benefit of a class, the rest being admitted by sufferance, or taxed for the privilege. Gas is a creation of times long after Hudibras was made to remark that the real worth of anything is just as much as it will bring; on the contrary, the worth of gas is not what it will fetch, but what it can be made and distributed for, after certain fixed profits on capital charges have been met. Hence, gas-works are not established to sell an article profitably, at a price just so much lower than that at which a competing trade can be carried on in something else—in home-made gas by a large manufacturer, or in oils or candles by smaller customers—but, speaking generally, at whatever price the product can be legally sold for, and the public must please themselves whether they buy it or not. Gas undertakings are enabled, as a rule, to compete even with large consumers who might be disposed to manufacture the article for themselves, because they enjoy certain privileges bestowed upon them for the public good; and also because, having a large general trade, they can always keep their works going at a profit, when the manufacturer might be compelled to have his own plant idle. Hence a mixed district of small and large consumers can be worked more economically than if every large consumer supplied himself, and the people were left in the dark. Consequently, it might be asked why the general public, who are compelled to use gas as a necessary of life, and who impart a stability to a gas undertaking which it would otherwise lack, should pay proportionately more for such light as they require than a manufacturer who uses gas as a trade facility, by which he earns money, and who may possibly cause considerable expense to the producers by making sudden demands on their plant at one time, and at another shutting up his establishment, and rendering temporarily idle so much capital as may have been devoted to his service.

Taking gas-works as primarily establishments of public utility, we consider that differential charges should not be levied in cases where it can be shown that the general public—by which we mean all small and medium consumers, rich or poor, who would usually be outside the benefit of any differential scale of charges depending on quantity consumed—would, in consequence, have to pay higher rates than would otherwise be uniformly charged to all. We object to a consumer paying more for his gas than is necessary, equally when the excess is to relieve another consumer, as to benefit a ratepayer who does not consume gas at all. It is quite easy

to find a number of cases to illustrate how a large gas consumer may be fairly allowed certain advantages, which will not prejudice the public, for the sake of ultimate benefit to the undertaking by the extension of its operations. For instance, a gentleman wishes to have a special main laid to supply his establishment, and he guarantees a minimum annual consumption equal to that on a certain length of main in the public highways. In this case, in the ordinary way of business, an equal length of main would be laid on the chance, perhaps after many years, of deriving so much revenue from it, notwithstanding the certainty of loss by leakage, depreciation, and capital charges. Hence, as this would, in the present example, be borne by the consumer, there can be no objection to allowing him a discount calculated (after reckoning everything) to place him on the same, or nearly the same footing, as a source of revenue to the concern, as so many different customers. Then, as regards cash discounts, there cannot be any sound objection to an allowance for ready payment of accounts calculated on the value of money for the time anticipated, *plus* the estimated cost of collection, and the risk of making bad debts. The cash discount would therefore represent interest, insurance, and cost of collection of the amount received, and so long as it is offered to all customers it is perfectly justifiable. It is difficult to perceive the reason for the course sometimes followed of offering a cash discount to large and not to small consumers. If there is nothing more than the financial question to be considered, the early payment of a number of small accounts would be more desirable than the same amount made up of a few large sums. This consideration tends to show how important it is, when allowances are in question, to distinguish clearly between simple discounts for cash, and drawbacks granted for other reasons, such as those already indicated. It will, of course, be understood that small consumers, whose cash discount would be insignificant to themselves individually, may be less amenable to the influence of inducements to pay cash than others whose monetary transactions are usually of such importance as to render their cash discounts alone a considerable source of income. Still, the influence, such as it is, should apply to all, and if the larger customers alone avail themselves of it, no small benefit will be secured.

With reference to differential prices within certain geographical limits there is little to be said, as this is pre-eminently a local affair. If the differences represent, as nearly as may be, the calculated expenses of supplying the outer regions over and above that which would serve the home district, the arrangement is an equitable one. There is, of course, this difficulty, supposing the Town Hall to be taken as the centre of the radii which include districts wherein gas is sold at different rates, that this system of localization is only strictly correct when the offices and works of an undertaking are situated very near to that centre. It would, in fact, be fairer if, as is sometimes done, distance from the source of supply were taken as the controlling consideration.

We have far from exhausted this very important subject; but for the present it is not our intention to deal with it at great length, or especially to touch on the closely-related question of meter-rents. On the whole matter, our sole desire is to see a just distribution of expenses among all classes of consumers, so far as simple means of adjustment will secure this end; and if there should be a doubt as to which class can be best served, we incline towards the small consumers, as it is manifestly better that the range of operations of a gas undertaking should be as wide as possible, so that its income shall be drawn from many sources, not likely to be readily disturbed. Benevolent reasons apart—although these need not be overlooked—we consider the strength of gas lighting to lie in its complete acceptance by the bulk of the people in their own houses, and not principally in the support it may receive from large consumers, whose sudden dropping off may be equivalent to the loss of a parish, and who are prone to set up private works, or try experiments with electric lighting, when annoyed by the imposition of an extra penny or two per thousand cubic feet, which would be little regarded by the ordinary householder or tradesman.

THE PROPOSED SULPHATE WORKS OF THE ROCHDALE CORPORATION.

THERE has been considerable discussion at Rochdale on the question of working up the ammoniacal liquor, much difficulty having been experienced in deciding on the kind of apparatus to be adopted for this purpose. The claims of an English and a German arrangement were well weighed, and the examination of the comparative merits of the two methods of working involved the Gas Committee in several journeys—

including two as far as Cologne—before they could make up their minds which to recommend for the adoption of the Council. Eventually the former model was preferred, although it is confessedly to cost, on the whole, nearly double as much as the other. The foreign apparatus had the disadvantage of being little known, and the Rochdale Committee seem more unwilling than usual to try experimental apparatus just now. We may be excused of appearing to disparage the known excellence of the English method of treating ammoniacal liquor, if we confess to some regret that a trial, which might have been arranged on perfectly safe conditions, of the German apparatus, was declined in the present instance. There can scarcely be too great diversity of design in the plant used in mechanical or chemical processes, so long as good results are secured by any one of the systems employed; for progress is materially assisted by the means of comparison and the exposure of principles thereby secured. There is, however, an astonishing variety of appliances already in practice for the extraction of ammonia from gas liquor; and the Rochdale Committee can scarcely be blamed for preferring to rely upon a process on the safety of which they had abundantly satisfied themselves.

THE CONGRESS OF THE SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ AT NANTES.

At the same time that the members of the British Association of Gas Managers meet at Birmingham, the Congress of the Société Technique de l'Industrie du Gaz en France will be in session at Nantes. As already pointed out by Major Dresser, in his letter in the JOURNAL of the 17th ult., the clashing of the two gatherings in point of time is to be regretted, and on another occasion it would be well if an arrangement could be made whereby a visit to both meetings might be rendered possible to any one who may desire the opportunity. It is announced that the French congress is expected to prove highly interesting, as the number of memoirs and communications handed in is considerable. There is a distinction observed between these two classes of papers, and the result of this arrangement is the collection every year, besides the more important memoirs, of a considerable number of papers bearing somewhat of the characteristics of the JOURNAL "Notes," but more rigidly confined to the boundaries of gas manipulation. For the memoirs, a sum of £160 is set apart to be divided into various prizes, at the discretion of the Committee; and to be awarded to the authors of the most important papers, upon the judgment of a special Committee of five members. A sum of about £48 is also allotted to be divided between the authors of the two best communications, the recipients being determined by the meeting. Besides these two series of prizes, there will be a prize of £8 given to the workman who can bring testimony of having served longest and most deservedly in any particular gas-works, presumably in France. The programme of the congress covers three days, and includes, besides the usual reading of papers and formal business, a visit to the St. Nazaire Gas-Works, and also to the establishment of the Transatlantic Steamship Company, of which M. Ellissen, the President of the Société for the current year, is one of the Managers. A peculiar announcement in the *Journal des Usines à Gaz*, which is also the organ of the Société, in reference to the meeting, is addressed to the members who intend to "assist" at the event, requesting all who have not yet sent in their *cartes de visite* to bring them. At the hall of assembly, which will in the present case be the theatre of the School of Sciences at Nantes, frames are prepared to receive these cards, with the names of their owners appended thereto, in order that the members may be enabled to know each other, and that the Société may, by retaining the photographs, keep a *souvenir* of any member who is lost to it by death. The custom is a graceful one, and might easily be imitated elsewhere. It is, of course, no affair of ours, if those more interested in the matter are content; but we desire to point out, while mentioning the congress, the great delay that is usually apparent in the publication of the Proceedings, and which one would imagine to be unnecessary. After the meetings of the Société, except in respect of a few of the papers which may be published in one of the technical journals, there is no account of the memoirs or communications available for outsiders for at least nine months or more, when the annual volume appears, long after the passing interest excited by the publication at the time of the titles of the papers has died away. We cannot but think that a reform of this method of procedure will commend itself to our *confrères* in France as being both easy and beneficent; and now, before closing this brief notice of the Nantes meeting, we will express the hope that it may be in every way successful.

Water and Sanitary Affairs.

WHEN referring last week to the Registrar-General's annual summary of the mortality of London in 1880, we mentioned Dr. Frankland's accompanying report on the water supply. This latter document undertakes to show that the water supply of London, except in the case of the Kent Company, is not only unfit for domestic use, but is becoming increasingly so. We remarked last week that the vital statistics adduced by the Registrar-General in reference to the Metropolis by no means indicate that the inhabitants are suffering from an unwholesome water supply. If there is any relation between this supply and the health of London, we have a right to infer that the water is both good and improving in its quality, seeing that the rate of mortality shows a marked decrease in recent years, especially in respect to diseases of the zymotic type. It may be asked how it is that the vital statistics thus apparently contradict the chemical analyses? In the first place, is the water supply, as derived from the Thames and the Lea, getting worse? Dr. Frankland states that if we take 1000 as the proportion of organic impurity present in Thames water as delivered in London in the year 1868, the figure last year rose to 1263. But if we look back to 1872, we find the number nearly as high, being 1243. That there has been some increase we do not deny; but the numbers fluctuate considerably. It will be found that the average of the five years commencing with 1868 is 996, while the average of the next five years, commencing with 1873, is less, being 938. It happens that the average of the last three years is higher, but we may hope that an improvement will again show itself. There is one table which records the "maximum amount of organic pollution" year by year, and this seems to show an actual change for the better. Beginning with 1868, we find the highest figure for the Thames supply to be in February, 1869, when it was 60 parts in 100,000, while the highest for the Lea supply was in December, 1872, when it was 39. The maxima for last year were respectively 42 in October, and 33 in February. If we divide the thirteen years into three periods—the first, commencing with 1868, consisting of five years; and the next two of four each—we find the average maximum for the Thames water to be 42 in the first period, 44 in the second, and 39 in the third. In the case of the Lea, the first and last periods show the same maximum—namely, 30—while the intermediate has 26. If we turn to the number of occasions when "moving organisms" were discovered by the microscope in the sediment deposited by turbid water, we find the record extends over the last twelve years. The last three years show a marked improvement; the average number of occasions being only seven, as compared with more than twice this average previously. So also we notice that last year there was no instance in which the water was "very turbid," and only one when it was "turbid." There were twenty occasions when it was "slightly turbid," and sixty-three when it was "clear and transparent." It is remarked that the supply furnished by the Chelsea and Southwark Companies approached nearest to uniform clearness, "each of them having, on one occasion only, delivered slightly 'turbid water.'" Concerning the "moving organisms," we may further observe that these were limited last year to the Grand Junction, Lambeth, and New River Companies. The East London Company have been caught tripping in this respect only twice in six years, the New River five times in twelve years, and the West Middlesex only three times in this period. Dr. Frankland declares that of the 142 million gallons of water supplied to London per day, 72 million gallons "were sometimes grossly polluted by sewage matters," while 62 million gallons "were occasionally so polluted, but 'to a less degree.'" "Sewage matters" may obviously differ widely from sewage, and this we may infer is the proper interpretation of Dr. Frankland's criticism. A brick is not a house, and an atom of nitrogen is not a poison. The brick may have belonged to a house, and the nitrogen may have formed part of the structure of a butterfly; but the house and the butterfly may be gone for ever. Whether the water supply of London is getting better or otherwise, we venture to say there is no practical evidence to show that it fails to be good and wholesome.

Alderman H. E. Knight, the Chairman of the Southwark and Vauxhall Water Company, in addressing the Shareholders at their half-yearly meeting last week, of which a full report will be found elsewhere, congratulated them on the growing prosperity of the Company, and on the reduction in the law and parliamentary charges. The latter feature was due to the circumstance that "the law had left the Company

"alone in the past half year, and the public bodies had not 'interfered with them.'" Expense had thus been avoided, and "for the past six months they had enjoyed happiness 'which they had not been accustomed to before.'" Of the London Water Supply Bill the Chairman could tell the Shareholders nothing. He believed it was in a state of incubation, and it might be hatched this session, coming out full feathered; but he thought this depended very much on their Irish friends. His expectation was that when the Bill did appear, it would "cost them a good deal of worry." Still the Chairman took a cheerful view of the future, and drew golden deductions from the balance-sheet. It is evident that the Company are now in a state of prosperity to which they have long been strangers, and the way is open for further and well-assured progress. The only drawback is the risk of a parliamentary conflict, but this is hardly likely to take place in the present year. The Company are acting wisely in both keeping their works in good order, and in taking steps to enlarge and improve their supply. Every practicable means should be adopted to satisfy the demands of the public, partly for the reason that this is the surest way of weakening the enemy's forces.

There is some wild writing in one of our engineering contemporaries, containing a statement that "the public are still 'face to face with a gigantic evil against which they are powerless.'" It may surprise people to learn that this terrible announcement has reference to the Metropolitan Water Supply, which the writer seems to think has something to do with the "fearful epidemic prevailing in our midst"—i.e., the small-pox. With things in this serious condition, the journalist in question solemnly enjoins everybody to buy a filter, as "one 'mode of lessening the direful consequences.'" It is admitted that even filters are not infallible, but it is urged in their favour that they "will arrest nearly all animal life." What animal life will be arrested, and what will escape, is judiciously left to the imagination. It is a pity that there is no effectual filter to intercept the rubbish which sometimes finds its way into the channels of the public Press. To inculcate these unwarrantable fears, is a species of mischief which, if not "gigantic," is certainly an evil to be deprecated. The writer also ventures to describe the London Water Supply as "inadequate." We are disposed to think there is something "inadequate" on the part of the writer.

The commencement of the new storage reservoirs at Shustoke, in connection with the Birmingham Corporation Water-Works, was the subject of an appropriate ceremonial a few days back, when Alderman Avery, as Chairman of the Water Committee of the Corporation, cut the first sod of the larger of the two reservoirs. This is designed to have a surface area of ninety acres, and to hold 400 million gallons of water, while the smaller reservoir will have a surface area of eight acres, holding 20 million gallons. The total cost of the work, including two new pumping-engines and sundry buildings, is estimated at £125,000. The water will be derived from the River Bourne, which is said to be exceptionally free from impurities, and with this addition to the supply it is expected that there will be no danger of any deficiency, whatever contingency may arise. At a luncheon which took place under the presidency of the Mayor, it was observed by Alderman Avery that, in supplying a town with water, "they must provide, not for daily wants or for 'averages,' but for maximum requirements, always considering that the heaviest demands were certain to be made 'at a time when it was most inconvenient to supply them.'" When the new reservoirs are completed, the entire storage capacity available for the borough and the surrounding district will be nearly 800 million gallons. Including the deep wells, the estimate of the storage capacity may be carried much higher.

A clever little book* has been written by the City Surveyor of Exeter, Mr. H. Percy Boulnois, M.Inst.C.E. Perhaps the title—"Dirty Dustbins and Sloppy Streets"—is scarcely a happy one; but the book itself is likely to prove very useful, as showing how it may be best to deal with the scavenging work of a town, whether large or small. Mr. Boulnois has an objection to the fixed dustbin or ashpit, and prefers moveable dust-boxes, made of iron, or of wood or wicker lined with tin. The final disposal of house refuse is a subject on which the Exeter Surveyor has bestowed much attention, as being one possessing peculiar difficulties. The authorities of one town to which an inquiry was addressed as to how they got rid of their rubbish, replied: "Sold by auction twice a year"—an explanation which certainly fails to go far enough, as

* "Dirty Dustbins and Sloppy Streets." By H. P. Boulnois, M.Inst.C.E. London: E. and F. N. Spon. 1881.

in another case, where the answer was, "Given or thrown away." In one instance the whole of the refuse is conveyed away out to sea in hopper barges and then sunk in deep water, for the mystification of those geologists who are to survive at the next upheaval of the sea-bed. We have also an account of Fryer's carbonizers and destructors as in operation at Manchester, and Mr. Boulnois observes that, "unless a ready sale for the refuse can be effected, by far the best method of disposing of it seems to be that by which it is completely annihilated by fire." There is a chapter on the removal of snow, and one on street watering. Altogether there is a mass of practical information, packed away in a small compass, with one rather droll misprint concerning certain scavenging contracts, in which it is said "the contractors' men are forbidden to refuse gratuities." To this, as a class, they certainly are obedient.

Notes.

A CHEAP NON-CONDUCTOR OF HEAT.

A cheap and effective non-conductor of heat has long been sought for many industrial purposes; but for use on surfaces usually at temperatures far above that of steam at ordinary pressures, there are few substances yet tried which can be considered even tolerably satisfactory. Many kinds of fairly good boiler-coatings, which are useful for retaining steam heat, contain animal and vegetable constituents which are unable to endure a temperature approaching even the dullest red, and are therefore unserviceable for covering retort-settings, furnaces, &c., for which non-conducting coatings are much needed. According to our contemporary, *Iron*, the long looked-for article has at last been discovered by Mr. W. Berkefeld, who has found that "Kieselguhr"—a kind of loose, friable earth—answers the required purpose. This material is mainly silica in the form of porous dust, and is derived from the shells of diatomaceae, large deposits being found in many places, but nowhere so pure as at Luneberg, in North Germany. It lies in beds, sometimes 100 feet deep, and of uniform quality, but varying in colour, the upper strata being white, the middle ones grey, and the lower of a greenish tint. As prepared for use, the composition consists wholly of the shell-dust mixed with a very small percentage of agglutinating material—just enough to hold it together. It is sent out dry, and requires to be mixed with hot water, and applied in a paste with a trowel. It is said to be quite incombustible, and practically imperishable, only requiring working up to be capable of being used over again. It is, of course, very light, and its efficiency depends chiefly on the amount of air-spaces in its bulk. It is stated that it is capable of absorbing 75 per cent. of its weight of water, which is indicative of its extremely porous character. If it possesses a surface capable of withstanding a considerable amount of hard usage, the material should obtain an extensive sale in this country. Mr. Berkefeld gives the substance the somewhat fantastic name of "fossil-meal," which, however well it may describe its appearance upon superficial inspection, is very misleading and ill-chosen, since it might be considered to mean that the material is of vegetable origin, which is not the truth.

A GUARD SAFETY-VALVE.

According to the *Revue Industrielle*, M. Barbe has successfully introduced a guard safety-valve for steam-boilers, to be brought into action only on emergencies. This valve is placed in a suitable position underneath the boiler-shell, and is essentially an ordinary weighted lever safety-valve turned upside down. When the valve is opened, therefore, water is blown off instead of steam. M. Barbe argues that, useful as ordinary safety-valves undoubtedly are, there are occasions when a sudden and explosive evolution of steam takes place, and at such times these valves are of little service, since the steam cannot escape with speed equal to that at which it is formed, and the pressure consequently rises to the bursting point. In all such cases, in addition to what must be reckoned a possible failure of the ordinary valve for other reasons, M. Barbe's valve would be a complete safeguard, as it would instantly discharge a large quantity of water. It is known that a cubic inch of water increases in volume about 1700 times when transformed into steam, and therefore the escape of the water would naturally be more efficacious in reducing the danger of explosion than the discharge of an equal bulk of steam. The idea, of course, is not new, but M. Barbe's apparatus for effecting the desired object is very simple and compact, although some objection might be urged against the awkward situation of the valve and the practical impossibility of examining it or keeping it in order during ordinary working; and all experience shows that fittings intended for use solely on emergencies are seldom in working condition when the event for which they are intended arrives. It is, however, stated that experiments have been made with the guard safety-valve, under conditions similar to those of actual but dangerous working, and it has answered so well that many have been fixed in French factories.

COAL TAR INDIGO.

At the Royal Institution lately, Professor Roscoe gave an account of the latest advance in the utilization of coal tar products by Baeyer, of Munich, in the fabrication of artificial indigo, which the lecturer considered would eventually become of great commercial importance. At present, it cannot be said that the competition of artificial and natural indigo is at all comparable with that between alizarine and madder, by which the last-named dye-stuff has been driven out of the

market; on the contrary, artificial indigo from coal tar is as yet dearer than the vegetable product from the East. It appears that native indigo was decomposed by Fritzsche so long ago as 1840, and aniline was then obtained from it. Subsequently a crystalline substance called isatin was procured from indigo; and, later, indigo was made from isatin. The next step was the production of isatin from an independent source, and this has been done in three different ways, two of which are too costly for commercial use. Baeyer has alone carried it out in a practicable manner. He commenced with cinnamic acid obtained from oil of bitter almonds, but this was much too costly. It has been found by Dr. Caro and Mr. Perkins that cinnamic acid can be obtained from toluene, which is a product of coal tar. From cinnamic acid, however obtained, a complex acid can be produced which is now for brevity called propiolic acid. This acid gives the colourless isatin, from which, by the use of suitable reagents, the indigo-blue dye-stuff is obtained. The commercial aspect of the production of indigo in this way is affected by the cost of preparing the dry propiolic acid. At the present time the material is placed in the hands of Manchester calico printers at the rate of 6s. per pound for a paste containing 25 per cent. of dry acid. The acid itself is worth 50s. per kilo., of which only 68.58 per cent. yields actual dye, so that the price of artificial indigo, being not less than 73s. per kilo., is more than twice the value of the pure natural colour. Hence competition with the Oriental product is not possible until the makers can reduce the price of dry propiolic acid to 20s. per kilo., and also obtain the theoretical yield of dye therefrom. Still the fact remains that the artificial process is a chemical reality, only hindered by economical considerations, which may at any time be removed, from taking a good commercial position. At the present exhibition of woollen fabrics, &c., in London, there are several pieces of stuffs dyed with indigo obtained from coal tar. It is impossible to say whether the process will eventually exert much influence on the value of the raw material, or if it will supplant the natural dye. Professor Roscoe thinks there is such a difference between the characteristics and methods of treatment of the two products that there will probably be room enough for both. The new process is at least to be regarded as one of the greatest triumphs of modern synthetical chemistry, which has had no field so fruitful in successes as that which is connected with the development of the hidden riches of coal tar.

Correspondence.

THE LIBEL ON THE SALFORD GAS ENGINEER.

SIR,—My attention has been called to a letter of Mr. Samuel Hunter, published on page 789 of your JOURNAL of May 10. That letter has been read and entered upon the minutes of the Salford Gas Committee, and afterwards read to the Council, although it is, to say the least, inaccurate. The legal proceedings were commenced by Mr. Samuel Hunter, who is well known as the Engineer and Manager of the Salford Gas Committee, in regard to a statement made by me in a letter addressed to the Chairman of that Committee so long ago as June of last year. That letter was the subject of an inquiry before a Special Sub-Committee at which the Mayor, the Chairman of the Gas Committee (Alderman Sharp), several members of the Council, the then Town Clerk, Mr. Hunter, and myself were present, when, after explanations were made, I was permitted, and even desired to withdraw the letter which Mr. Hunter has since made the cause of his action. At the close of this investigation the Chairman, on behalf of the Committee, thanked me for having brought the matter before them, although it was said I was mistaken in the character and description of a certain cannal which was being substituted by a contractor in lieu of that which ought to have been delivered under the contract. Notwithstanding this withdrawal, Mr. Hunter claimed £10,000 damages from me; instead of which he has received an apology from my Solicitor, a vote of confidence from his Committee, and the congratulations of his friend Mr. Christopher Moorhouse—the late Town Clerk of Salford—who said: "I congratulate you heartily on your present position in this matter."

Manchester, June 11, 1881.

ELLIS LEVER.

NOTTINGHAM CORPORATION WATER UNDERTAKING.—Mr. M. Ogle Tarbotton, the Borough Engineer of Nottingham, has just prepared a highly interesting and elaborate report on the position of the water undertaking belonging to the Corporation, at the close of the first financial year of their management, which terminated on the 25th of March last. After rapidly sketching the origin of the late Water Company, the report proceeds to notice in detail the principal works—five in number—capable of affording supplies of water for the town. It then deals with the actual quantities of water pumped last year, and the estimated potential supplies, showing that the latter exceeded the former by 5,250,000 over 3,900,000 gallons per day. The considerable alterations and improvements which have been made in the works since their transfer to the Corporation are instanced; and the capacities of the various reservoirs are given. These total to only 6,898,043 gallons, "or less than two days' present supply to the district." Particulars are then furnished of the mains and services, the regulations for the prevention of waste, &c.; and, lastly, the necessity of increasing the supply of water to meet the rapidly-growing requirements of the district is referred to. We shall take an early opportunity of reproducing the portions of this report which are of general interest, in order to show the present position of this, the largest of the recent transfers of water-works to corporate control. It should be stated that a coloured map of the district accompanies the report, showing the several parishes within the parliamentary district of the Corporation, and the areas of each in acres.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION 1881.

PROGRESS MADE TO SATURDAY, JUNE 11.

Title of Bill.			Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords . .	Commons Bill	March 29	April 7	May 13	May 31	..	..
Alnwick Gas Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 2	March 8	March 28	..
Barrow-in-Furness Corporation Bill.	Lords . .	Commons Bill	Jan. 27	Jan. 28	May 5	May 19	May 23	} June 3
Beverley Water Bill	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 7	April 5	April 28	
Bingley Water and Improvement Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 2	April 8	May 3	..
Birkenhead Corporation (Gas and Water) Bill	Lords . .	Commons Bill	Feb. 4	Feb. 7	Feb. 15	March 22	April 7	..
Bradford Water and Improvement Bill	Commons .	Commons Bill	Jan. 27	Jan. 28	April 4	May 31	June 3	..
Bray Township Bill	Lords . .	Commons Bill	Jan. 31	Feb. 2	Feb. 2	March 11	March 24	..
Brighton and Hove Gas Bill	Commons .	Commons Bill	Jan. 27	Feb. 2	Feb. 7	March 23	April 7	..
Cambridge University and Town Gas Bill	Lords . .	Commons Bill	Jan. 27	April 8	May 19	March 18	April 8	..
Caterham Spring Water Bill	Commons .	Commons Bill	Feb. 18	Feb. 18	Feb. 4	May 24	May 31	..
Cheltenham Corporation Water Bill	Lords . .	Lords Bill	June 2	..	..	..	..	..
Cleator Moor Local Board Bill . . .	Commons .	Commons Bill	March 15	..	..	..	..	..
Colne and Marsden Local Board Bill.	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 14	March 3	March 14	..
Dudley Gas Bill	Lords . .	Commons Bill	March 11	March 21	March 22	March 25	March 29	} March 29
Dundalk Water Bill	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	
Eastbourne Water Bill	Lords . .	Commons Bill	April 29	May 11	May 23	May 31	..	..
East London Water Bill	Commons .	Commons Bill	Jan. 27	May 6	May 16	May 27	May 31	..
Egremont Local Board Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 2	April 5	May 5	..
Fylde Water Bill	Commons .	Commons Bill	Jan. 27	May 5	May 13	May 27	May 31	..
Goole and District Gas and Water Bill	Lords . .	Commons Bill	Jan. 27	Feb. 7	Feb. 14	March 15	April 25	..
Hexham Gas Bill	Lords . .	Commons Bill	Jan. 28	Jan. 28	Feb. 3	March 15	March 21	..
Holland (Parts of) and Sutton Bridge Water Bill	Commons .	Lords Bill	March 28	May 23	May 23	June 3	..	..
Hyde Gas Bill	Lords . .	Commons Bill	April 1	April 8	May 24	May 30	..	..
Irvine Burgh Bill	Commons .	Commons Bill	Feb. 2	Feb. 3	Feb. 15	March 22	March 31	..
Kirkcaldy and Dysart Water Bill . .	Lords . .	Commons Bill	Jan. 28	Jan. 31	Put off for six months	..	..	..
London Sea Water Supply Bill . . .	Commons .	Commons Bill	Jan. 27	April 5	May 12	May 19	May 23	} June 3
Lower Thames Valley Main Sewerage Board Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 15	March 18	April 4	
Matlock Water Bill	Commons .	Lords Bill	Jan. 28	Jan. 28	Feb. 8	March 7	March 11	..
Oban Burgh Bill	Commons .	Commons Bill	March 14	April 5	May 9	..	..	..
Paisley Water Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 2	March 11	April 4	..
Reading Corporation Bill	Commons .	Commons Bill	Jan. 27	March 31	April 8	May 10	May 13	} June 3
Richmond Gas Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 9	March 18	March 29	
Ryton Local Board (Water) Bill . .	Commons .	Commons Bill	Jan. 27	May 5	May 13	May 20	May 24	..
Sevenoaks Gas Bill	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 8	March 18	April 25	..
Sheffield Water Bill	Commons .	Commons Bill	Jan. 28	March 31	April 8	May 10	May 13	} June 3
South Metropolitan Gas Bill	Lords . .	Commons Bill	Jan. 28	Jan. 31	March 2	March 18	March 29	
Stalybridge Extension and Improvement Bill	Commons .	Commons Bill	Jan. 31	Feb. 2	Feb. 7	March 22	March 31	..
Stirling Water Bill	Lords . .	Commons Bill	Jan. 27	April 7	May 9	May 17	May 27	} June 3
Westbury-on-Trym Gas (No. 1) Bill	Commons .	Commons Bill	Jan. 28	Jan. 31	Feb. 14	March 25	April 5	
Westbury-on-Trym Gas (No. 2) Bill	Lords . .	Commons Bill	Jan. 31	May 17	May 27	May 31	June 3	..
Westgate and Birchington Gas Bill.	Commons .	Commons Bill	Jan. 31	Feb. 2	Feb. 7	April 1	May 16	..
Woking Water and Gas Bill	Lords . .	Commons Bill	Jan. 28	May 13	May 24	May 27	May 30	} June 3
"	Commons .	Commons Bill	Jan. 28	Jan. 31	Feb. 7	April 1	May 12	
"	Commons .	Commons Bill	Jan. 28	Jan. 31	March 14	May 24	June 2	..
"	Commons .	Commons Bill	Jan. 28	Jan. 31	Feb. 1	Preamble	not proved.	..
"	Commons .	Commons Bill	April 1	May 24	May 27	May 31	..	..
"	Commons .	Commons Bill	Jan. 27	Jan. 28	March 2	March 22	March 31	..
"	Lords . .	Lords Bill	Jan. 28	Jan. 28	Feb. 1	March 11	March 22	..
"	Commons .	Commons Bill	March 25	April 4	April 4	..	..	..
"	Lords . .	Commons Bill	March 22	March 31	April 5	May 5	..	} June 3
"	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 4	March 4	March 21	
"	Lords . .	Commons Bill	May 27	June 3	June 3	..	..	..
"	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 4	April 8	May 26	} June 3
"	Lords . .	Commons Bill	Jan. 27	March 29	April 7	May 12	May 16	
"	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 7	March 15	March 28	..
"	Lords . .	Commons Bill	Jan. 31	March 25	April 4	April 5	May 31	..
"	Commons .	Commons Bill	Feb. 2	Feb. 7	Feb. 7	March 15	March 24	..
"	Lords . .	Commons Bill	Jan. 31	March 22	April 4	April 5	April 8	} June 3
"	Commons .	Commons Bill	Jan. 27	Feb. 2	Feb. 21	March 15	March 21	
"	Lords . .	Commons Bill	Jan. 27	March 11	March 21	March 31	April 4	} June 3
"	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	
"	Lords . .	Commons Bill	Jan. 27	May 31	..	..	..	..
"	Commons .	Commons Bill	Jan. 27	May 19	May 30	..	..	..
"	Lords . .	Commons Bill	Jan. 28	Jan. 31	Feb. 7	March 15	May 17	..
"	Commons .	Commons Bill	Jan. 31	Feb. 2	Feb. 7	..	..	..
"	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 4	May 24	May 31	..
"	Commons .	Commons Bill	Jan. 27	Jan. 28	Feb. 7	Bill withdrawn	..	..
"	Lords . .	Commons Bill	Jan. 27	Jan. 28	Feb. 7	Bill withdrawn	..	..
"	Commons .	Commons Bill	Jan. 28	March 24	April 7	April 8	May 6	} June 3
"	Lords . .	Commons Bill	Jan. 28	Jan. 31	Feb. 7	March 11	March 22	
"	Commons .	Commons Bill	Jan. 28	Jan. 31	Feb. 7	May 17	May 30	..

HOUSE OF LORDS COMMITTEE.

MONDAY, MAY 23.

(Before Lord BELMORE, Chairman; and Lords AMHERST, CLANERASSIL, CLEMENTS, and KINTORE.)

DUDLEY GAS BILL.

(Continued from p. 974.)

The case for the promoters having been concluded, Mr. BINDER said it had been arranged that the petition of the Upper Sedgley Local Board should be first considered, and Mr. Shiress Will would call his evidence before addressing the Committee.

Mr. Joseph Smith, examined by Mr. SHIRES WILL.

I am Clerk to the Upper Sedgley Local Board, which was formed in 1867. The population of our district is 14,500, chiefly of an agricultural description. I produce a map drawn in the year 1844, which shows that Sedgley is very much detached from Dudley, the distance being about two miles. There are five villages comprised in the district of Upper Sedgley, and four in that of Lower Sedgley. A portion of the village of Upper Gornal and a portion of Upper Sedgley are at present supplied by the Dudley Gas Company. I should most certainly say that Sedgley is not in

any way a suburb of Dudley. The population of the whole of Sedgley is 36,000, and that of Dudley I believe to be about 40,000. The area of the former parish is, however, much larger than that of the latter. The mains were laid along the roads as far as Sedgley in the year 1858. I have heard complaints of the impurity of the gas supplied. There is great anxiety on the part of the inhabitants of Upper Sedgley to have the supply of gas in their own hands, under the Public Health Act, because a portion of the district is still unlighted. A meeting of the inhabitants has been held, under the Borough Funds Act, when the necessary resolutions were passed authorizing opposition to the present Bill. The Upper Sedgley Local Board have never given any authority to the Gas Company to lay pipes within their district; and any powers possessed by the Company were given by the former Turnpike Trustees.

Cross-examined by Mr. RICHARDS: Supposing we had power to supply gas, we should light a good many more houses than is the case at present; because, as I understand, the Dudley Gas Company are incapable of supplying the important part of our district. What we really want is power to supply the inhabitants with gas.

Mr. RICHARDS: But there is a Company already there supplying the district.

Mr. SHIRESS WILL: Not the whole district.

Mr. RICHARDS: Not the whole district, of course. But is it proposed to supply in competition with the existing Company?

Witness: That would be a matter of convenience. We would buy them up if we could effect an arrangement on reasonable terms.

No longer by compulsion, but by agreement; is that so?—In any way we could get them. We are most anxious that the district should not continue in darkness.

Cross-examination continued: I have heard of applications being made for a supply of gas, which have been refused; that of Mr. Wilkes being one. This gentleman is, however, now being supplied, although at great danger to his family, I am told. The lights continually go out in consequence of being below the level. There is an Association supplying gas in Lower Gornal, and I believe the price charged is 5s. per 1000 feet.

Mr. RICHARDS: I understand the price there is 5s. 6d. per 1000 feet, while the Dudley Gas Company charge 3s. 6d. and 3s. 3d. per 1000 feet when the consumption is above a certain amount. Do you think these charges are unreasonable?

Witness: They are higher than, in my judgment, they should be. The Lower Gornal Association supply a district in which the gas has to travel a long way.

What would you supply the gas at yourselves?—I cannot tell.

Tell me shortly what it is you require. Is it to throw out the Bill and prevent the Gas Company obtaining any capital at all?—We find a large district unsupplied with gas, and which has no prospect of being supplied by the present Company, because I am told that the gas will not descend to the position of more than half our residents.

Supposing the works were placed upon a lower level, this difficulty would be got rid of, would it not?—If separate mains were laid down, but I am not sufficiently scientific to speak as to this matter.

Mr. Stephen Wilkes, examined by Mr. SHIRESS WILL.

I reside at Sedgley. My reasons for not treating Sedgley as a suburb of Dudley are that the latter town ends at the boundary of the Sedgley parish. The parish of Sedgley is very curiously constituted, being situated on a very large hill, and the main road along which the Dudley Company carry their present mains runs along the top of the hill, and they cannot go, as they say, either to the right hand or to the left. The road runs from the old reservoir at Dudley, and there is not a house from there for more than a quarter of a mile. The village of Upper Gornal is very straggling, chiefly lying along the old turnpike road, and its inhabitants are very poor. No one would ever dream that gentlemen from Dudley would come to live in Upper Gornal, and call it a suburb of the town. Sedgley lies about a quarter of a mile beyond Upper Gornal, and there are only 18 or 20 houses between the two places. I am not aware that there are any Sedgley people working in Dudley; they are chiefly colliers, nail makers, or agricultural labourers. I am supplied with gas by the Dudley Gas Company, but very imperfectly. I have complained many times, and have had the Directors at my house to see what could be done. When I first took the house the Manager of the Gas Company said he would supply me with gas, but the Company would not be at the expense of laying a main, because it was only a by-road; consequently it cost me £40 or £50 for the main alone; besides the fittings. We found, however, that we only obtained a very imperfect light, which gradually grew worse, until it became so bad that we had to give up burning gas from seven to ten o'clock each night. We have been compelled to be very cautious indeed, or else we should all have been blown up on several occasions. The Directors said I ought to have had a holder erected; but I said they undertook to supply me with gas, and I requested a holder from them, and even went so far as to say I should press the matter in a court of law; but they would not do it. They said I was nearly 200 feet lower than the village of Sedgley, and I ought to have a holder to receive as much gas in the daytime as would last me at night; but I am only just off the brow of the hill. The parish extends for two miles lower down, and keeps falling all the way; but the Company's supply only extends to one house a little higher up than mine. The Local Board of Upper Sedgley are desirous that the gas supply should be in their own hands, on purpose to light up the very dangerous roads extending over their large district. There are about 17 miles of roads without a single gaslight, and accidents are continually occurring. I wrote to the Company, and was met by a gentleman, to whom I mentioned that there were two very dangerous places in the neighbourhood where I lived, and I offered to guarantee the payment for four lights at one very dangerous corner, if the Company would fix them; and also to pay for the lighting and extinguishing, and keeping them in repair. Mr. Collett, however, said he did not care about doing it, his excuse being that the days would soon be getting longer.

Cross-examined by Mr. RICHARDS: The mains were on the spot to which I have referred. Mr. Collett did not ask to have the matter put off; he simply refused to supply. There is a main along the road as far as Sedgley, but no lights, because our position as a Local Board will not allow it.

Mr. RICHARDS: What encouragement do you give the Gas Company to take mains along country roads if there are no lights upon the roads where mains already exist?

Witness: It is no use giving any encouragement when they positively state that they cannot supply any lower than my present residence.

Cross-examination continued: I have written many times complaining of the insufficient lighting of my own house, and the Company have sent their men for a week together, night after night, to test the pressure of the gas at the main in the road, and they found that there was none at all. If the Local Board could have the lighting in their own hands, they could supply the whole district, and also light up the roads; but we cannot go into competition with the Gas Company. My light became better after ten o'clock at night, because, I suppose, people then discontinued using gas. I do not think the Dudley people treat Sedgley as a suburb, or else they would come and live there.

Re-examined by Mr. SHIRESS WILL: There are places now in Sedgley, on the highest level, that the Company will not light, simply because they say it will not pay. There have been many complaints besides mine of want of pressure. For instance, in the public buildings, even on Sunday nights, the gas is very bad. At the place of worship I attend we can scarcely get any light at all on some nights; and it is the same with others. Complaints have been made on the subject both of impurity and pressure, but no answers have been received.

The CHAIRMAN said the Committee would like to know what were the powers of compulsion on the Gas Company, because they understood that any persons could call upon a company to give them a supply of gas.

Mr. SHIRESS WILL said that if Upper Sedgley was within the district they could compel the Company to supply them; but if not within the district they could not compel them. At present they were between two stools—the Company would not supply them, and yet insisted that they were within their district.

Re-examination resumed: I can see the result of the impurity of the gas on my ceilings.

By the COMMITTEE: I have some works in the district of the Bilston Gas Company, and I believe they are charging 2s. 9d. per 1000 feet for

their gas; but I use a great quantity, so that this price may be exceptional.

Mr. Joseph Law, examined by Mr. SHIRESS WILL.

I am a farmer and contractor, residing at Upper Sedgley. It is the desire of all the inhabitants to have the gas supply in their own hands. At present there is great difficulty with regard to lighting the roads and streets. The consumption being so small, and the Dudley Gas Company taking all the best parts of the district, it will not pay the Lower Sedgley district to supply the gas. The inhabitants have made a very strong point of the matter, and at the last election for members of the Local Board they would not support men who did not go in for buying up the "Lower Gornal Gas," as they called it, and supplying the whole of the district, and lighting up all the main roads and the dangerous parts of the district.

In cross-examination by Mr. RICHARDS, witness reiterated the opinion given by previous witnesses that Sedgley was not a suburb of Dudley.

Mr. Thomas Waterhouse, examined by Mr. SHIRESS WILL, said he was Solicitor and Clerk to the Upper Sedgley Local Board. He produced a resolution passed at a meeting of the Trustees of the Sedgley Roads on April 30, 1853, authorizing the Dudley Gas Company to lay down certain mains and pipes as proposed by them.

In cross-examination by Mr. LUMLEY SMITH, witness said these roads ceased to be turnpike roads some years ago, and since then had not been lighted.

In re-examination by Mr. SHIRESS WILL, witness said the Trustees ceased to light the roads before their trust expired.

Mr. George J. Brown, a Civil Engineer, and Surveyor to the borough of Dudley, produced a map, indicating the different districts, and showing the population of the same.

Mr. SHIRESS WILL said he had a few observations to make on behalf of the Upper Sedgley Local Board. Up to the present time very considerable inconvenience had arisen, owing to the uncertainty of the language used in the Acts of 1821 and 1853, as to what were the suburbs of Dudley, in consequence of which the Local Board of Upper Sedgley were paralyzed in their actions. According to the 161st section of the Public Health Act, 1875, when there was no company authorized by Parliament supplying gas within a district, the local authority might themselves supply gas; and, if necessary, they might apply to the Local Government Board for all requisite powers as to money or otherwise, without going to Parliament. Then the section went on: "And if there is any such company or person"—this was very important for his case—"so supplying gas"—that was within a part of the district—"but the limits of supply of such company or person include part only of the district, then the urban authority may themselves undertake to supply gas throughout any part of the district not included within such limits of supply." The effect of this clause was that if the district of Upper Sedgley was within the limits of the Dudley Company, the Local Board had no power; but if the Gas Company's limits extended to only part of Sedgley, then as regards the other portion his clients might supply themselves with gas. The contention on the part of the Dudley Gas Company was that the whole of the district was within the limits of their Act; and the consequence was that, unless some definition of these limits was arrived at, the district of Upper Sedgley would remain in its present inconvenient position. His learned friend appeared to fight shy of raising this question, whereas it was the whole question upon which his (Mr. Shiress Will's) opposition turned. What had been the Company's own construction of the matter? In 1821 their first Act contained the words "Dudley and the suburbs thereof," but until 1853 nothing was done by the Company towards lighting the district. Their Act of the latter year used the same words, but even after this time nothing was done until 1858, and then, there being two Turnpike Road Trusts along the Wolverhampton Road, on the ridge of the hill, notice was given to the Trustees that mains were about to be laid down. The Trustees replied that they did not consider the Gas Company had power, under their Acts, to use the portions of the roads to which their notice referred, but they had no wish to raise objections, and authorized their Surveyor to permit the pipes to be laid down as required, upon certain conditions. Therefore, at this early date, there was a distinct notice to the Gas Company that they were coming within a district which the Trustees did not consider (whatever the Company thought) belonged to them, and in which they could come as a right, and without asking permission. It had been endeavoured to be shown that the supply in this district was afforded in consequence of a requisition; but the matter appeared pretty plain. It seemed that an application was made by a gentleman of the name of Cresswell, and at the same time there was a talk of a new company. A resolution was therefore passed by the Gas Company, in which they referred to the chances of a new company, and they considered that, as a commercial undertaking, it would be for their advantage to supply the district. He (Mr. Will) had invited Mr. Collett to direct the attention of the Committee to any place in the Company's minute-book where the resolution appeared; but, although he searched, it was impossible for him to find it. Therefore, while his learned friend, Mr. Richards, was extremely loth even to contend at first that Upper Sedgley was within his district, Mr. Stevenson was equally reluctant on the subject. The latter gentleman said he could not offer an opinion, the limits being so very wide; and another witness said he considered Sedgley to be within the district of the Gas Company, because there was no limit fixed. It was impossible, upon grounds like this, to suppose Parliament intended this wide area to be tied to the Dudley Gas Company. Let the Committee consider what the consequence would be if they should be of opinion that Upper Sedgley was within the district of the Gas Company. It was known that Mr. Stevenson proposed new works at a lower level, but there was no guarantee that the works would be made, and no guarantee in regard to the price that would be charged. At present the Company were charging a differential rate, and he challenged his learned friend to justify this by reference to any section in his Act of Parliament. The Company were entitled to charge a rate subject to a maximum, and were not entitled to charge one rate in one street and another in another street, unless their Act expressly authorized them to do so. His learned friend said it could be done without special power; but he (Mr. Will) would like to know what was the reason for asking Parliament—as was often done—for powers to charge differential rates. From 1821 down to the present time the Dudley Gas Company had treated this district as being outside their limits, and they could not therefore now stand in the way, and prevent an application to the Local Government Board. He therefore asked, if the Committee passed the preamble of the Bill, that they should say that nothing in the Company's Acts should prejudice the Sedgley Local Board in any application they might make to the Local Government Board, who would, of course, deal with the application upon its merits; but unless a saving clause of this kind were introduced, his clients would certainly be prejudiced. Something had been said with reference to a clause in the petition referring to the compulsory purchase of the works of the Gas Company. What was meant was simply this: The Dudley Gas Company might say to the Local Government Board: "These gentlemen ought not to be authorized to have powers of their own, because we are there within the

parish, and they will be supplying in competition with us, and our mains will become useless." In order to meet the equity of this, it was proposed that if the Company were willing to sell any works of theirs within the Sedgley Local Board's district, the latter would undertake to buy, if the Local Government Board gave them the power under section 161 of the Public Health Act, 1875. This was shortly the point, and he hoped the Committee would decide the matter in his clients' favour.

Mr. RICHARDS asked Mr. Will to hand in a clause expressing his views, and it should receive immediate attention.

Mr. BIDDER said the matter might never arrive at a discussion of clauses, and therefore this requisition was a little premature. He would call two witnesses before addressing their lordships.

Mr. Henry M. Wainwright, examined by Mr. PEMBROKE STEPHENS.

I am Mayor of Dudley, and practise as a Solicitor in the town. I have had a great deal to do with all the public works of the borough for the last 45 years. The Corporation have considered the present Bill, and determined to oppose it as gas ratepayers; a petition was therefore presented, signed by 120 consumers. I consider a suburb to be a place connected with a town by the residence of persons having occupations in the town; but this is not the case with Sedgley, Upper Gornal, and Tividale. Sedgley is part of the parliamentary borough of Wolverhampton, and I should say the inhabitants go there far more for ordinary purposes of business than they come to Dudley. Within the last few years, to my knowledge, extensions have been made to the works of the Gas Company, but I apprehend upon land subject to the conditions of the Act of 1871. The quality of the gas has been complained of; in fact, I have myself made complaints both as to quality and quantity. Last November, on the occasion of a party at my house, I found it necessary, though there was a gaselier with three lights, to have candles placed upon the table, in order that my friends might see each other across the table. The Company were very courteous and obliging, and sent Mr. Collett down, and alterations were made—for which I paid—but the supply of gas is no better now than it was before. With regard to the accounts, until the last few years they were supplied on a printed form, professing to be under the Act of 1847, containing about seven or eight items of receipts and expenditure; but it was impossible from them to arrive at any satisfactory conclusion as to the state of the Company's affairs. In almost every single item which might involve certainty there was another item linked with it which was uncertain, so that nothing reliable could be discovered upon any single point, except perhaps the rates and taxes. The feeling of the Corporation was that they were not obtaining the information intended by the Act of 1871, and in consequence they caused proceedings to be taken. The Town Clerk made an application for a copy of the accounts in the prescribed form, and tendered 1s. for it; and in consequence of their default, the Gas Company were summoned before the Magistrates, who fined them £50 for such default, and £10 costs. The Company appealed, and a special case was stated for the consideration of the Queen's Bench Division, when the Judges decided that the Dudley magistrates were right in convicting the Company—that the Act of 1871 did apply, and had applied from the time when it was passed.* The Company then applied for leave to appeal, but the Court, without hearing the counsel who appeared for the Corporation, refused permission. The first improved account was furnished some time during 1879, and was made for the year ending June 30, the Company stating they were in the habit of making their accounts terminate at this period of the year. In this account, I think, £67,000 or £69,000 was given as the total expenditure, and a deduction of £17,400 was written off for contingencies and depreciation fund. Since then another account for the entire year 1879, showing the expenditure to be £81,000, was filed with the Clerk of the Peace, but the Company refused to furnish me with a copy, and I was compelled to go to Worcester and examine it at the office of the Clerk of the Peace. The discrepancy between the two accounts showed that a very large expenditure had taken place during the last half of the year. In consequence of the continued dissatisfaction of the Corporation with the furnished accounts, a petition was presented to the Justices at Quarter Sessions for the appointment of an Accountant under the Act of 1847, upon whose report we again applied to the Justices for a reduction in the price of gas. The Gas Company appeared by counsel, and the matter was discussed, and ultimately the Deputy-Chairman determined that no relief could be given to the Corporation for two reasons—first, because there were back dividends which had not been paid; and, secondly, because the reserve fund had not been filled up; these being, in the judgment of the Court, conditions precedent to affording any relief—giving the Gas Company, in fact, the benefit of their own wrong-doing, because as long as they keep this fund unfilled up and uninvested, no relief can be obtained from the Court of Quarter Sessions. The Company having now come to Parliament with a Bill, which is purely a capital Bill, and merely to strengthen their hands, the Corporation ask to protect themselves and the town. The petitioners consider the sum asked for is greatly in excess of the fair and proper requirements of the Company. I have heard that it will be necessary for the Company to apply to Parliament next year for a Bill for additional land and works; but I apprehend they cannot legally spend any money which may be given by this Bill upon any part of the lands they at present possess. I think that unless the Company come to some fair and reasonable terms with the Corporation, it would be better they should come again another year with one entire scheme, so that the public may see exactly what is asked for.

Cross-examined by Mr. RICHARDS: The decision of the Queen's Bench Division was given long after the Bill was deposited, and therefore it could not be drawn in conformity with the decision. A reduction in price is asked for on the ground that the Company have been earning profits and spending them on works, instead of paying their back dividends and filling their reserve fund. Instead of so doing, it was their duty to have asked Parliament for further powers, and their Act could then have been revised. Undoubtedly upon the new capital dividend would have had to be paid, but Parliament would never have given them power to raise additional money at 10 per cent.

Mr. RICHARDS: You say, "If the Company would make reasonable terms." What do you mean? You never suggested any terms that I am aware of?

Witness: I have not asked for any terms, but my idea is that the Company should account for the £17,481 which they have used for the purpose of capital, together with some £1600 which they have taken and used for the purpose of paying income-tax. I also consider that the Statute of Limitations should be held to apply to the back dividends, which have been in arrears for ten years, and practically abandoned. The present holders of shares are not the persons who were prejudiced by the non-payment of these dividends; and there being a provision in the Metropolitan Gas Acts declaring that such arrears of dividend shall not be paid beyond six years, I think such a clause ought to be made to apply to this Company.

Cross-examination continued: Our object is not to damage the Company, so that we may buy the works cheap. My own opinion is that we are better without them. The purchase of the works has never been

* A full report of the proceedings here referred to was given in the JOURNAL for March 22 last, p. 479.

considered by the Council in any way, to my knowledge. I understand the Accountant appointed at the Quarter Sessions had full access to the Company's books, but I do not think he was therefore in a position to give every information which could possibly be required. I went to Mr. Collett the day before we were going into a court of law, and asked to see the accounts, and the request was refused. Besides being a Solicitor, I was a petitioner seeking to support a petition I had presented to the Justices, and I consider Mr. Collett was bound by statute to furnish me with the account I wanted. According to my reading of their Act, the Company cannot erect works for the manufacture of gas upon any land bought since the passing of their Act of 1853. In that year the works were transferred by a general description to the existing Company, and I think it might be reasonably contended that all the land and works then belonging to the old Company were sufficiently described in the Act; but the lands acquired since cannot by any possible means be considered as so described. That Bill was unopposed, and was obtained by the evidence of myself and of the then Engineer of the Company. The word "suburbs," of which I now complain, was allowed to remain, because it was in the original Act of 1821. I think it had relation to the town of Dudley as governed by the provisions of the Dudley Town Act.

TUESDAY, MAY 24.

Mr. Wainwright recalled, and further cross-examined, by Mr. RICHARDS.

I think any terms offered should come from the Company seeing that we consider they are wrong-doers. We want more gas, cheaper gas, better gas, and several other things.

Mr. RICHARDS: But these things can hardly be obtained unless the Company have more capital to carry on their concern with?

Witness: If the necessity for works be shown, certainly not.

Cross-examination continued: I agree that it would be a pity if a fair conclusion were not arrived at upon this Bill; but inasmuch as they must come again next year it would be better to have one entire scheme.

Re-examined by Mr. PEMBROKE STEPHENS: In the Bill there is a provision that we should have 15-candle gas; but at present we have anything the Company choose to give us, and to this extent we are rather benefited. My complaint is that the Company have kept us at arm's length, and have prevented us from having the information the law intended we should have. It occurs to me that one fair condition would be that the reserve fund should be of limited amount, so as not to deprive my constituents of the benefit of getting cheap gas. We have not had any means of determining when the expenditure was incurred as between Dudley proper and places they are pleased to call suburbs, nor out of what fund it was made.

Mr. STEPHENS said that until the mains were laid there could be no revenue from the outside districts, and therefore either capital must have been raised, or the profits made in Dudley spent for these districts.

Mr. RICHARDS: We have raised fresh capital.

Mr. STEPHENS: We object equally to that.

Re-examination resumed: I desire to see the reserve fund filled up, so that if we have ever to go again to Quarter Sessions the fact of its not being filled up shall not interpose to prevent right being done. At present there is absolutely no definite limit of supply in the Bill, but I think the limits ought to be exactly defined. The site for the new works is also a very important matter for the town, and ought to have been dealt with by the present Bill, by giving the proper parliamentary notices as required by the Standing Orders.

Mr. George Bagott, examined by Mr. PEMBROKE STEPHENS.

I am an Alderman of the borough of Dudley, and have been for many years Chairman of the Streets and Gas Committee. For the last 20 years there have been complaints as to the quality and price of the gas, and also objections on the ground of insufficient pressure. We consider the charge made for the supply to the public lamps to be exorbitant. In a neighbouring town they are only paying £2 5s., while I think we are paying £2 15s. 6d. I think it would be a great mistake to grant the Company powers to raise any further capital, because the town consider they have been very badly treated by having both high charges and bad gas. From the shape in which the Bill was introduced, it was impossible to obtain a discussion on it in the House of Commons, and therefore this is the first opportunity there has been of laying before Parliament the really substantial grounds of objection to the conduct of the Company. There is a proposition to relieve the Company of a portion of their outside district, and in my opinion this would solve some of the difficulties as to the money. I believe they supply Sedgley with gas, but I think they ought to have created a reserve fund instead of so doing. If the Company do what is right by the town, there is no wish to take up a hostile attitude. I may say, however, that there have been numerous deputations from the Corporation to the Company, but we have never obtained any redress; and in the absence of their doing what we consider fair and right both the Corporation and the consumers object to their being strengthened with more money.

Cross-examined by Mr. RICHARDS: As I understand, instead of making a reserve fund they have been extending their mains in other districts, which they have no right to do; but I cannot tell how the money so expended can be got back.

Mr. RICHARDS: You do not propose that the Directors should put their hands into their own pockets, and pay out whatever you think is the proper amount for the reserve fund?

Witness: If they have improperly laid out the money they ought to find it out of their own pockets.

But it all turns upon whether "they have improperly laid it out"?—The town consider they have.

Do you not think that a new Bill, subjecting them to the Act of 1871, is likely to improve both the quality and the pressure of the gas?—I do not think it is. I think the Company should improve their quality and reduce their price before they ask for any extension of powers at all.

Do you not think you have a better chance of getting 15-candle gas if an Act of Parliament is passed insisting upon it, than you have ever had up to the present time?—Not under the present management.

Then you would get rid of the present Directors?—I have no desire to do so if they will mend their ways and do better.

Mr. STEPHENS (in re-examination): My learned friend spoke of the Directors being called upon to put their hands into their pockets. Is it not one of the contentions of the Company that they have not yet paid their back dividends?

Witness: It is.

They have been paying 10 per cent. for the last 10 years or so, and are further claiming these back dividends, which have been stated to be £8000 or £10,000 in round numbers. One way in which the reserve fund might be filled up, if Parliament thought fit, would be by the application of the back dividends, thus setting one off against the other?—Yes.

They have had a good dividend for 80 years or more, and, curiously enough, have not filled up their reserve fund, by reason of which the Justices told you they could not help you to a reduction of price; and you therefore think the time has arrived when somebody might reasonably press them to do what they have not done so long as they could help it?—Certainly.

Mr. BIDDER, in addressing the Committee, said he thought it would be

seen that to the gas consumers of Dudley this question was one of considerable importance. The Gas Company had a monopoly in the district, they had not been before Parliament for 28 years, and they were now endeavouring to obtain from their lordships that which would practically keep them out for probably another 28 years. Mr. Stevenson said the Company were asking power to raise what altogether amounted to £76,000 of capital, which would last them for 10 or 15 years; but let the future be tried by the past. In 1853 the Company had expended £25,000, while up to the present time they had expended £81,000—no matter where it came from, but it was their gross expenditure—which was something like £2000 a year for purposes of all kinds. They were now asking for £76,000, which at the rate of the past—even leaving out the £10,000 for gasholders, and so reducing it to £66,000—would last them for 33 years; and therefore he was within the mark if he said that something like a quarter of a century would elapse before (supposing there were no difficulties in the way) they would find it necessary to apply to Parliament again. It appeared, therefore, right for the Corporation to ask the Committee to be very careful and scrutinize the proposals and position of the Company very closely before passing the Bill, at least in its present state. The startling point about the matter was that although the Company were asking for powers which would enable them to keep away for the time he had mentioned, if the evidence of Mr. Stevenson were accepted, it was inevitable that they would have to apply again next year for the necessary powers to take land and extend their works. The gentleman who drew the Bill must be congratulated upon his ingenuity, because it was simply introduced as a money Bill, for power to raise a large amount; not a word was mentioned in it about works. If the Company intended to act loyally and in accordance with the provisions of the law, it was immaterial whether they merely had the £10,000, which they would spend at once, or the larger sum, which would be only applicable when they came to Parliament next session; still it was rather an unusual thing to ask for capital without submitting the scheme upon which it was proposed to be expended. The Standing Orders stated that the notices should set forth the limits of the proposed works, and also that notice should be served upon all owners and occupiers; and then came the Act of 1871, which said that the works should not be constructed without the consent of the owner of every dwelling-house within 300 yards, except upon the land specified. The only object of the Company in trying to obtain their Act now, when they said a Bill was inevitable next session, was that they might try in some way if they could not evade the necessity for applying to Parliament again. If they could manage this in any way whatever, then they could snap their fingers at the gas consumers for another quarter of a century. The Corporation of Dudley did not want to interfere with the legitimate prosecution of the Company's undertaking, but they said, seeing how much was wrong in the past, it was for the Company now to apply with a properly devised Bill, in order to rectify the wrong. The Company said that until very recently they did not understand that they were under the Act of 1871; and if this were so, they had availed themselves of the Act of 1847 to keep the public most wonderfully in the dark, because their accounts showed nothing at all about their capital; and even as regarded working expenses the accounts were so framed that, without anybody being aware of it, 2 per cent. had been charged for depreciation and added to capital purposes. The object of the Company in refusing to furnish their accounts was clearly to prevent the Corporation obtaining the necessary knowledge before they had to appear in Parliament; and this statement was not made without justification, because Mr. Collett said he had received from his Directors such instructions as led him neither to give any details nor take any steps with reference to their preparation. Not only had the Company availed themselves of their position under the Act of 1847 not to give any information to the public, but they had been distinctly acting in direct opposition to this Act in a matter immediately concerning the gas consumers. The Act directed that after payment of 10 per cent. dividends the surplus should be applied in the payment of back dividends, and then in the accumulation of a reserve. The only excuse which had been attempted was that they were justified by something they found in the Companies' Clauses Act; but these Consolidation Acts were only incorporated in special Acts so far as they were not varied by the special provisions of these Acts; and, what was more, by the well-known canon of construction of statutes, if a later statute and an earlier statute were inconsistent, the later statute repealed the earlier. It was only stultifying Parliament to suggest that, when it was said in 1847, "You shall, when you have got to a certain point, reduce the gas-rate, and if you do not the Quarter Sessions shall do it," it was intended to leave applicable a provision of an earlier Act which would absolutely override it. The Company, however, had taken the money which formed the surplus of their profits, by their own admission, to the extent, in the aggregate, of £17,400, and had applied it to the purposes of the extension of their works outside their legitimate district, because the words "Dudley and the suburbs thereof" could not be fairly or reasonably construed to include the distinct—not outlying—villages of Sedgley and Tividale, which were not a continuous part of Dudley, and which did not for their trade depend upon Dudley. They were in another parliamentary borough, and were separated from Dudley by a considerable tract of open country. What was the consequence? When the Corporation found it out, and took the Company to the Quarter Sessions, the latter set up their own wrong as a reason why they should not be bound to lower the price of gas; and their arguments prevailed. Assuming for the moment that the Court of Quarter Sessions were rightly advised, was it not a monstrous case, because if it applied to the past it would apply to the future, and amounted to this—that the Company might go on for ever carefully neglecting to pay their accrued back dividends and make up their reserve fund, and by this means set the gas consumers and the Quarter Sessions at defiance *ad infinitum*. Assuming that by an imperfection in legislation the Company had really found a loophole in the Act of 1847, and had availed themselves of it, and could do so again, were their lordships going to continue to allow them to have this loophole, and set the public law at defiance? With respect to the reserve fund, it was perfectly clear that the Company had over and over again had the money to make it up; and as regarded the back dividends, it was so long since any had accrued that the Company had no right to them. He (Mr. Bidder) had two suggestions to offer—the Company ought in future to be limited to one district, which ought to be defined in a legitimate or definite way; and they ought to sell to the Local Authorities of Sedgley and Tividale upon fair terms—by arbitration, if preferred—the works in these districts. He also protested against the postponement of a reduction in the price of gas, because the Company chose to take the money which came out of the pockets of the consumers and employ it illegally in executing works of a comparatively unprofitable character out of their district. With regard to the capital asked for, there was, first, a special gasholder, which would cost £10,000, and was wanted immediately, and which they said could be properly constructed upon their present land. There was not any objection to their having such a moderate amount of capital as would be necessary to carry them on until they made the application Mr. Stevenson said was inevitable next year. Further than this their lordships were invited not to grant the powers asked for, and then assure that proper provisions were introduced into the Bill

for the protection of the consumers. It was a remarkable thing that the Committee had not been permitted to see one responsible person connected with the Company. They had had the Secretary—a mere servant, who had to go to his Directors for orders, and who withheld accounts when he was told to do so; they had the Engineer, who was exceedingly young in the Company's service; and the Accountant, who only began his duties in 1877; but none of the Directors or the Chairman had been called, nor any one who could speak with responsibility as to the conduct of the Company. Mr. Stevenson had been called to say what ought to be done, but no one to say, "We intend to do it." If, therefore, the new capital were granted, the consequence would be the Company would endeavour to find some way of driving a coach and six through the Act of 1871, and escape coming to Parliament at all.

The Committee having deliberated, The CHAIRMAN said: Before you begin your reply, Mr. Richards, it may save some trouble if I say that the Committee are unanimously of opinion that the Bill may proceed, if you are prepared to insert a clause giving the Sedgley Board power to go before the Local Government Board.

Mr. RICHARDS said he was quite ready to adopt the suggestion of the Committee. The statement made by the Chairman had relieved him very much, because he was prepared to point out that there was really no opposition to the preamble. There was one point, however, with regard to the amount of capital—

The CHAIRMAN: Our decision carries the capital, and also the illuminating power, which will be fixed at 15 candles.

Mr. STEPHENS said he should like again to point out that no works were mentioned in the Bill, and the usual rule was that the parties obtained an amount of capital proportioned to the need they had proved.

The CHAIRMAN said the Committee had decided the point.

A short adjournment here took place to give time for the preparation of clauses to carry out the decisions of the Committee. On re-assembling the clauses of the Bill were proceeded with.

Mr. STEPHENS proposed a clause to the effect that within six months from the passing of the Act a testing-place should be provided at the Police Station in Dudley, or at such other place as should be approved by the Town Council.

Mr. RICHARDS objected to the clause, because the Company would have to keep an officer constantly in attendance, at a cost which was not to be despised, the testing of gas being a delicate operation. It was not stated in the Act that the testing-place should be other than a convenient place at the Company's works. The case was not like that of London, where the gas was made seven miles away from the point of consumption, and might be altered in character. It was only a question of dignity; the Town Council wished that the Company should go, at some inconvenience, to an office of theirs, rather than that their official should go to the works of the Company.

Mr. STEPHENS said the Corporation having the means of testing an article they paid for could not be an injury to the Company, who would not employ a man more or less.

After some further conversation, The CHAIRMAN said the Committee were of opinion that the testing should take place at the Police Station, and therefore the remaining words proposed must be struck out.

The clause, as amended, was agreed to. Mr. STEPHENS said there was another question to be settled—viz., as to the limits, because great inconvenience had resulted from the interpretation put upon the word "suburbs."

The CHAIRMAN: We cannot determine the suburbs of a place. Mr. STEPHENS next applied for the Committee to determine that out of the capital to be raised they should fill up the reserve fund.

The CHAIRMAN said the Committee could not agree to this. Mr. STEPHENS: Then will you say that the reserve fund of the Company shall be deemed to be full?

The CHAIRMAN: No. Mr. STEPHENS said there was one thing the Committee could do—viz., limit the back dividends to six years, the same as in the case of the Metropolis Gas Act, 1860.

The CHAIRMAN: The effect would be to shut the Company out of any back dividends at all.

Mr. RICHARDS said the circumstances were about as different as they could possibly be.

The CHAIRMAN said the Committee rejected the proposal. Mr. SHIRESS WILL proposed a clause to the effect that nothing in this or any other Act relating to the Company should prevent the Local Board of Upper Sedgley from applying to Parliament or to the Local Government Board for power to make and supply gas, provided they purchased the plant included in their district by agreement or arbitration. He said the words "or any other Act" were inserted in order that the Local Authorities should not be debarred from obtaining a Provisional Order.

The CHAIRMAN: What would debar you? Mr. SHIRESS WILL said his clients believed that the battle would have to be fought over again before the Local Government Board, and the Company would then produce their Acts of 1821 and 1863, and say the district he (Mr. Will) represented was within their area.

The CHAIRMAN: But this Act, being later, will repeal the earlier Acts. Mr. SHIRESS WILL said the intention was to carry out the decision of the Committee; but if their lordships did not approve of the words he would not insist upon them. As regarded the proviso, it would act against his clients, as it would be no advantage to them to buy the works. It was more an advantage to the other side, because it was well known that when a corporation bought the works of a gas company it was really the dividends that were considered. He therefore submitted that the Company should not have any undue profit out of the district he represented, but at the same time they were not to be prejudiced by having the works left upon their hands, and therefore all that the works cost they should be recouped.

The CHAIRMAN: The price you propose is not the value to them, but the cost?

Mr. SHIRESS WILL said his learned friend knew that a gas-pipe might be as valuable after it had been laid for many years as when it was first put down, or even more so.

Mr. RICHARDS said that, like port wine, it would improve by keeping. The clause commenced with the words, "Nothing in this or any other Act." He did not mean to say there was anything in any other Act to prejudice his friend, but if there was he artfully got over the impediment by slipping in the words, "or any other Act," so that he was endeavouring to place himself in a better position than he was in a week previously, although he understood the Committee to mean he should be in the same position.

A short discussion ensued, in the course of which Mr. Shiress Will said he would withdraw the proviso.

The CHAIRMAN intimated that the Committee had decided to leave out the words "or any other;" and the clause was agreed to.

The remaining clauses of the Bill were then read, and, with amendments, agreed to; and the Chairman was directed to report the Bill, as amended, to the House.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

FRIDAY, JUNE 8.

(Before Justice BOWEN.)

CORPORATION OF DEWSBURY v. CORPORATION OF BATLEY.

This was a special case raised for the opinion of the Court, in regard to the respective liabilities of the two Corporations, under circumstances fully set forth in the following judgment, delivered this day.

His Lordship said this was an action brought against the Batley Corporation to recover their proportion of damages and costs in an action brought by a Mr. Jagger for damages in consequence of an influx of water into his colliery, attributable to an accident to a culvert in the water-supply system of Dewsbury, Batley, and Heckmondwike. Batley at one time formed part of the United Board for purposes of water supply, but the action was defended on the ground that in 1878, when the cause was determined, the liability of the Batley Corporation had been put an end to by the purchase of their share and interest in the water-works, and the payment of the purchase-money by the remaining parties in the joint undertaking. The accident happened in 1876, and in June of that year the claim for compensation was made by Mr. Jagger. The United Board determined to defend the action, and on Aug. 7, 1878, Mr. Jagger recovered a large amount against the United Board. But a few weeks before the action was determined Batley had separated from the United Board, and it had been broken up by the purchase of the share of the Batley Corporation and the payment of the money. The Batley Corporation, therefore, now contended that all liabilities they might have been under were transferred by statute to the remaining partners of the United Board. In the Act of 1871, by section 75, there was a provision that the Batley Corporation might sell and transfer all their share and interest in the water-works to the United Board at a price to be agreed upon by arbitration; and sections 77 and 78 contained further machinery with respect to the proposed purchase. In 1876 another Consolidated Act was passed, making arrangements for vesting in the United Board all the rights and interests of the Batley Corporation; but by this Act all former Acts were repealed, subject to the provisions therein contained being carried out in the Consolidated Act. A difficulty arose in the drafting of this Act by dovetailing the statutes one into the other. The arbitration came on before Sir H. Hunt, who had to assess the estate, share, and interest of the Batley Corporation. The case for the defence rested on section 3 of the Act of 1876, which stated that until the payment of the money the Batley Corporation were to continue to enjoy all rights and interests in the joint undertaking; but there was also this provision, that when such payment was made the rights, powers, and privileges of the Corporation, and all liability in respect to their interest, should absolutely cease and determine. The purchase-money was paid on July 4, 1878, some weeks before the action of Mr. Jagger was determined. The Corporation of Batley therefore said their liability had ceased, and the question for him to determine was whether this was a good answer to the claim. He was bound by the Act of Parliament, and one more difficult of interpretation he had seldom seen. He should give judgment with costs for the defendants.

Miscellaneous News.

WARRINGTON CORPORATION GAS SUPPLY.

At a recent meeting of the Warrington Town Council, the question of the discount allowed to large consumers of gas having been fully considered, it was recommended that the following scale of discount on the price of gas for half-yearly consumption be adopted, the same to take effect from the 25th of March last:—Within the borough: 4s. per 1000 feet, with discounts at the following rates if paid one month from date of account:—Under 100,000 cubic feet, 6d. per 1000; above 100,000, and under 800,000 cubic feet, 7d. per 1000; above 800,000, and under 2,000,000 cubic feet, 8d. per 1000; above 2,000,000 and under 4,000,000 cubic feet, 10d. per 1000; above 4,000,000 cubic feet, 1s. per 1000. Outside the borough: Within a mile of the boundary, the rate to be fixed at 4s. 6d. per 1000 feet, with a discount of 6d.; exceeding one mile, 5s., with 6d. discount; exceeding two miles, 5s. 6d., with 6d. discount. The question came before the Council again at their meeting on Tuesday, the 7th inst.—the Mayor (Alderman Pickmere) in the chair—when the minutes of the Gas Committee, containing the above recommendation, were presented.

Alderman HOLMES, in moving the adoption of the minutes, said the Council would observe that the Committee had made a little concession in price to consumers of large quantities of gas. The Committee thought in the main that it was fair to business men that it should be so, and they had adopted a scale which to some extent was favourable to large consumers.

Mr. MONKS seconded the motion.

Mr. DIXON said he had thought that by this time the Council would have heard of a reduction in the price of gas. The Committee had simply adopted the old scale of charges, the same as he had known for ten or twelve years. He was surprised to see that the price of gas in Warrington had not been reduced within this time, seeing that it had been lowered in many other places. He also thought the illuminating power of the gas might be better than it was.

Alderman HARRISON considered it was quite right that a reduction in the price of gas should be made. There was, he said, no disguising the fact that nearly every town which had no greater advantages than Warrington had had the price of its gas reduced. There was no doubt at all that a great many complaints had been made as to the quality of the gas. He would like to ask the Chairman of the Gas Committee whether there was any prospect, at no remote period from the present, that the price of gas would be reduced. It was, he considered, a proper inquiry to make, and his impression was that the very first thing that should be done, when the Committee saw their way, was to reduce the price of gas to the consumers. It was the consumers who had made the gas-works what they were, and the profits of the works, if there were any, ought not to be employed in reducing the rates to other persons, who probably did not use gas at all.

Alderman WEBSTER said he had no doubt that the Gas Committee felt the importance of reducing the price of gas as much as any other body of consumers. They were equally interested, and as he stated again and again, if gentlemen would take the trouble to look into the accounts they would see that the price of gas could not be reduced at present; and there was not the slightest doubt but the gas would be reduced in price as soon as possible, and this scale was the first instalment of it. The very large consumers were experiencing a little benefit, and they were entitled to it. With regard to the quality of the gas, he thought he might say that the gas at present was not surpassed by any place in England.

Mr. PLATT said he quite agreed with Alderman Harrison that the gas consumers should not be taxed for the benefit of the rest of the community. What the consumer paid above the real value of the gas went to a reduction of the rates, and to help people who perhaps consumed no gas at all.

This he thought was a hardship and an unjust thing. When the gas-works passed into the hands of the Corporation it was said it would be some time before the price of gas could be reduced; but this resulted from the fact that they were applying the profits, and perhaps a little more, towards establishing new gas-works which would be for the benefit of future generations; that was to say, if gas was not superseded before they had paid for the works.

Alderman HOLMES said he had not the slightest objection to any questions being asked, and, so far as he was concerned, he would give an explicit answer to every question which was put. Mr. Dixon had referred to the quality of the gas, and he (Alderman Holmes) had said before in the Council, and might repeat it now, that they had an independent tester, and any person wishing to have the gas tested had nothing to do but to make application for the purpose, and he would have it done. As to the price of gas, he was going to give the same answer that he had given before—namely, that they must get into their new works and then see what they cost, and afterwards what the cost of the production of gas would be, before they could do anything in the way of reduction. It was said that it was a great injustice to the consumers of gas that they should be taxed unnecessarily for the benefit of the others of the community who did not consume gas at all; but they must bear in mind that there was another side to the question. The ratepayers of Warrington had taken the responsibility of the gas-works upon their shoulders, and there was a possibility that the electric light might supersede gas, and the ratepayers would then have this responsibility upon them, while the gas consumers would be defunct. The reduction in price was a subject which had been before the Committee many times in conversation, but never for serious discussion, for the reasons he had assigned. He wished to say emphatically that the statements made about the quality of the gas were incorrect. From the very moment that the Corporation took possession of the gas-works instructions were given that the quality of the gas should be improved. It was said that as the works had come into the hands of the Corporation there would be many complaints about the quality, and they therefore decided that they would make it better. The quality of the gas had since materially improved, and was now about 19 candles. Before the Corporation took over the gas-works he believed the illuminating power very rarely exceeded about 17 candles. He wished to mention another fact, and this was that for every additional candle which was added to the quality of the gas it made an addition to the cost. And therefore if the Committee had not reduced the price of the gas, they had reduced it in another direction by giving a better quality. He believed if greater care were taken they should not have the complaints which they had. There was a great deal of gas that was wasted in the town through carelessness.

The motion was then put and carried.

EXHIBITION OF GAS APPARATUS AT CHELMSFORD.

A most interesting exhibition of gas apparatus was held at the Corn Exchange, Chelmsford, last Tuesday, Wednesday, and Thursday, under the auspices of the Chelmsford Gaslight and Coke Company; and there can be little doubt, from the success of the exhibition, and from the excellent manner in which all the arrangements were carried out, that it has made a considerable impression upon the public mind of the neighbourhood. Much credit is due to the Directors of the Company, with Mr. T. M. Gepp at their head, and to Mr. Arthur Mead, Assoc. M.I.C.E., the Company's Engineer, for their exertions on the occasion, enabling, as they did, the most uninitiated to form a good idea of the value of the application of gas to various household and business usages. Mr. Mead had an energetic assistant in the person of his brother, Mr. Henry Mead, and valuable aid was also lent by Mr. Arthur Straight and other gentlemen.

A department of general interest was, of course, the exhibition of gas cooking-stoves, of which many specimens by the best-known manufacturers were shown by several local and other firms. An examination of these naturally revealed facts which are familiar to those connected with the industries producing these stoves, but not always remarked by the general public. During the exhibition three lectures on coal gas, gas lighting, heating, cooking, &c., were delivered by Mr. F. W. Hartley, A.I.C.E., &c., who, for the purpose of illustrating his remarks, had a platform, upon which were observable a variety of scientific instruments, including Thompson's calorimeter, for ascertaining the powers of solid fuels generally, but more especially of coal; a small apparatus for making gas; and two or three illustrations of Bunsen burners for heating by gas. These lectures—the two first of which were delivered on Tuesday, and the third on Wednesday evening—were thoroughly well attended; and at their close hearty votes of thanks were accorded to Mr. Hartley.

On Tuesday evening a dinner—the whole of the viands at which were cooked by gas—was served in the board-room of the Corn Exchange; about 80 persons, including ladies as well as gentlemen, being present. At the close several complimentary toasts were proposed, among others to Mr. Hartley, for his interesting lectures, and to Mr. Mead for his indefatigable exertions to render the proceedings a success.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held at the Offices, Sumner Street, Southwark, on Thursday last—Alderman H. E. KNIGHT in the chair.

The SECRETARY (Mr. Alfred Jelley) having read the advertisement convening the meeting, the minutes of the last meeting were confirmed, and the following report and accounts were presented:—

Thirteen hundred and seventy-six houses have been brought into charge in the half year ended the 31st of March last, the half-yearly rental of which amounts to £1299 18s. 6d. Six thousand and thirty-nine yards of new mains have been laid during the past half year, of which 641 are outside the Company's parliamentary district. Improvements have also been made in the position of other mains and pipes. The total amount of revenue received from water-rates during the half year was £89,593 1s. 7d., as against £84,811 6s. 11d. in the corresponding half year of 1880.

Constant attention has been given to the Company's plant. No. 1 and No. 2 engine at Hampton and No. 5 at Battersea have been especially overhauled, and your Directors believe the whole of the Company's works to be in a thoroughly efficient condition.

For a considerable period the attention of the Board has been directed to an increase in the supply of water, and to assist them they have obtained the opinion of eminent geologists and scientific men, and after very careful consideration they have decided on sinking wells on a piece of land purchased at Streatham, from which they have every reason to believe a large supply of excellent water will be obtained. They have also under consideration, and are preparing plans for works, whereby they consider the quality of the water obtained at Hampton will be further improved, at a considerable saving of expense to the Company.

The contract for pipes and special castings having expired on the 31st of December, tenders for the future supply were obtained by advertisement, and a satisfactory contract entered into for two years' supply.

Several Bills which have been brought before Parliament, affecting the interests of the Company, have received the due consideration of your Directors, and since the last half-yearly meeting a statutory notice has been lodged of a Bill to be introduced into Parliament in the present session, under the title of the "London Water Supply Bill," whereby it is proposed, among other purposes, to constitute a Public Water Authority, and to authorize and empower such Water Authority to purchase, by agreement or arbitration, the undertakings of the Metropolitan Water Companies, or any of them, or any part of such undertakings, and to authorize and require such Companies respectively to sell their undertakings, or any part thereof, by agreement or otherwise to such Water

Authority. This Bill has not as yet been brought in, but when introduced will receive the most careful consideration of your Board.

The sum of £4778 8s. 11d. having been charged against "repairs of engines," in connection with Messrs. Harvey's accounts, this half year, your Directors have the pleasure to report that this account has now been cleared off, and will consequently leave a considerably increased amount available for dividend in future half years.

Your Directors recommend that a half year's dividend at the rate of 7 per cent. per annum on the ordinary stock and class "D" shares of the Company, and 5 per cent. per annum on the preference stock of the Company, be declared payable on and after the 15th day of July next.

Dr.—REVENUE ACCOUNT, FOR THE HALF YEAR ENDED MARCH 31, 1881.

<i>Maintenance.</i>			
Maintenance and repair of impounding and service reservoirs, &c., including materials and labour	£991	10	5
Maintenance and repair of mains, pipes, &c., including materials, labour, &c.	£7957	13	9
Repairs of engines, &c., at the several works, included in Messrs. Harvey's accounts	4778	8	11
		12,736	2 8
Pumping and engine charges, including coals, wages, &c.	10,155	18	8
Filtration, including materials and labour	1,229	1	2
Salaries of Engineer, Superintendent, and Clerks, and wages of Inspectors and Turncocks	3,622	10	4
Rents	25	11	0
Thames Conservancy	1,152	12	6
Rates and taxes	4,103	3	6
		£34,016	10 3
<i>Management.</i>			
Allowance to Directors	£1,025	0	0
Allowance to Company's Auditors	21	10	6
Salaries of Secretary, Accountant, and Office Clerks	1,326	8	4
Superannuation	260	0	0
Commission to Collectors	2,067	4	10
Stationery, printing, and general charges	623	3	6
Law and parliamentary expenses	322	7	2
Official Auditor and Water Examiner	89	16	7
		5,675	10 11
Dividend and interest account for transfer of profits	48,089	19	8
Balance carried to next account	4,500	0	0
		£92,282	6 10

Cr.—REVENUE ACCOUNT.

Balance brought from last account	£4000	0	0			
Surcharges on water-rental to Sept. 30, 1880	1637	1	3			
				£5,637	1	3
Allowances for empty houses.	£2918	11	2			
Do. for overcharges	1747	18	10			
Do. for bad debts	1397	4	0			
				6,063	14	0
				£426	12	9
Water rents accrued to the date of this account	92,603	3	7			
				£92,176	10	10
Rents received					86	10
Registration and transfers fees					19	0
				£92,282	0	10

The CHAIRMAN, in moving the adoption of the report, said he had the pleasure of meeting the Shareholders under circumstances in which he could congratulate them, he thought, even more strongly than he had done before, on the favourable condition of their undertaking, and on the prospects which lay before them. Following the plan he had hitherto adopted, he would first deal with the accounts. The alterations in the accounts relating to the capital explained themselves. Passing to the revenue account, he stated that the total under the head of "maintenance" was in round figures £34,000, which was £2500 more than at last September, and £1500 more than at March last. The explanation of the increase was very simple. In the first place there was a sum of about £520 which had been held in suspense as to matters on which the Government Auditor could not decide as to whether they should belong to capital or revenue. This half year the question had been settled, and the sum of £520 had been charged, under the head of "maintenance," to this account. Then the frost had caused a large increase in the cost of the street work. The Company had had considerable expense in keeping their engines in a thoroughly efficient condition. To do this they had incurred an extra expenditure of about £500 in the past half year. They had improved the mains by enlarging them in various parts of the district, so as to improve the facilities of supply. This had cost £150. They had paid for damages arising through frost and other causes, to the extent of £300 more than usual. These figures added together represented £1950, which, with the £500 he had already mentioned, explained the reason why "maintenance" was £2500 more than at last September. The Shareholders would see that the charge was perfectly legitimate, but that it had arisen from extraordinary circumstances. The "management" charges were so nearly alike that he found nothing to call attention to. On the item of law and parliamentary charges he heartily congratulated the Shareholders. The law had left the Company alone in the past half year, and the public bodies had not interfered with them, or raised grounds for putting them to expense. They had for the past six months enjoyed happiness which they had not been accustomed to before. He did not imagine, however, that this would continue long, and they were always prepared to meet attack. Still, they had been left at rest in the past half year, and the consequence was that the law and parliamentary expenses were only £322, against £2700 in the preceding half year. On the other side of the account the Shareholders would find that the allowances for empty houses amounted to £2900, which was £500 more than in the corresponding half year. The Directors, of course, could not regulate the number of empty houses in the Company's district. This increase had arisen, he supposed, from the bad state of trade and the general bad times. The item of overcharges, £1700, was about the same as at March last, but was £700 more than at September. He should tell them that in the March quarter this item was always considerably more than in the Michaelmas quarter, on account of the whole charge being taken into account. As regarded bad debts, they were £1400, against £1100 last half year, and £1500 in the corresponding half of last year. This was an item which varied from time to time, and he could only attribute the present increase to the badness of trade. The amount of water-rates accrued to the date of the account was £92,600, which was about the same as at September last, but compared with £88,900 at March, 1880. The Proprietors might say, "If we increase £3600 from March to September, how is it that we are stationary from September to March?" This was a question capable of very satisfactory explanation. There had been no falling-off in the increase of houses in the Company's district, and in rentals from new houses and new supplies. The report specified what these had been, and the Shareholders would see from the amount collected that, as regarded the extension of the Company's legitimate source of income, it was as good and as regular as ever; but the reason why the rentals had not increased in the past half year was again to be attributed to the extraordinary state of affairs experienced during the long and severe winter. The non-increase—he would not say the falling-off—was entirely in the meter account. The household supply showed a satisfactory increase, but during the

long frost the large manufacturers who took water by meter were prevented from using any, and the less quantity of water thus consumed accounted for the non-increase. He now returned to the item on the debtor side of the account of dividend and interest account for transfer of profits, £48,000, which was £3000 more than in the corresponding period of last year, but £2000 less than last half year. The explanation of this reduction was quite satisfactory. There was, however, one item he would mention first. The balance carried to next account to provide for losses was £4500. Hitherto they had carried forward only £4000 for this purpose, and the increase of £500 was because the Government Auditor considered that £4000 was not sufficient, looking to their increased rental, and to the fact that last half year it was not sufficient to meet the losses from bad debts. This increase of £500 the Directors could not but concur in, but at the same time it made a difference in the present accounts. He would now explain why there was £2000 less than last half year in the dividend and interest account for transfer of profits. There was £500 less from empty houses, and £600 more carried forward to meet losses from bad debts. Instead of paying £4000 off Harvey's account, the Directors had paid off the whole of the balance, which was £700 more. They had paid £2000 more for maintenance; £150 more for the Engineer's department, owing to the frost and the extra turncocks, and men required to attend to the duties; they had paid £100 more for Collectors' commission, which, however, was a satisfactory payment; and they had paid £200 more for printing. These figures, added to the £700 more for overcharges, made a total of £4930 on this side of the account, but they had savings on certain items. There was a saving of £150 in filtration; rates were less by £500; and law charges were less by £2400. This made a total of £3050, which deducted from the £4930 gave the explanation for the decrease of £2000, to which he had drawn the Shareholders' attention. Going to the dividend and interest account, he observed that the remarks which he had made would probably explain some of the items in it. There was £31,000 applicable for dividend, against £37,000 last half year, when some £5000 was paid for dividend, or £6000 more than the corresponding half of last year; and there had also been paid the various items he had already explained. Deducting the dividend the Directors now proposed to pay, a balance of £836 would be left to be carried forward. The only item which called for any remark on the liability side of the balance-sheet was that of temporary loans—£30,000. This had been paid off with the exception of £11,000, which would no doubt be cleared off in a fortnight. Turning to the other side of the account, he stated that the money had been coming in exceedingly well this half year. The water-rents in the hands of collectors for collection amounted to only £2000, against £3400 last September, and £3000 in the corresponding half of last year; so the Shareholders would see that the collectors had done their work better. The item of "Suspense—expenditure on account of works, subject to future allocation," was £2400, against £3200 last half year, and £25,000 in the corresponding period of the year 1880; but this £25,000 included the deposit for the Company's Bill in Parliament. There was nothing whatever now in suspense, except the £2400 in connection with the works the Company were about to carry out at Hampton, and this was an item so especially a charge to capital, that there could not be the slightest shadow of doubt that it must be charged to capital account when they commenced their Hampton works. It must not be imagined, because the Company were paying a 7 per cent. dividend this time, that they were in a worse position than before. He would give the reason why the dividend was only 7 per cent., and place facts before the Shareholders proving that the concern was even more prosperous and more valuable than it was six months ago. He had stated that after paying the 7 per cent. there would be a balance of £800 to carry forward, against the £5000 odd which was carried forward in the previous half year. They were aware, however, that they had purposely carried forward large amounts, because they knew that they had extraordinary claims, such as Messrs. Harvey's account, to meet each half year; but he had told the Shareholders that when these claims were wiped off they would come to the happy time either of piling up large amounts or increasing their dividends. What he had told the Shareholders had come true, because they would now carry forward, as he told them they would, only a small sum when they came to the last payment on Messrs. Harvey's account. They, however, had such elasticity in their resources that they had a very advantageous future to look forward to. Let them remember to what an enormous extent the Company suffered last half year in what he called extraordinary claims. After recapitulating various items to which he had previously drawn attention, he stated that the total was £7700, added to which there was about £1000 for extra street works on account of the frost, and extra turncocks and other expenses, which he estimated at about £500. Then they might take the increase which they had over the corresponding half of last year. If the Shareholders looked to the figures they would find that it was the difference between £89,000 and £92,600. They might therefore look forward to a natural increase in their income next half year of £12,800; but they must not think they would have all this. Last half year they carried forward £5138, which next half year they would not have to depend on, but only £836. The difference in these two amounts was £4300, but deducting this from the £12,800, there remained £8500, which they might fairly look forward to as the amount to be added to the sum applicable to dividend next half year. He had already mentioned that £4000 meant 1 per cent. dividend for the half year, and it rather made them rub their hands when they thought of £8000. Still, they must not be too sanguine. The Company had had to submit to a revision of their rating for one thing; and although they did their very best, they also had to submit to a considerable increase in their assessment. This would take away something from the £8000, but he knew of nothing else, and therefore he thought the Shareholders might fairly assume that there was a good nest-egg for the future. He had, as succinctly as he could, made all the remarks he thought necessary on the figures, and had now to deal with the report. It was stated, after referring to the new mains laid, that "improvements have also been made in the position of other mains and pipes." The meaning of this was that the Directors found, in the long and severe frost to which he had referred, that some of their mains and supplies were laid so near to the surface of the roads as to become affected, and the customers were deprived of their ordinary supply of water. They felt that this was not creditable, and that the Shareholders would support them in the view that it should not continue. They asked their Engineer to report which mains should be lowered and better placed. He did so, and without hesitation the Directors ordered this accommodation to be given. The total amount of revenue last half year was £89,000, or £4600 more than in the corresponding period of 1880. This was a positive amount collected of £4600, and he took it into account in his estimate with respect to the increase to be looked forward to in the current half year, at only £3600. The report next called attention to their engines; and the Board were told, and believed from personal inspection, that their plant was in a thoroughly efficient condition. It was their determination that it should be so, so that whenever a purchaser came forward he should not be able to say the Company had not kept the concern in a proper and satisfactory condition. Probably some explanation would be required as to the clause referring to the supply of water from wells, and to works which the Directors had under contemplation at

Hampton. The Shareholders knew that there had been a very great outcry and a strong desire expressed that water should be supplied from wells. The Directors, feeling desirous of keeping pace with the times, cast about them, and they were determined, if they possibly could, to get a certain supply of water from wells. They had had the matter under consideration for a long period, but the time had not arrived when he could have mentioned it before. Now, however, he could do so. They consulted Professors Ansted, Ramsay, and Prestwich, as well as Mr. Lucas, the well-known geologist; and after having had reports from all these eminent men, they had one from their own Engineer, who very carefully sifted the reports of these gentlemen. As a result, the Board felt they might determine to sink a well, and try one as an experiment first. All the reports of the professional men pointed to Streatham as a most desirable locality, where they could not only obtain excellent water, but a large supply. The Directors had purchased a small piece of land at Streatham, and were sinking a well, and they believed that when the works were carried out—and the cost would be comparatively small—they would be in a position to give a very large supply of beautiful water. If they found that the present experiment succeeded, they would not hesitate to try again. They had also under consideration plans for certain works which they might possibly carry out at Hampton. If undertaken, these works would relieve the Company of some thousands a year, and in conjunction with other items save the whole expense of the Battersea establishment. If this could be done they would have the benefit not only of the saving, but of 40 acres of land which were valued at all sorts of prices. By these works the Company would not only be able to supply a better article, but would place themselves pecuniarily in a very advantageous position if they were called on to sell their works. Iron being now very cheap, the Directors thought it desirable to enter into a contract for two years, on somewhat lower terms than before, for pipes and special castings. As to Bills before Parliament, the Directors had attended to the measures affecting the Company's interests, but fortunately they had not been interfered with. Of the London Water Supply Bill he could not tell the Shareholders anything. He believed it was in a state of incubation, and it might be hatched this session, and become full feathered; but he thought this depended very much on their Irish friends. Whatever the scheme was, however, the Shareholders might depend upon it that when it was brought forward the Directors would give their attention to it, and he thought they might also reckon upon its costing them a good deal of worry. They then came to the amount paid in connection with Messrs. Harvey's accounts. As the Shareholders were aware, it was becoming less every half year, and the happy time had now arrived when it was all wiped off. It was felt by the Government Auditor that the Company should pay this £40,000 or £50,000 back to capital. They had suffered for it by decreased dividends, but it was thought only honourable to do what they had done. As he had said, there was now an end of it. They were at present paying a very fair dividend, and they would pay a better dividend in future. They proposed to pay 7 per cent. this time, and he believed they would have been almost justified in calling it an interim dividend. So far as he was concerned, he thought an even 7½ per cent. would have been better; but the Government Auditor considered that the whole of Messrs. Harvey's account should be cleared off. There was one other matter he wished to call special attention to—the quality of the water supplied by this Company and the other Metropolitan Water Companies. They had had to put up with what he had always regarded as distorted statements as regarded the quality of the water, and they thought the time had arrived when really something should be done on responsible authority really to test what was the quality of the water supplied to London, and to have it analyzed day by day by men whose reports would be beyond suspicion, and that the reports should be sent to the highest authorities. He then read the reports of Drs. Odling and Meymott Tidy and Mr. Crookes for the months of January, February, March, April, and May of the present year, with the view of showing how each month the water supplied by the Companies had improved. The reports, he added, were accompanied by figures, and they were open to every scientific man who chose to do so to look into them. He thought that the mere fact of these reports being on record must shut the mouths, to a great extent, of those babblers who, knowing nothing about the matter, talked a lot of ridiculous nonsense about the quality of the water supplied by the London Water Companies. In conclusion, he observed that it was not mere dividends the Water Companies had to look to. They felt the responsibility of their duties to the public as well as to their Shareholders. The quantity of water the Company now supplied was amply sufficient for the wants of their district. Still, they must keep their eyes on increasing the quantity. Although in the past few months there had been a large increase in the number of fires in the Metropolis, and there had been some large fires in the Company's district, they had never experienced any want of water. He had dwelt on the quality of the water, and had dilated on everything that could interest the Shareholders. The Directors were satisfied that the concern was worth more than it was six months ago, and they were also satisfied that they were placing it in a stronger and better position every six months.

Mr. C. M. VIALLS seconded the motion.

The CHIEF ENGINEER (Mr. T. W. Rumble, F.R.S.E., M. Inst. C.E.), in reply to questions with regard to the well at Streatham, said he should think that the depth of the stratum above the chalk was about 230 feet. They would make the well from the surface through the chalk, the thickness of which had not yet been tested.

The CHAIRMAN, in reply to a question as to whether capital would be required for the works he had referred to, stated that at present the Company were not wanting money, but if they carried out the works they contemplated at Hampton they would require more capital. He thought it very likely before they met again they would receive a due allotment of the surplus capital they had power to call up when they wanted it.

The motion was then put and carried unanimously, as was a further resolution declaring the dividends recommended.

Votes of thanks having been unanimously accorded to the Chairman, Engineer, Secretary, and Officers of the Company, the proceedings terminated.

LIVERPOOL CORPORATION WATER SUPPLY.—The annual accounts of the Liverpool Corporation Water Committee have been issued; and from them it appears that, for the twelve months ending December last, the total ordinary income of the Water Department was £196,202, and the ordinary expenditure £196,374, this latter sum including £15,920 for promoting the Vyrnwy Water Bill.

GOOLE GAS AND WATER SUPPLY.—At the monthly meeting of the Goole Local Board last Tuesday, a resolution of the Committee of the whole Board was agreed to, recommending the Board to accept all the powers and privileges given to them by the Goole and District Gas and Water Act, 1881. The provisions referred to enable the Board to become subscribers to the extent of one-third of its shares—£20,000—to the Company to be formed to take over the gas and water works from the Aire and Calder Navigation.

SOME NOTES FROM AMERICA. (FROM OUR OWN CORRESPONDENT.)

May 25, 1881.

In my letter of April 25, a mistake was made in regard to the amount per 1000 feet the Gas Companies would receive if they were awarded the contract to light the street lamps at the price mentioned in their bids—namely, 18 dols. per lamp per year. I allowed in my figures for the use of 4-foot burners; this should have been 3-feet. A strong effort was made a few years ago to have the 3-feet burners on the lamps in the city proper replaced by others passing one more foot per hour, and I was under the impression that the recommendation had been adopted; but from the annual report of the Superintendent of Lamps and Gas of New York City, which has just reached me, I see the change has not been made. However, practically it is safe to say that the burners pass close upon 4 feet per hour, as, in supplying 16-candle gas, the standard must be more than kept up to, and as neither governors nor automatic burners are used on the lamps, the only way to be sure of coming up to the mark is to send out the burners a little above the standard. Adopting, though, the 3-feet standard, the Gas Companies bidding for the lighting at 18 dols. per lamp per annum would have received, after deducting 4 dols. per lamp per year for lighting, &c., 1 dol. 17 c. (4s. 8½d.) per 1000 feet for their gas.

In point of fact, though the Gas Companies have been awarded the contract for lighting the lamps for the ensuing year, their gas will net them only about 1 dol. 12 c. (4s. 6d.), as they were induced to accept 17 dols. 50 c. (£3 10s.) per lamp, instead of 18 dols. The Metropolitan Company, who bid 18 dols. 25 c., also accepted the reduced figure; thus all the lamps up to Seventy-ninth Street—being the city proper—are to be lighted at the one figure, while the amount granted the Companies in the more sparsely settled portion of the city—Harlem and the adjacent section—for similar services, ranges from 19 dols. 50 c. (£3 16s.) to 32 dols. (£6 8s.). But gas is not to be the sole illuminator of the thoroughfares.

The Board of Aldermen having just passed an ordinance, over the Mayor's veto, giving the Brush Company the privilege of laying their wires in the streets, the Gas Commission have contracted with that Company for the illumination of Broadway and Fifth Avenue, from Fourteenth to Thirty-fourth Streets, Union and Madison Squares, and Fourteenth and Thirty-fourth Streets between Fifth Avenue and Broadway, for the sum of 7400 dols. (£1480) per year. This is the small district the Brush Company bid for on the last of March, referred to in my letter of April 25. The two squares or parks mentioned are on the line of the streets named in the proposal. It is the intention to use lights of great power, elevated to a considerable height at these two points; and the lamps will have a separate circuit from the smaller ones on the streets. It is expected that all these lights will be in operation by June 1.

According to the report of the Superintendent of Lamps and Gas of New York City, it appears that there are now 23,365 public lamps in use, an increase of 775 over last year. The naphtha lamps have been replaced by gas. The bids from the Companies for supplying gas to the public buildings under the control of the Department of Public Works (the Superintendent of Lamps and Gas being an officer of this department), for the year 1881, were—from the New York, Manhattan, and Metropolitan Gas Companies, 1 dol. 75 c. (7s.) per 1000 feet; Municipal Company, 1 dol. 80 c. (7s. 2½d.); Harlem Company, 2 dols. 25 c. (9s.). The report shows that the total amount of gas used by the city in 1880, including street lamps and all public buildings, was 313,700,560 cubic feet. This does not include some 8 million feet made on the several islands in the harbour, under the supervision of the city. The following table shows the kind of gas made by each Company and the impurities contained therein, as well as the illuminating power:—

Name of Company.	Kind of Gas.	Sulphur. Grs. per 100 Ft.	Ammonia. Grs. per 100 Ft.	Sulphur-retted Hydrogen.	Candle Power.	Specific Gravity.
New York.	Tessie du Motay	7.95	None.	None.	22.31	613 to 690
Manhattan.	Coal gas	26.89	8.87	None.	19.35	425 „ 447
New York Mutual.	Pine wood and naphtha and coal gas	3.49	None.	Frequent traces.	26.26	724 „ 817
Municipal.	Tessie du Motay	2.56	None.	None.	28.52	640 „ 661
Metropolitan.	Coal & naphtha	10.90	6.66	None.	20.94	527 „ 568
Harlem.	Coal gas	38.58	1.03	Occasional traces.	18.08	413 „ 456

Bray's slit union burner, No. 7, is used for testing the gas of the New York, Mutual, and Municipal Companies. The Metropolitan Company's gas is tested by a No. 6 of the same style of burner; while the Empire 5-foot burner is employed for the coal gas. [This last burner is made in two parts; the lower section or base contains a check, the upper portion is a bulb, and screws down on the base. It is claimed by some persons for this burner that the gas comes to a state of comparative rest in the bulb, which ensures a more even flow, and hence better results.] Previously the old "London" standard 15-hole Argand burner was used, and gave a result of 2 candles less than those in the above table for coal gas, and from 3 to 6 candles less for water gas. The report concludes with some remarks on electric lighting, both by the arc and incandescent systems.

Gas coals are lower this season than at any time for some years past. This is occasioned by a fight going on amongst the owners of the chief mines. Standard American caking coal is now delivered at New York at 4 dols. 50 c. (18s.) per ton of 2240 lbs.

At a recent meeting of the New York Board of Fire Insurance Underwriters, the subject of uninsulated electric light wires came up for discussion. One or two accidents have occurred through an electric light wire coming in contact with a telephone wire. It was decided to ask the electric light companies to insulate their wires. Any building in which this mode of lighting is used will be rated as specially hazardous unless the insulation of the wires be perfect.

Dr. Paget Higgs, author of "The Electric Light in its Practical Application," and for ten years at the head of the laboratory of the celebrated Wheatstone, is reported to have made some important improvements in electric lighting. Apparently the novel feature of the lamp consists in the use of an infinitesimal arc; that is, the distance between the poles of the lamp is so slight as to be scarcely perceptible. It is said that this lamp, supplied by 7 or 8 of Bunsen's pint cells, will give a light of 40 candles. The Doctor is also reported to have overcome the difficulties experienced by M. Faure in storing electricity.

THE Employers' Liability Assurance Corporation, Limited, have just issued a table of their various rates to cover all employers' risks under the Employers' Liability Act, 1880, for every £100 per annum paid in wages. Gas and water works *employés* come under Class IV., together with men engaged in shipbuilding trades, in dock, barge, and harbour service, in the manufacture of earthenware, glass, steel and iron, &c.; the premium being 5s. per cent. Joint policies to cover all accidents during employment, giving full indemnity to the employer against all liability under the Act, or compensation to the workman—in case of death, one year's wages; or, in case of total disablement, two-thirds of a week's wages, for a period not exceeding 26 weeks—are similarly granted at the rate of 12s. 6d. per £100 paid yearly in wages.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.
(Continued from p. 978.)

Mr. S. DALZIEL (Kilmarnock) read the following paper

ON GAS CONSUMED IN THE STREET LAMPS.

The object of the few remarks I am about to make on the subject of gas consumed in the street lamps is more to provoke discussion than to give information. As to the mode of charging—whether by the number of hours (each burner burning so much per hour), so much per lamp per season, or by the average meter system—each plan has its own advocates, and all believe their own to be the best. As a rule, however, whichever way it may be, either the public or the gas company feel at times that advantage is being taken of them. The public complain that the charge for the lamps is excessive, or the gas manager says that they are not charged high enough. Hence, at one time, the number of hours formed the basis of the charge for public lighting; next so much per lamp was the basis; then came the average meter system: This is not satisfactory, and it sometimes seems as if Justice was blind, and might was right; hence the unseemly wranglings in gas committees and town councils when gas affairs are discussed.

My own experience has not been as I could wish. Our system is the average meter system, and I consider that in this case it has failed, not from the fault of the system itself, but of the manner in which it has been worked; the meter lamps not being, I believe, attended to in the same manner, nor lighted so regularly as the other lamps. I do not say this is intentional; but there is a great disparity between the indications of the meters and a calculation at per hour, and the amount of gas consumed per hour per burner; and I am borne out in my conclusions, made from tests not by me, but by persons in the employ of the Corporation, that the public get from 15 to 30 per cent. more gas per lamp than they are actually charged for.

In the case of a corporation, in some minds feeling gets the better of justice, and the remark is often made that consumers are only getting their own, and changing the money from one pocket to the other; forgetting all the while that, on the one hand, the gas manager wishes to have, and should have accounted to him all the gas that has been consumed. Most gas managers are ready to stretch a point, and give the public the full quantity, and even more than they pay for; at the same time it is only just that every cubic foot of gas that leaves the works should be accounted for. This being done, it is a check on extravagance in lighting, and has a wholesome effect on the lighting department, when it is known that all gas used must be paid or accounted for. It is only lately that I have been able to get this fact recognized, and looked at in a businesslike way. Gas-works are manufacturing concerns, and managers are anxious to sell as much gas as possible per ton of coal. I consider this the best test of efficient management, position, locality of works, length of mains, number of services, number of meters, &c., being taken into account. So it is the manager's duty to see that every one, whether public or private consumer, is charged for what he uses. Supply the public lamps with gas free, if desirable, but give credit for what has been used.

We have in our town 573 public lamps, 392 of which are lighted all night, and 181 are put out at eleven o'clock, besides a few that are lighted all the year round. These 573 lamps give an average of one lamp to every 44 inhabitants, which, I am certain, is a much higher average than in most towns in Scotland, and perhaps has a very important bearing on the leakage question in every town. If we take one foot per day per lamp for leakage, which is under the mark, we have from this source alone about 44 cubic feet of gas lost for every ton of coal carbonized. To some this may seem a small matter; but to show you the effect of it I will refer to a town making nearly as much gas annually as we do, which has about half the number of inhabitants, one-fourth the length of mains, and probably about one-third the number of public lamps, where there is about two-thirds less leakage from this source alone. I only mention this to show whence arises many an unexplained difference on the leakage question, and the large quantity of gas sold per ton of coal in one town over another. In connection with this subject, I may mention that on one occasion some four years ago, about Midsummer, I was surprised at a small holder I had been emptied so quickly, as I was not aware of any unusual consumption going on. I sent men over the town, and found as many as 30 lamps with the stopcocks open and the gas escaping. We have more or less of this every season, so that a loss of a foot of gas per day per lamp is under the average.

To show you how subtle the forces are which are at work, let any one take an experimental meter, with 1·5 inches of pressure upon it, and close the stopcock and micrometer screw on the outlet, and in the course of 48 hours it will be found that the 50th part of a foot of gas will have gone, showing that the more general the consumption of gas in a town, and the lower the average consumption per consumer, the higher the leakage account will be. This appears to be a digression from the main subject, but I wish to show that public lamps are different from the services of private consumers. The probability is that in the latter case each service supplies several consumers or burners, whereas a lamp service supplies only one; hence the greater necessity that, like the Jew, the gas manager should exact his full "pound of flesh."

Ever since I had anything to do with the lamp account it has been a source of annoyance to me. For many years pillar lights were used; then No. 1 fishtails; next No. 2 iron burners; next bat-swings, &c.; and five years ago, after considerable pushing and argument, I induced the Lighting Committee to adopt the lamp governor with a No. 4 Bray's burner, which was followed by very satisfactory results; but as many of the regulators had got out of working order, the parties in charge would not consent to repair them, the result being a great waste of gas, and consequently a heavy loss to the Corporation. Some people would not be convinced but that lamp governors were nothing but toys, and their use simply a piece of extravagance; and most of us know that

"He that complies against his will,
Is of his own opinion still."

At the beginning of the present season it was thought by a few of the sapient ones that a No. 2 Bray's burner without a governor would give better results—though they never tried to see—than a No. 4 with a governor, and that the No. 2's would consume less gas, and give better light; but the striking facts brought out show how little gas lighting is understood by the community, even by men who have much general scientific knowledge. It is hard to drive preconceived notions out of one's head. Some of my people would not be persuaded that a large burner with a governor would give a better light, with less gas consumed, than a small burner without the governor, consuming the same amount of gas; so a large number of the No. 4 burners, with governors, consuming 2·2 to 2·5 cubic feet per hour, were taken off and replaced with No. 2 Bray's burners consuming 3·4 cubic feet per hour, the average illuminating power being 6 candles, and the pressure 20-10ths. The No. 4 burner with regulator averaged 2·4 cubic feet per hour, and the illuminating power was 10 candles; the No. 4 burner consuming 1 foot less per hour, and giving 4 candles more light. Truly this was burning the candle at both ends. These results I have verified repeatedly, and it is confirmed, by all who

have given the subject their attention, that a large burner with a low pressure gives the best results in illuminating power.

If the average meter system is the mode by which the public lamps are charged, I consider that it would be well to check the consumption as per meter by the number of hours the lamps have been lighted. I find that the gas paid for has not increased in the same proportion as the number of hours the lamps were lighted; in fact, the consumption per lamp has been decreasing, while it ought to have been the reverse. In 1877 the average consumption per lamp was 2·3 cubic feet, while each year since it has been only 2·1 cubic feet, and the lamps were lighted 100,000 more hours. There should be a little discrepancy between the result of calculation by time and the registration by meter, if the meter lamp is regularly lighted and put out the same as the other lamps. It is an important matter, as every 10th of a foot of gas consumed in the lamps is equal to £27. The 10th of a foot of gas per hour seems small, but in the aggregate it bulks largely.

I will now give a tabular statement of the hours and consumption of the public lamps:—

Public Lamps.						
All-night Lamps.			Eleven o'clock Lamps.			
Year.	Hours.	Average Consumption. Cubic Feet.	Hours.	Average Consumption. Cubic Feet.	Total Hours.	
1872-3	2166	2·08	1028	2·00	770,512	
1873-4	2216	2·01	1023	2·24	786,335	
1874-5	2317	2·07	1076	2·08	897,124	
1875-6	2441	2·20	1091	2·15	977,511	
1876-7	2441	2·29	1015	2·34	939,204	
1877-8	2409	2·28	1031	2·37	1,021,844	
1878-9	2485	2·27	979½	2·50	1,068,192	
1880	2544	2·12	1094	2·24	1,165,133	

Gas Consumed in Public Lamps for Season.

All-night Lamps.					Eleven o'clock Lamps.				
Year.	No.	Consumption. Cubic Feet.	No.	Consumption. Cubic Feet.	No.	Consumption. Cubic Feet.	No.	Consumption. Cubic Feet.	No.
1872-3	263	4500	195	2040					
1873-4	263	4470	199	2294					
1874-5	304	4800	179	2344					
1875-6	328	5376	162	2375					
1876-7	329	5325	173	2450					
1877-8	344	5500	187	2450					
1878-9	361	5500	181	2450					
1880	384	5500	175	2450					

During the season ending 1880 the lamps were lighted 100,000 more hours than in the previous season, and I was only paid the same amount per lamp, while if I had been paid according to the number of hours, and the quantity of gas each burner was consuming—and which I was justly entitled to—I should have been paid for nearly 1 million feet more, being equal to nearly 300 feet for every ton of coal carbonized. I have also calculated the actual amounts each burner was passing per hour, and I find that they correspond, or nearly so, with what the meters would, and some of them did indicate, if these particular lamps had received the same attention as the others.

In conclusion, I will only remark that as the gas manufacturer makes and supplies the gas, he should, the same as any other manufacturer, charge for what is supplied, but let the consumer check the amounts. The meters and burners should be carefully tested to ascertain that they are doing their duty, the burners especially that they are consuming as much as the other lamps in the district. A register of the hours should be carefully kept, and comparisons made with the meter indications. If they nearly agree, it will show they are being faithfully attended to; if not, then the cause of error should be inquired into. If this were done monthly, or as often as the indications of the meters were taken, there would be fewer disputes, and it might lead to better feeling and harmony between manufacturers and consumers of gas.

Discussion.

Mr. NIVEN said, so far as he could gather from the paper, Mr. Dalziel was not very favourable to the average meter system, and that the feeling was based on the disparity he had observed in the indications of different meters. Mr. Dalziel considered that the difference of pressure in different localities did not account for this. Now, he (Mr. Niven) would like to know whether wet or dry meters had been used. He would also like to ascertain whether the lamps which were kept burning all night were lighted every night, or only so many nights in the year.

Mr. DALZIEL said both wet and dry meters were used, and the lamps were lighted nearly the whole year.

Mr. NIVEN said he would further like to know what was the normal night pressure when the lamps were burning, and whether there would be any increase of pressure.

Mr. DALZIEL said the pressure was the same from night till morning. The works were at the top of a hill, and it was therefore necessary to keep the pressure on. The pressure at the works was 24-10ths, and this was calculated to give a pressure of 20-10ths in the town.

Mr. NIVEN said that another important matter with which they all agreed had been confirmed—namely, that the larger the burner (other things being equal) the better the illuminating power from the quantity of gas consumed. It was, he thought, the duty of every member of the Association to advocate the throwing aside of small burners, such as Nos. 2 and 3. There was a town in which was advocated the use of Bray's Nos. 4, 5, and 6. With respect to the iron burners, he thought, with the President, that soon they would be found only in antiquarian museums. He himself had had some difficulty in regard to public lamps. Some people were found to be very conservative of their own feelings, but in regard to the feelings of others they were so liberal that they would not give credit at all, and accordingly he had the greatest difficulty in regard to the public lamp question. While it was necessary that all gas managers should state their own experiences, he did not see how they were to get rid of their personal difficulties, because these difficulties were based not so much upon practical details as upon personal considerations, prejudices, and feelings.

Mr. D. M. NELSON (Glasgow) said he was often surprised to find difficulties arising where none existed. Where scientists such as Giroud, Sugg, and, coming nearer home, Mr. D. Bruce Peebles, and others, produced excellent and simple apparatus to govern gas, it was only for gas managers to take advantage of these facilities. If gas managers would take advantage of the facilities and apparatus placed within their reach, a good deal of dissatisfaction would be cleared away, and a better feeling would be found to exist amongst all parties interested in public lighting by gas. Mr. Hamilton, the Inspector of Lighting for the City of Glasgow, was present, and he (Mr. Nelson) was certain this gentleman would favour the meeting with his experience.

The President remarked that he was sure if gas managers had only their own feelings to consult, and were permitted to have their own way, governor burners would come into use very speedily. The difficulty was to induce corporations who were burning gas to adopt them.

Mr. DALZIEL said the President was quite right. He had had a good

deal of discussion with his Committee before he could get them to face the question. However, a gentleman had been appointed on the Committee who had spent a good deal of time in studying the subject, and who thoroughly understood the importance of consuming gas through large burners. This gentleman backed him (Mr. Dalziel) up in his desire to increase the size of the burners, but still there were members of the Committee who could not see and believe. It was difficult to get men who had not paid any attention to the question to understand that a small burner, relatively speaking, consumed more gas and gave less light than a larger burner with a governor.

Mr. HAMILTON (Glasgow) said he had no intention of giving the result of his experience, otherwise than in a hurried and imperfect manner on such an important subject as the sale of gas by contract. There was no doubt that, as Mr. Nelson had observed, by the use of regulators and governors, and with the exercise of ordinary care, it was quite possible to pass near enough the quantity of gas which was agreed upon between seller and buyer. But these regulators and governors required care and looking after. Giroud's rheometer was used to a limited extent in Glasgow, and hitherto it had done very well. The largest number of regulators in use of any one maker in Glasgow was the old diaphragm governor of Peebles; and if the diaphragm could be formed of more durable material, it would make it a first-class article. It was, in his experience, the best governor they had ever yet had. It admitted of a change of burner; but with Giroud's rheometer the governor required to be changed when the size of the burner was altered. In Glasgow, where 6000 or 8000 lamps were changed from 2 feet to 1 foot for four or six months, as the case might be, the advantage of Peebles's governor would be apparent. Although the old jets were being done away with, there were still 2000 in use in Glasgow, lighting small courts, where the traffic did not require a larger light. There was another burner which had been tried on a limited scale—namely, Borrodale's. The objection to it was that the disc stuck, and it could not be known when it did stick except upon examination. Giroud's rheometer, on the other hand, worked very freely, and even during the severe frost of the past winter, the 200 or 300 that were on the lamps did not appear to be affected. He would like to make one remark about the use of larger burners. The observations that had fallen from several of the speakers on this subject were quite correct. Street lighting in some towns was not what it ought to be, and because people had grown accustomed to a small light, they did not hear much about it. If gas managers had nothing else to thank the electric light for, they had to thank it for causing the introduction of larger burners, and it had forced the question of street lighting into a position which it had never before occupied. At the same time, where gas was as cheap as it was in Glasgow, and if only the municipal authorities would thrust their hands a little deeper into their pockets, and give those in charge of the lighting arrangements a little more latitude, gas managers would not yet be driven from the field by the new agent. But this was a different thing. Although the electric light was making progress, shilling for shilling he did not think it would compete with gas in Glasgow. He should be glad at some other time to give his experience of public lighting in Glasgow; but at the present moment he could neither do justice to the subject nor to himself.

Mr. M'GILCHRIST (Dumbarton) said he had to thank Mr. Dalziel for bringing this subject forward. There were, no doubt, many governors admirably adapted for the purpose of controlling the flow of gas. Mr. Hamilton had had most extensive experience in regard to governors and street lighting, and probably no man in Scotland could embody more information in a paper on this subject than he could do; and therefore he (Mr. M'Gilchrist) was glad that Mr. Hamilton had volunteered his services.

Mr. NAPIER did not think the difficulty lay so much with gas committees as with the lamp-lighters. Mr. Dalziel seemed, he thought, to labour under a difficulty in getting the lamp to which the meter was attached lighted at the proper time. He had the same difficulty under the hour system as Mr. Dalziel with the meter system in watching the lamp-lighter. He did not think it mattered so much, so far as he could gather from Mr. Dalziel's paper, what kind of burner or governor was employed, provided they had the exact quantity of gas. The difficulty was to get the meter lamp lighted at the proper time, and his trouble was to watch the lamp-lighter.

Mr. DALZIEL said the main difficulty was that Peebles's governor diaphragm gave way, and required to be renewed now and again, and further he could not get the lamp-lighter to light the meter lamps regularly, and thus, in consequence of the irregularities, the meters did not give a fair average of the amount of gas consumed.

Mr. STEWART (Greenock) said that in Greenock they had worked the average meter system for some time; but as he had the lighting of the lamps entirely in his own hands, he was not subjected to the annoyance which was sometimes experienced when the lighting was in the hands of other parties. He thought a great deal of the average meter system where there was a sufficient number of meters, but where there was only one meter to a large number of lamps the discrepancy would be considerable. Last winter they had had a good deal of bother by not keeping an account of the number of hours the meters were off, but they had been able to come to a conclusion as to the amount consumed. Had the lighting been in the hands of another official, he would have had more annoyance, and he was afraid there would have been a discrepancy between the amount of gas consumed and that paid for. If governors were employed they could be well watched. A man could be appointed to look specially after the governors and meters, and a close average could be struck of the amount of gas consumed. He had tried a governor with one of Mr. Peebles's clocks, and he had found it to work well. His intention was to place one of these clocks in each lamp-lighter's district, and this would be a considerable check on the meter consumption.

Mr. NELSON said that, from his experience of Scotland, and also of a great part of England, nine-tenths of the towns were lighted at a loss to the gas producer, whether a corporation or a company. A good deal of heartburning would be removed if the municipal authorities, or the lighting committees, would be a little more liberal towards the gas producer; but he was not going to argue this, because if complete harmony were to exist electricity would run wild over our streets. He was satisfied of this, however, that whenever a town agreed to have and to pay for good light, they would hear less about electricity.

Mr. ADAMSON (Airdrie) asked whether the application of meters to street lamps did not reduce the pressure, and give a differential pressure in a measure to the lamps burning without any meter at all.

Mr. DALZIEL said it was understood that a meter required 1-10th of pressure; but in testing a burner, the pressure was taken at the burner, and not at the meter.

Mr. M'GILCHRIST said the difficulty in regard to differential pressure was got over by putting the meter a little higher than the majority of the lamps to which gas was supplied, so as to equalize the pressure.

Mr. JEFFREY (Kirkintilloch) said he, too, had had some trouble with the meter system, and the remedy he had found for the evil was to put the meter exactly in the centre of the lamps which required to be lighted, so

that no matter at which end the lamp-lighter commenced, he had always the same number of lamps to light.

On the motion of the PRESIDENT, a hearty vote of thanks was accorded to Mr. Dalziel for his paper.

(To be continued.)

THE GAS AGITATION AT NORWICH.

THE PUBLIC LAMPS AND THE GAS-WORKS ASSESSMENT.

At the last meeting of the Norwich Town Council, two phases of the Gas Question were dealt with, the first being as to the price to be paid for the gas supplied to the public lamps.

The TOWN CLERK reported that he met Mr. F. L. Linging, the Secretary of the British Gaslight Company, in April, with respect to the contract for lighting the public lamps for the year commencing on July 1. He said there were about 1175 lamps lighted, at a cost of £3 4s. each lamp, and five fitted with Sugg's burners, at £13 17s. each; making the total cost £3850 per annum. Since the existing contract was made the gas had been reduced 3d. per 1000 feet, or nearly 7½ per cent., which upon £3850 would be about £280 per annum. A reduction of 5s. for each common lamp, and 17s. 6d. for each of the other lamps, or about £300 a year, was asked for; but Mr. Linging declined to entertain the proposal, or, indeed, any other for reduction of price, alleging that when the last contract but one was made (four years ago), the Company had yielded too much, considering that they supplied the posts and every appliance, kept all in repair, and lighted and extinguished the lamps. The charge for the gas consumed, he contended, was considerably less than was charged to private consumers, and that as during the past four years the price of gas to private consumers had been reduced another 3d., there was a total deduction of 6d. per 1000 feet since the contract. Disappointed, he (the Town Clerk) had an interview with the Chairman of the Company, with whom he discussed the points. Mr. Linging had since written that the Chairman had reported to him the particulars of the interview on the subject of the renewal of the public lighting contract, and, in doing so, stated fully all the reasons urged for reduction in the price charged for public lamps. The price charged for public lighting was only 2s. 6d. per 1000 feet, whilst the general consumers paid 3s. 6d. In the opinion of the Directors, therefore, there were no just grounds of complaint, and under existing circumstances they did not feel themselves justified in reducing the present price charged for public lighting in Norwich.

The DEPUTY-MAYOR moved, and Mr. DAYNES seconded, that the terms be accepted for one year.

Mr. WILLIS said there was one point worthy of attention in the Town Clerk's statement. It established the concession on the part of the Company that the price of gas was to be 2s. 6d. per 1000 feet. Between this price and charging £3 4s. a year for a lamp he drew a distinct difference. He was glad to find the Company making a reduction of 30 per cent. upon their retail price for lighting the public lamps, but he disagreed with the idea that 2s. 6d. per 1000 feet would land the Corporation in a charge of £3 4s. for each public lamp. At £3 4s. for each public lamp, there was no cottager in Norwich using gas but what was supplied at a cheaper rate than the Corporation. His proposal was that the Corporation should proceed on entirely different lines; the old custom of paying so much per lamp being superseded. As long ago as 1877 eighty towns abandoned the system, and adopted that of having average meter indicators, by which payment was made for the actual quantity of gas consumed, and not for a particular quantity suggested by the imagination of a company. The idea was that a public lamp consumed 5 feet of gas an hour, and the contracts were based upon this calculation; but experience and observation, extending over a large part of England, showed that this was a complete fallacy, and that the consumption of gas by public lamps was equal on the average to only 4 feet an hour. If each lamp were lighted 3776 hours a year, its consumption, at 4 feet per hour, would be about 15,000 feet. This was a large consumption—larger, he believed, than had taken place in the Norwich lamps. He proposed that the Corporation should accept the price of 2s. 6d. per 1000 feet, and call upon the Company to supply the city by meter. The cost of lighting the lamps had been much reduced owing to the introduction of torch lighting. It cost from 8s. to 10s. per annum for lighting and extinguishing each lamp; but as there might be a slight charge for interest on the cost of the lamps, which belonged to the Company—though as the cost formed part of the capital account he could hardly see how this was to be brought in—he would be liberal, and allow 12s. 6d. for lighting, &c. This would make the annual cost of lighting the public lamps £2 10s. each, a saving of 14s. per lamp per annum, or of £820 a year. He was sure under the system proposed the city would be as well lighted as now, while they would be left free to develop any other form of lighting they pleased. The only other point to consider was the number of meters. In other towns the proportion was 1 to 15 lamps; but he thought 1 to 20 would be sufficient. He moved—"That a communication be addressed to the Gas Company accepting a supply of gas for the public lamps as may be required at the price estimated in their letter, 2s. 6d. per 1000 feet; that the number of hours be, according to a time table, 3776 hours per lamp per annum, each lamp to be regulated to 4 feet per hour; that such consumption be ascertained by meter indicators, to be fixed to a percentage of lamps according to mutual agreement (say 1 in 20); and that such indicators do not vary more than 2 per cent. in favour of the buyer, or 3 per cent. in favour of the seller." If, he said, this proposition was met by the Company, the city would not only be as well lighted as at present, but would save between £800 and £900 a year.

The Deputy-Mayor, on the suggestion of Mr. Daynes, withdrew his motion in favour of that made by Mr. Willis, who, in answer to questions, said that the cost of the meters was very small.

The motion of Mr. Willis was then unanimously agreed to.

Mr. WILLIS next called attention to the assessment of the Gas Company's works. The last assessment, was, he said, made in 1876. At that time the capital of the Company was rather over £100,000, and the assessment, made on the basis of 5 per cent. on the capital, was fixed at £5200 a year. This was a fair and full assessment of the works at the time. But since then £40,000 had been expended by the Company—£55,000 if depreciation was to be included—on account of capital, not one penny of which was assessed to the public rates. There was a bargain made with the Company by the Assessment Committee, that the assessment should be undisturbed for five years; but as the five years had expired, the time had come to object to any further arrangement of the kind. He failed to understand why the Company should have five years' grace. If any private individual added to his premises, the extensions became at once assessable to the rates. In the enlargement of private buildings it was sometimes difficult to ascertain the exact amount expended; but there was no such difficulty in the case of public companies, because their accounts showed to a penny what had been the expenditure during the last year. If it should appear that during a previous year nothing had been added to the capital expenditure of a company, then no addition would be made to the assessment; but if it should turn out that there was an increase in the capital account, then the addition should form the basis of re-assessment, and be added to the sum on which the previous assessment was made. As the

Assessment Committee had been looking after the compound householder, he hoped they would not neglect these greater interests. In making a re-assessment of the Company's property, he suggested that the assessment should be made, not on the capital expended, £40,000, but on the actual value of the property—£70,000. It would be seen in the newspapers that a £20 share in the Company was now worth £32 or £33; therefore, although the Company might contend that the increased assessment should not be more than £2000 a year, he submitted that it should be £3500 a year—that the assessment should be made on £70,000, not on £40,000. The justice of this would be apparent by an illustration. If a man built two houses, identical in plan, but from some accident or otherwise one let at £50 and the other at £100 a year, the assessment on the latter would not be made on the cost of erection, but on the annual value. It might be said that owing to the policy of the Gas Company there might arise disaster; but if the shares of the Company should fall, then the assessment would be adjusted to the altered value. As long, however, as the shares maintained their present market value, they, as rate-chargers, were entitled to their share of the spoil. Some time ago the Company made a comparison of their assessment with that of the Water Company. At the time he did not understand the matter, because he had not an account of the capital of the Water Company; but he could now see that, as compared with the Water Company, the Gas Company had just ground of complaint, though they really had no actual cause of complaint. There was no just grounds for maintaining the assessments of the Companies at the present figures. They were not like Companies which, though established in Norwich, did their trade abroad. Every penny of their income was derived from the citizens. Such Companies did not require nursing at the public expense; and he felt called upon, in the interest of the shopkeepers of Norwich, to demand that such favourites of fortune should be made to pay their just and equitable share of the public burdens.

Mr. DAYNES remarked that in 1860 the Gas Company was assessed at £800. In 1863 the Gas and Water Companies were both assessed at £1500; since which time the assessments of the Companies had been from time to time increased.

On the motion of Mr. J. D. SMITH, it was resolved that a deputation of members of the Corporation be appointed to wait upon the Assessment Committee of the Board of Guardians, with a view to the assessments of both Gas and Water Companies being re-adjusted on an equitable scale.

BIRMINGHAM CORPORATION WATER SUPPLY.

COMMENCEMENT OF THE NEW STORAGE RESERVOIRS AT SHUSTOKE.

The important work which the Water Committee of the Birmingham Corporation are about to carry out at Shustoke, by the construction of two large storage reservoirs, was formally commenced on Saturday, the 4th inst., by Alderman AVERY, in his official capacity as Chairman of the Committee, cutting the first sod of the large reservoir.

The reservoirs are situated in the picturesque valley of the River Bourne, about midway between Shustoke and Whitacre, which are respectively east and west of the site. The large reservoir runs up the valley for nearly a mile, and covers an area of about 90 acres, the smaller reservoir being at its eastern end, towards Shustoke, and having a surface water area of eight acres. The average depth of the large reservoir will be 17½ feet, with a storage capacity equal to 400 million gallons; and the average depth of the small reservoir will be 10½ feet, and it will be capable of containing 20 million gallons of water. The height of the embankment at the western end of the large reservoir will be 29 feet, and in the deepest portion of the reservoir there will be 23 feet. Alterations will be made to the stream, so as to carry off the flood water into a new channel without passing between the two reservoirs. The water of the Bourne will be first drawn into the smaller reservoir, which will receive all the suspended matter and impurities by deposition, and it will then flow into the main or storage reservoir for distribution, in conjunction with the water derived from the other sources of supply, over the town and district served by the Corporation. The Bourne water is exceptionally free from impurities, and will afford an important addition to the present supply, which will then be absolutely secure against all contingencies that may arise. Messrs. John Aird and Sons, of Belvedere Road, Lambeth, are the contractors for carrying out the work, which is to be finished in two years. The amount of their contract is £78,900; but the total cost of the work, which includes two new pumping-engines at Whitacre and the erection of cottages and other buildings, will be about £125,000.

Invitations were issued by the contractors to members of the Town Council and other gentlemen to be present at the ceremony of cutting the first sod, and a party consisting of the Mayor (Alderman Chamberlain), Aldermen Avery and Deykin, and members of the Town Council left the New Street Station by train for Whitacre, where they were joined by Mr. J. S. Dugdale (Recorder of Birmingham), Mr. Dugdale, Mr. F. James (Chairman of the South Staffordshire Water-Works Company), the contractors, (Messrs. Aird and Ellis), and Mr. Wasdale, the Superintendent of the water-works. After a brief inspection of the engines and works at Whitacre, the party were conveyed to the extremity of the large reservoir, and in the course of the journey the boundaries of the reservoir, as marked out, and other particulars with reference to the work were explained. Having arrived at the spot selected for the ceremonial, Alderman Avery cut the turf with the usual formalities, threw a spadeful into a barrow, wheeled it a short distance, and then tipped it, amidst the cheers of the assembled visitors. This part of the ceremony being concluded, the Mayor, Alderman Avery, and others drank success to the undertaking in the splendid water taken from the Bourne.

The party then partook of luncheon, which was served in an adjacent tent, under the presidency of the Mayor.

The toast of "The Queen" having been duly honoured,

The Mayor proposed success to the undertaking inaugurated that day, and coupled with the toast the Water Committee of the Corporation of Birmingham, and their esteemed friend, Alderman Avery, its Chairman. He said the work they had just begun was part of that which was most characteristic of the municipal enterprise of the present day. First and foremost among the duties of municipal governors was that of providing the greatest requisite of life—water, which was required for drinking purposes, and all the operations of cleanliness, on which depended the enjoyment of life. In other places less fortunate than Birmingham some of the loveliest spots in the country had to be secured, and, with the aid of the engineer, who was always ready in a work of this kind, the natural beauties were destroyed in order to satisfy the necessities of the town. In the case of Birmingham they hoped they should add to the beauty of the locality. He was very pleased to have taken part in the commencement of an enterprise which would be so very useful and so advantageous to the neighbourhood. The toast he asked the company to drink was that of success to the enterprise, and when they considered that the work would create a great reservoir, covering 90 acres of land, and containing many million gallons of water—when they considered that something like £80,000 would be spent upon the work, that an army of workpeople would be engaged upon it, and that all the resources of modern engineering would be called to their aid, they might well hope that it would be successful throughout. They could not engage in an

undertaking of this kind without great risks of every description. They were, however, supported by a firm who had had such vast experience, in this and in other countries, in carrying out works of a similar kind, that they might place absolute confidence in them, and look forward to the satisfactory completion of the work at the end of the two years, or a little more, that an undertaking of this kind would require. In coupling the name of Alderman Avery with the toast, he said the Corporation were fortunate in having the services of this gentleman as Chairman of the Water Committee.

Alderman AVERY, in responding, said the work which had been commenced that day, and which, in the name of his colleagues he had great satisfaction in inaugurating, might safely be said to confer immense benefits of comfort, of welfare, and of health upon the present generation, and in all probability upon future generations for all time to come. Perhaps it might not be uninteresting to supply some particulars of the reservoir, the construction of which had just been commenced. The land covered an area of 162 acres, and it was acquired by the late Water-Works Company in the year 1872, at a cost of £35,000. The actual surface covered by water would be as nearly as possible 90 acres; the depth varied from 25 or 26 feet to different levels, the average depth being about 17½ feet, and its total storage capacity would be about 420 million gallons. The natural embankment was as nearly as possible three-quarters of a mile in length, and the artificial embankment about 1½ miles. The selection of a situation suitable for an impounding reservoir was always a responsible and a difficult work for an engineer. What was ordinarily wanted was a valley with two sides and a natural embankment at one end, and then there was nothing more to do than to dam across the other end of it. The site the company saw before them on both sides consisted at one end of gravel, sand, and clay, and at the other end of gravel, sand, and marl. A large number of trial holes had been sunk at different parts of the site, and what he had described had been found to be the general condition of the surface of the soil. Some 10 or 12 feet below the surface the Engineer arrived at a bed of solid clay which had been proved to a depth of about 40 feet. The embankment would be of considerable width, and there would be a gradual slope downwards, so as to prevent damage by the washing of the waves, while the whole of the artificial embankment from top to bottom would be 30 feet high. Upwards from the bottom it would be puddled, like a wedge, for 6½ feet, the puddling going below the bottom of the embankment about 15 feet, and there it would be interwoven, or blended, with the adjacent subsoil. There would be on all sides a solid impervious bed of clay at the bottom, a natural embankment along one part of it, and where this did not exist, a puddled wall, the result being the formation of a complete basin of the capacity he had mentioned, absolutely impervious, so far as engineering skill could make it, to the percolation of the water. With regard to its advantages to the district, to the village of Shustoke, and to the town of Birmingham, he did not think they were altogether unmixed. The landowners received what the purchasers considered a magnificent solatium to part with the land, and £200,000 or £300,000 was spent upon the works at Whitacre and those contemplated at Shustoke. These parishes, therefore, had not much to complain of in what the Corporation were doing, while the inhabitants of Birmingham would enjoy a considerable reward, to which they were entitled, for the outlay incurred. The works at Whitacre were equal to a supply of from 4 to 5 million gallons per day, the actual quantity taken being something more than 2 millions. The engines were of 280 and 225 horse power, and at each stroke about 200 gallons of water were raised. Their lifting power was equal to 4 or 5 million gallons per day, but the actual delivery was about half this quantity. When the works now contemplated were completed the Committee expected to be able to send from 9 to 10 million gallons of water into Birmingham in addition to the quantity he had stated. They would have two powerful engines, each of them capable of delivering to the reservoir nearer Birmingham from 4 to 5 million gallons of water per day, making, with the capacity of the present engines, a total of about 9 million gallons per day, or rather more. In addition to this there would be the vast storage reservoir, which would fortify the town against any danger from drought. It was necessary to provide against all contingencies. They must provide, not for daily wants or for averages, but for maximum requirements, always considering that the heaviest demands were certain to be made at a time when it was most inconvenient to supply them; so that in what they were doing they were not making any extravagant provision for the future. His only fear was that they had calculated too closely, and he could have wished that what they were now doing had been done a year before; but the supply had always been in excess of their actual wants up to the present time. With the existing reservoirs, when the Shustoke reservoir was completed the Committee would possess a storage capacity of 600 or 800 million gallons of water for the supply of the borough and the surrounding district. Birmingham would then have a satisfactory, complete, and magnificent supply of water, which would contrast most favourably with the state of things eight or nine years ago, when the town was dependent upon the foul River Tame for its water. The Bourne Valley being remarkably thinly populated, they had all the elements, as far as they could have them in a place near a population, of probable purity in the supply. The enterprise now inaugurated was originated and devised by Mr. J. W. Gray, as the acting Engineer of the late Water Company, Messrs. T. and C. Hawksley being Consulting Engineers for the Bill promoted in 1870; and the Corporation had done, and were doing, all that was contemplated in this Bill, and something more. When the sources of their present supply were considered, and when it was recollected that, of all towns in England, Birmingham was one of the most difficult to supply, in consequence of its elevated position, he thought the greatest credit was due to those who had drafted this scheme, and especially to their Engineer, for great and important works had been executed at a moderate cost, and the ratepayers had not only been charged nothing for what had been done, but a substantial reduction had been made in the water-rate. He concluded by speaking in very warm terms of the services of Mr. Gray, and proposed his health, and that of the contractors, heartily wishing success to the latter in the work they had undertaken to carry out.

Mr. GRAY, in reply, said Alderman Avery had forgotten to say that when the 1870 Bill was before Parliament evidence was given respecting the peculiarly pure and special qualities of the Bourne water, and it was stated that there were few, if any, water supplies in England equal to the water of this river. This applied to a sample of water taken from the Bourne at the time; but when the new works were constructed the Bourne water would be very much superior to what it was now. It had the peculiarity of softening after being exposed for a time to the atmosphere, and if it was allowed to stand for a time it softened very considerably. This peculiarity Birmingham had not at present the benefit of, but it would have the benefit of it after these large reservoirs were constructed. No one was more pleased than he that the contract for the work had fallen into the hands of Messrs. John Aird and Sons, who had plenty of plant and capital at their command to carry out such an undertaking.

Mr. J. AIRD also responded, observing that their desire was to do their duty to the Corporation, and to show by the result of the work two years

hence that the confidence which had been placed in them had been fully appreciated.

Mr. J. S. DUGDALE, in proposing—"The Mayor and Corporation of Birmingham," said there was no doubt that the Corporation had taken the lead in one of the greatest objects for which a corporation ought to exist—namely, providing for the health and prosperity of the people under their charge, and supplying them with one of the greatest necessities of life—an ample and abundant supply of pure water. He thought it was a great advantage that the Corporation had been able to secure such an eminent firm of contractors for the work as Messrs. John Aird and Sons.

The Mayor having briefly replied, the company separated.

HULL CORPORATION WATER SUPPLY.

At a Meeting of the Hull Water-Works Committee, on the 3rd inst.—Alderman Woodhouse presiding,

Mr. WITTY (the Deputy-Chairman), remarking that there was a large income over the expenditure in connection with the water-works, asked what was done with the surplus—was it placed to the credit of the water-works fund? Every undertaking should, in his opinion, stand upon its own basis, and it could scarcely be considered right that the earnings should be devoted to discharging the deficits on other accounts. It ought to go towards reducing the water-rates of the borough. The question had been commented upon outside the Corporation, and he moved for a return of the actual amount to the credit of the water-works fund.

The CHAIRMAN pointed out that after the annual payment of £2600 to the borough fund, as specified by the Act when the water-works were taken over, the remainder of the profit would be devoted to the discharge of the existing debt. After this had been cleared off, the water-rates would be reduced. The balance in hand was temporarily placed in the bank, and interest at 4 per cent. accrued.

Mr. WITTY: I want to know what the amount is. I think that the surplus ought to go towards a reduction of the debt as speedily as possible. My contention is that it is not applied to what the Act of Parliament says it should be applied.

The CHAIRMAN: We have not the management of these funds. You will have to move in the Finance Committee rather than here. We have only to earn the money, and to pay it over to the Treasurer.

Mr. WITTY still thought the matter came within the province of the Water Committee. Supposing the balance were on the wrong side they would, he said, have to put themselves in a position to remove it.

The CHAIRMAN: No, we should not.

Mr. WITTY: But we should in the administration, surely. I think that it is a thing that this Committee should have to do with.

The CHAIRMAN considered they ought not to meddle with the matter after it had been taken out of their hands.

Mr. ANSELL was of opinion that the Act of Parliament never intended that they should make a profit out of the water-works, and he agreed with Mr. Witty that when they had reduced the debt they should take the opportunity of lessening the water-rate. The Legislature never intended that the public should pay a higher rate than necessary, and that the surplus should be devoted to other funds.

The matter dropped without a motion, Mr. Witty stating that he would bring the subject before the Finance Committee.

THE IMPURITIES IN WATER, AND THEIR INFLUENCE UPON ITS DOMESTIC UTILITY.

By Mr. GEORGE STILLINGFLEET JOHNSON, M.R.C.S., F.C.S.

[A Paper read before the "Applied Chemistry and Physics Section" of the Society of Arts, Thursday, April 28, 1881.]

There are some impurities found in the water of rivers, more especially in those rivers which, like that in the immediate neighbourhood of this building, take their course through large towns, concerning which I shall have little to say this evening. I allude to organic impurities, the detritus of living beings, sewage, and the like; and my reason for keeping silence upon this great subject is the incompleteness of our knowledge regarding it. Our highest medical authorities seem to be at variance as to the nature and degree of the baneful influence exerted by those impurities which I have mentioned upon the human economy, with the exception of the so-called specific poisonous products of such diseases as typhoid and cholera; and our highest chemical authorities are very much at variance as to the best method of estimating or determining the amount of these organic pollutions in waters, as they also are in the various accounts they give of the processes by which nature removes them. It would ill become me, therefore, to do more than hint at the existence of this source of contamination of water, unless I stood prepared to bring forward some new facts or experiments throwing light upon the subject, which I am not in a position to do. I must, therefore, confine myself this evening to the discussion of some of the more important inorganic impurities contained in natural waters, and their influence upon the domestic utility of the important liquid which contains them.

The word "impurities" has occurred several times already in this paper. I have also spoken of "pollutions" and "contaminations," all of which expressions tend to convey the idea that the presence of substances so described, in the water we drink and employ for household purposes generally, must needs be injurious and prejudicial. Now, the tendency of this paper will rather be to show the great usefulness of many of these so-called "impurities" in natural waters; and the word is used here in its strictly chemical sense, to indicate anything which we find in and accompanying water which is not the chemical compound H_2O .

Pure water, the compound containing two atoms of hydrogen combined with one atom of oxygen, is a pure chemical substance which is never found in nature. We explain this by the statement that water exerts a solvent action upon various gases and solids. It is, then, by virtue of its solvent action that water becomes impregnated with the impurities of which I am to speak; and I will, therefore, ask you to follow me while I make a few preliminary remarks upon, and show you a few experiments illustrating the nature of solution. The process of solution consists essentially in a change of physical state, without alteration of chemical constitution. Thus, when sugar or common salt is dissolved in water, we can obtain the solid sugar, or chloride of sodium, by simply evaporating the water; and these are instances of true solution; but, if metallic copper be dissolved in nitric acid, that is an instance of solution accompanied by chemical change; for, if we evaporate the blue liquid thus obtained, we have a deposition, not of metallic copper, but of nitrate of copper, the salt formed by the chemical action which takes place between that metal and nitric acid. Solution proper, then, consists in a change of physical state simply, without change of chemical constitution. Now, we know of but three physical states in which matter can exist—the solid, the liquid, and the gaseous. The solvent, or substance which brings other substances into solution, is usually a liquid. The dissolved body may be either a solid or a gas.

The physical state in which we find any substance depends to a great extent upon the nature and intensity of the physical forces which happen to be acting upon it at the time. Besides the action of solvents, the two

physical forces, heat and pressure, exert a very powerful influence upon the physical state of matter. The essential difference between the three physical states of matter is one of the relative freedom of motion which exists between the molecules or ultimate particles of which the matter consists, the gaseous form of matter possessing the greatest, whilst the solid possesses the smallest degree of molecular mobility. Heat, on the one hand, increases this mobility of the molecules of matter, whilst pressure has the reverse effect.

Next, observe that the solvent (e.g., liquid water) is in the intermediate condition, as regards molecular mobility, between the solid and the gas, whose physical state it must assimilate with its own before it can bring them into solution. It follows, then, that the liquid solvent must bind a gas in chains, as it were—must diminish the free mobility which exists among the particles of that most elastic form of matter—whilst it will have to increase the molecular mobility of the comparatively sluggish solid, in order to make them respectively assume their own physical state. Accordingly, we should expect to find that a liquid will have its solvent action upon solids increased by the application of heat, whilst its power of dissolving gases will be diminished by heat, but improved by pressure. And these laws are obeyed in almost all instances.

I will now show you one or two experiments, to illustrate these preliminary remarks upon solution. When I stir up these two white powders in separate beakers of hot distilled water, you observe that one of them (which is powdered sugar) becomes readily incorporated with the water, changes its physical state, assuming that of its solvent, and is dissolved. That is an instance of a soluble substance. This other powder, however, refuses to do anything but remain partially suspended in the water, making the liquid look milky, while the greater part of it (for it is very heavy) sinks and remains at the bottom of the beaker. It is the salt called sulphate of baryta, and is one of the most insoluble bodies known.

To illustrate the effect of heat in assisting the solution of a soluble solid substance in a liquid, it will be sufficient to cool this hot saturated solution of iodide of lead; when we find that water which was capable of retaining a large quantity of this salt in the liquid state whilst hot, becomes incapable of doing so as it cools, and the excess of salt separates out from the solution in the crystalline form.

To demonstrate the action of heat in retarding the solution of a gas in a liquid, I will first pass up a little water into this tube, which contains dry ammonia gas confined over mercury. As soon as the water reaches the gas, you see that the latter disappears, being dissolved by the water. Now, if I pour a little hot water over the outside of the tube, we shall soon see the effect of heat in increasing the molecular mobility of the ammonia, for the restraining power of the water, at this high temperature, becomes insufficient to control the elasticity of its volatile companion, and the ammonia bursts its chain and resumes the gaseous condition. As the tube cools again, the solvent power of the water is again triumphant, and the gas disappears. Not only does the temperature of the liquid solvent exert an influence upon the quantity and quality of the substances which it is capable of dissolving, but the solvent action of a liquid is often considerably modified by the presence therein of substances which it has already dissolved.

We will consider this influence of dissolved matter in water upon its solvent action on other forms of matter somewhat fully, since it serves to explain the presence of some of the impurities found in waters; and it will be convenient to divide the subject into two heads, viz.:—1. The influence of dissolved gases upon the solubility of solids. 2. The influence of dissolved solids upon the solubility of other solids.

1. Excluding those cases in which a chemical action occurs, resulting in the production of some insoluble compound by the action of a dissolved gas upon one or other of the elements present in a dissolved solid, the general tendency is for a dissolved gas to increase the solubility of solids in their common solvent. As an illustration of this, I will cover this solution of copper sulphate with a strong solution of ammonia gas in water. You see now three layers in the containing vessel. Below, the blue solution of copper sulphate; above, the colourless solution of ammonia gas in water; and between the two a light blue turbid layer, the turbidity of which is due to the presence there of suspended hydrated oxide of copper, a substance which is insoluble in pure water, and in most neutral and alkaline solutions, but which is soluble in a solution of ammonia gas in water, yielding a dark blue liquid, which you see is produced when I stir up the contents of the beaker. There are other instances, which will occur to every chemist, of solid bodies quite insoluble in pure water, yielding to the solvent action of a solution of ammonia gas in water. It appears, then, that the dissolved gas confers a degree of molecular mobility upon the water which has dissolved it, or at least enables the water to produce the requisite freedom of motion amongst the molecules of an otherwise sluggish solid, which is necessary in order to compel it to assume the liquid state.

2. It is frequently observed, and especially amongst the halogen group of elements, that an insoluble salt is rendered soluble by the presence in their common solvent of a very soluble solid body. One of the most striking and beautiful examples of this is seen in the case of the red mercuric iodide, which is entirely insoluble in pure water, but is readily dissolved by water saturated with potassic iodide—a very soluble salt. It is essential that the potassic iodide be present in a somewhat concentrated solution, for, as you see in this beaker, when a solution of mercuric iodide in one of potassic iodide is mixed with a large bulk of pure water, the red mercuric iodide separates out. If there be any chemical action between the two iodides in this case, it is of the very feeblest kind. Indeed, some experiments of my colleague, Mr. J. M. Thomson, have tended to show that, if the double salts formed by dissolving insoluble halogen compounds in soluble ones be compounds at all, they are molecular, not atomic combinations. It is, at all events, interesting to remark, that when a dissolved solid assists the solution of another solid body, it is the more soluble substance—that which is endowed with freest molecular mobility—which serves to bring about the liquefaction of the more sluggish solid; and there are instances of this action which cannot be at all explained by chemical action, as in the case of the solubility of quick lime in a strong solution of sugar.

It sometimes happens that the action of a solvent is arrested by the formation of a protecting film of an insoluble substance upon the surface of an immersed solid. Thus marble, which is a compact crystalline variety of carbonate of lime, is freely dissolved by a solution of hydrochloric acid gas in water, the only solid product of the accompanying chemical action being the salt known as calcic chloride. Now, calcic chloride is freely dissolved by water, and, as each particle of it is formed on the surface of the marble, it is dissolved off by the water, and fresh surfaces of marble are constantly exposed to the action of the hydrochloric acid. But if we immerse marble in water containing both hydrochloric acid and sulphuric acid in solution, its surface speedily becomes covered with an insoluble film of calcic sulphate, and the action ceases. Marble is still there in abundance; hydrochloric acid is also present in quantity adequate and sufficient for its solution; but, by reason of the intervening insoluble film of calcic sulphate, they are prevented from acting upon one another. "The chemical force can only act at infinitesimally small distances." Another instance of the protecting

action of an insoluble film upon the surface of an otherwise soluble solid is seen in the case of the black ferrous sulphide. When this substance is acted upon by sulphuric acid, the salt known as ferrous sulphate is produced. Now, green vitriol, or ferrous sulphate, does not dissolve in cold, strong sulphuric acid, but it dissolves readily in hot, dilute sulphuric acid. When, therefore, I pour cold oil of vitriol over this ferrous sulphide, there is little or no action, a film of ferrous sulphate forming on the surface of the sulphide, and protecting the sulphide beneath from the action of the acid; but when I pour water into the containing vessel, a brisk action is at once set up, heat being developed by the admixture of the water with the acid, cold strong sulphuric acid being converted into hot dilute sulphuric acid, which dissolves off the ferrous sulphate as fast as it is formed.

I will now pass on to a consideration of some of the impurities contained in natural waters—in water as it is supplied to us for use in everyday life—explaining, where this is possible, the sources and method of contamination, and, further, discussing the chief precautions necessary for the removal of such impurities as are prejudicial to the domestic utility of this valuable agent. First, then, we will consider the gas found in solution in natural waters. With some trifling exceptions—viz., some of the rarer mineral waters—the gases dissolved in water are those which are present in our atmosphere—oxygen, nitrogen, carbonic acid, and ammonia. The oxygen and nitrogen gases, the elementary constituents of the atmosphere, are present in it in invariable quantities, and are far less soluble than the other two.

The carbonic acid and ammonia, or compound gases, are chiefly products of animal life, and are constantly being removed by plants and vegetable organisms, but they are also more soluble in water than the first two. The carbonic acid is present in larger proportion than the ammonia, whilst it is also far less soluble than the latter gas. Indeed, after a long continued fall of rain, the presence of ammonia in the air of a place is hardly recognizable.

Spring waters are very apt to contain much larger quantities of CO₂ than rain water or river water. Meandering, as they frequently do, through subterranean passages, they are exposed in their course to influences peculiarly favourable to their conversion into strong solutions of this gas. The earth being the common receptacle for dead organic matter, and her cavities being in many cases never penetrated by the sun's rays, or ventilated in any way, accumulations of carbonic acid are to be expected in these regions. The water, then, which is often very cold (it may be produced by melted snows) is churned up at frequent intervals along its course with these terrestrial gases, and becomes, in consequence, highly charged with them.

We are able to demonstrate the presence of dissolved gases in water, by simply boiling it in an apparatus such as this which I now show you, and collecting the permanent gas which escapes, as is being done here. The presence of these dissolved gases in water appears to be in every way beneficial. If we consider water as a beverage, the sparkling and refreshing effect of spring water is largely due to the dissolved gas, especially to the carbonic acid gas which it contains. Again, boiled or distilled water, from which the gases have been expelled by heat, is mawkish and insipid, but may be again rendered palatable by aerating it with charcoal. But more than this, absolutely gas-free water (which, however, can only be obtained by boiling water *in vacuo*) boils at a temperature considerably above 100° C., and with violent explosion.

Again, it is probable that the oxygen dissolved in water oxidizes, and removes some of the more readily putrescible organic matters contained therein; and it certainly is of the utmost importance to the life of fish. The dissolved gases in water also exert an important influence upon its solvent action for solids, as we shall now find. The solid substances dissolved in waters are generally chlorides, sulphates, and carbonates of the alkalies, and of the alkaline earth metals.

Those waters which contain the alkaline earths in solution, are divided into (1) calcareous and (2) magnesian waters, the former containing sulphate or carbonate of lime in solution, the latter sulphate or carbonate of magnesia. Such waters are said to be hard. It is in the case of the carbonated calcareous and magnesian waters that we observe most distinctly the influence which a dissolved gas may exert in modifying the solubility of a solid in their common solvent. For the carbonates of lime and magnesia are insoluble in pure water, or nearly so; but considerable quantities of these salts may be brought into solution by water charged with carbonic acid gas. For instance, if I bubble carbonic acid gas through this clear lime water, we first observe a milkiness due to the formation of insoluble carbonate of lime; and on continuing to pass the gas, we finally obtain a clear solution. The dissolved gas enables the water to overcome the molecular sluggishness of the calcic carbonate, and to reduce it to the liquid condition; just as the dissolved ammonia gas in our previous experiment enabled the water to hold in solution the hydrated cupric oxide. Now, if I boil this clear solution of bicarbonate of lime, the excess of gas is expelled by the heat (just as the ammonia gas was expelled from its dissolving water when the temperature of the tube containing the solution was raised), and the water, no longer aided by the mobile carbonic acid gas, loses its power of keeping the calcic carbonate in the liquid state; accordingly this salt is re-precipitated.

Bearing these facts in mind, we shall be able to explain some of the phenomena of nature in connection with this subject of calcareous waters. We have seen that spring waters are frequently highly charged with carbonic acid gas. Now carbonate of lime, in the shape of chalk deposits and limestones of various kinds, is a very constant ingredient of the soil in many parts of the earth's surface. It must, therefore, be a matter of very frequent occurrence for water, already highly charged with carbonic acid gas, to come in contact with carbonate of lime in the course of its subterranean wanderings; hence the frequent contamination of natural waters with dissolved carbonate of lime. But there is another interesting and very beautiful phenomenon which we are enabled to explain by the light of the above facts. I mean the formation of stalactites and formations such as are figured in the diagram on the wall. Suppose a water holding in solution much carbonate of lime and carbonic acid gas to trickle slowly through the roof of a cave. From each drop of water, as soon as it finds itself exposed to the common air, some of its dissolved carbonic acid gas will begin to evaporate, and for each molecule of gas which thus leaves the water, a molecule of calcic carbonate will be deposited in the solid form. Let a few of these solid particles adhere to the roof of the cavern, and from the nucleus thus formed, the production of vast conical masses, such as are here portrayed with their beautiful tapering apices pointing towards the earth, is only a matter of time. The nature and quantity of the dissolved salts in spring water will, of course, vary with the composition of the soil through which it has passed. Many mineral waters are of great medicinal value.

We will next consider the influence of dissolved lime-salts upon the domestic utility of water. Is "hardness" in water prejudicial? If we consider the water as a beverage, the answer would be, "No." The worst that hard waters have been accused of is, that they produce a tendency to calculous formations in those who drink them. But I think the water-drinker may answer to that charge, "Not proven." And, on the other hand, we cannot but remember that the metals calcium and magnesium,

in combination with phosphoric and carbonic acids, play the important part of conferring the requisite degree of hardness and stability to our frame—are, in fact, the earthy constituents of the skeleton. But there is another purpose for which water is employed—viz., for washing—which is hardly less important than that we have just considered. For this purpose hard water is certainly disadvantageous.

Soap contains fatty acids, which form insoluble compounds with the lime and magnesia in hard waters, and no lather will be produced till all the lime and magnesia dissolved in the water have been precipitated in this way. And this occasions a waste of soap.

Now, what is called the temporary hardness in water may be removed by boiling it. The expulsion of the dissolved carbonic acid gas by this means leads to the removal of the calcic carbonate from solution in the water, and the hardness due to this cause is then removed. But the water may contain sulphate of lime in solution, which will not be removed by boiling the water. On the contrary, unless the water had been previously saturated with the salt, the evolution of steam in boiling would rather tend to concentrate its solution, and thus the permanent hardness due to this cause would remain. Moreover, there is a further objection to boiling water (except in small quantities) for the purpose of removing its hardness, since, besides the consumption of fuel which is necessarily incurred, the deposited calcic carbonate tends to form boiler incrustations, often of considerable thickness, upon the walls of the vessel employed for the purpose. And if they do not lead, as they have too often done, to dangerous accidents by their suddenly becoming detached, and producing explosive bursts of steam by allowing the water to come in contact with the strongly-heated metal wall of the vessel, yet must invariably cause great waste of fuel, owing to their inferiority as conductors of heat. Therefore, the process of Mr. Clark, which is conducted without any application of heat at all, was a great boon to mankind, especially as it has the additional advantage of clarifying a water as effectually as any filter.

The problem before us is essentially this: How may dissolved calcic (and magnesian) carbonate be best removed from solution in water? *i.e.*, how may these salts be converted into suspended and insoluble matter with the smallest possible expenditure of time and money? We have seen that the method of boiling the water, though effectual, is objectionable on the score of expense, liability to accidents, &c. Now, in Mr. Clark's process, which I have said is preferable, the suspended insoluble calcic carbonate produced has to be removed by subsidence. There are two methods by which suspended matter is removed from water in nature—subsidence and filtration—and these processes are also adopted by man for the same purpose. Now it is claimed for the method of purification by filtration that organic matters are oxidized by the substances employed—*e.g.*, charcoal, which has the property of retaining oxygen gas in its pores. But the process of Mr. Clark also undoubtedly removes dissolved organic matters from waters, the lime which is added acting as a mordant, and producing their precipitation. Mr. Clark's process is as follows:—By adding quick lime or hydrated (slaked) lime to a carbonated calcareous water, the carbonic acid gas, which is holding the carbonate of lime in solution, is first removed by combination with the added lime, and the carbonate of lime thus produced falls, together with that previously in solution, as a solid insoluble precipitate. The turbid water is left to clear by subsidence, and is then drawn off freed from temporary hardness.

I have hitherto been speaking of what may be called unavoidable impurities in water—viz., impurities which are introduced by natural processes which are beyond the control of man; but, before concluding, I must allude, however briefly, to a very important accidental source of contamination of water, which is sometimes introduced by man himself—I mean the contamination of water with lead. And here we shall find that the influence of dissolved matters in any water is extremely important in modifying its solvent action upon this metal. Lead, from the ease with which it is worked, and the resistance which it offers to atmospheric action, changes of temperature, &c., has been found to be a very convenient metal wherewith to construct pipes for the conveyance of water, and cisterns for its storage. But lead is dissolved in appreciable quantities by some natural waters, and the long-continued ingestion of the metal, even in very minute quantities, produces serious symptoms of disease in the human subject, so much so that the metal has given its name to at least two specific affections—lead colic and lead palsy. It becomes, then, a matter of the utmost importance to be able to state, from a knowledge of the ingredients of any given water, whether or not it will be safe for persons to drink this water after it has been stored in leaden cisterns—whether or not the particular water is likely to exert any solvent action upon the metal. This we are able, in many cases, to do. For it has been found that pure water, free from both dissolved solids and gases, has no solvent action upon lead. But water containing dissolved oxygen becomes impregnated with lead, oxide of lead being, to a certain extent, soluble in water.

1. *Practical Deduction.*—Rain water, stored in lead, must not be used for drinking purposes. Again, when waters containing carbonates, and especially sulphates, in solution are stored in leaden cisterns, the metal becomes coated with an insoluble protecting film of carbonate and sulphate of lead, further action being thereby prevented, and the water does not become saturnine.

2. *Practical Deduction.*—Carbonated and sulphated calcareous waters may with impunity usually be stored in lead; but the film which forms on the surface of the metal should by no means be removed.

3. Waters containing nitrates and chlorides in abundance cannot safely be stored in leaden cisterns, since the nitrate and chloride of lead are soluble salts. The practical deduction from this is obvious.

In concluding, I hope I have convinced most of my hearers that, though we do not drink pure water, it would be very much worse for us if we did, and that, whilst we may sometimes be inclined to ask, "Why is such a substance here?" we generally find at last that it serves some important purpose which had escaped our ken—in fact, that we are finally led to wonder at the Wisdom which works through intricate and complicated labyrinths to a perfect and simple end, and are forced to admire the ultimate tendency and result of even such seeming anomalies as the "impurities in water."

THE POLLUTION OF THE SEVERN BY WORCESTER.—At last Tuesday's meeting of the Worcester Town Council, a letter was read from the Town Clerk of Cheltenham, stating that twelve months ago the Town Council had called the attention of the Corporation of Worcester to the pollution of the Severn by the sewage of the city being allowed to flow into the river. It was nine months since the matter had been referred to the Water and Sewerage Committee of the Worcester Corporation, but no action had been taken by that Committee in the matter. The Corporation of Cheltenham would, the letter stated, be very sorry to assume a hostile attitude to the Corporation of Worcester, but unless something was speedily done they would take steps to put in force the Rivers Pollution Act. Mr. Bozward moved that the letter be referred to the Sewerage Committee; but the Town Clerk suggested that the Corporation should ask permission of the Corporations of Cheltenham and Tewkesbury to inspect their works for the treatment of sewage. This was agreed to.

NOTES FROM SCOTLAND.
(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

Within the past six months I have directed attention to what has all the appearance of a high-handed mode of forcing so-called reforms upon the meter makers of this city. It is a notorious fact that officials are only too prone to rush to the conclusion that they possess greater authority than is conferred by the Act under which they are appointed, and, carried away by their self-constituted importance, they often rush to wild excess in their demands. The latest development of this spirit, probably of a milder type than has been described, is the subject of the present "Note." In order that the bearings of the question may be thoroughly understood, I will go back to the 12th of January of the present year, when Mr. Geo. F. Blaikie, designing himself "Chief Inspector," wrote to the meter makers and said: "By authority of the Board of Trade, and sanction of the Magistrates, on and after May 2, 1881, the stamps on all meters tested and found correct will bear the year and the month in which they are stamped." Details follow with respect to the size of the stamp, and the letter concludes: "The Chief Inspector will be happy to meet with and arrange any matters of detail with the different meter makers." If Mr. Blaikie did not understand the purport of this communication, he ought never to have sent it; and if he did realize its true meaning, then he must have known that the carrying out of such a scheme simply meant that the manufacturers of meters would be prevented from fulfilling orders with that despatch which is often so necessary in this branch of the trade. Were such a rule enforced, makers could not, during the slack season, store up meters in anticipation of the demand during the busy season. But if meters were made and stored in an unfinished state, when the demand came one of these things would happen—either that the customer would be disappointed in not getting his goods timeously, or the Chief Inspector would find it necessary to provide additional apparatus and an increased staff of officers *pro tem*. There is another alternative. He might have a staff sufficient for any emergency, and keep them going about half the year with their hands in their pockets, whistling merry tunes. There is plenty of money wherewith to pay such a body of men. If any good were to result from the introduction of the rule intimated by the Chief Inspector, it might be defended; but, so far as I can see, not a single argument, having the shadow of reason in it, has been advanced in favour of the change. The only pleas that seem to have been urged in favour of the new rule were that the stamping of the month would be convenient for finding out the number of a meter when the certificate was wanted, and the date on which it was stamped, and that, when the amendment of the Sale of Gas Act was effected, they would be ready in Edinburgh for what the Inspector anticipated would be one of the clauses. I do not know the nature of the amendments which are prepared to be made upon the Act, but if they are all equally important with the above, the Act might as well stand as it is. When such pleas are put forward on the one hand, and when, on the other, the welfare, if not the very life, of an important branch of industry in Edinburgh is considered to be in the balance, one is really astonished at the temerity of the Chief Inspector, who, it must be remembered, however, writes "by authority of the Board of Trade." It is interesting to probe this matter of authority. On the 20th of May last Messrs. W. and B. Cowan, who have taken up the point, wrote to the Secretary of the Board of Trade, intimating the receipt of Mr. Blaikie's letter, and asking whether it was compulsory to have the month as well as the year upon the stamp, as "we find that the month upon it is sure to cause unpleasantness between the buyer and the seller of the meter." To this communication they received a reply, dated the 24th of May, signed by Mr. Chaney, and couched in the following terms:—

Sale of Gas Act, 1859.

Gentlemen,—I am directed by the Board of Trade to acknowledge the receipt of your letter of the 20th inst., and, in reply, to acquaint you that it is required by the regulations of the department that the stamps issued to the gas-meter inspectors should bear the date of verification; but that such date may include the year only, or the year and month together. Some local authorities have preferred to show the month as well as the year when a meter is tested, whilst others only require the year to be shown. I am, however, to point out that the department has no power to interpose with the action of the local authorities, and I am, therefore, to suggest that you should represent the matter to the local authority of your district under the Act.

(The italics are mine.) So it appears that "by authority of the Board of Trade" has really no foundation; but perhaps Mr. Blaikie will be able to explain. Messrs. Cowan, through their Mr. Donaldson, made a representation to the Magistrates yesterday, with the result that the "month" is not to appear upon the stamp. The provision which the Chief Inspector was anxious to make for something which was to happen in the future did not meet with much favour, and indeed the proposal was received by some of the Magistrates with the scriptural injunction: "Sufficient unto the day is the evil thereof."

The mind of the public in Edinburgh is being gradually prepared for the introduction of the electric light. As yet no definite statement has been given embodying the result of the Committee's inquiry into the subject; but in the course of a postprandial speech on Monday evening, the Lord Provost, replying to the toast, "The Corporation of Edinburgh," took occasion to refer to the recent improvements that had been made in the city. He had, he said, much pleasure in mentioning that, owing chiefly to the exertions of Mr. Landale, they were likely soon to have experiments on a large scale in the lighting of the city with the electric light. Mr. Landale had been recently in London making inquiries on the subject, and the arrangements for instituting experiments were in such a forward state that it was expected they would take place in a few weeks. It was proposed in the first place to light up the North Bridge from the Iron Church to the Register House, and also the whole line of Princes Street from the Register House to the west end. He congratulated the citizens on the near prospect they had of the adoption of the electric light, which would add another to the many attractions of the city. Now, how came this little speech to appear in print? The dinner at which it was delivered (in celebration of George Heriot's birthday) is strictly private, and the speech appeared only in the Conservative organ. Mr. Landale is said to be a Conservative in politics, and it is further rumoured that if not he, at any rate certain other members of the Council, are Shareholders in an Electric Lighting Company which has acquired ground at the west end of the city on which to erect the necessary works for providing the electric light. Those who are aware of the manner in which many companies are launched and advertised can draw their own conclusions from the above.

The gas exhibition which is to be held in Aberdeen towards the end of September promises to be a very successful one. It is anticipated that a great number of the firms who took part in the Glasgow Exhibition will send specimens of their manufacture to the "Granite City." The Great Hall and the Common Hall of Marischal College Buildings have been placed at the disposal of the Exhibition Committee, and the Town Council have consented to allow the use of gas gratuitously. Looking to the outcome of the Glasgow Exhibition, it will be a question whether the Committee should think of making awards. If they resolve upon such a course it is to be hoped they will be more successful than their Western neighbours.

Mr. Arthur G. Quigley, Assistant Manager, Greenock, has received the appointment as Manager of the gas-works at Penicuik. Mr. Charles Meiklejohn, lately Assistant Manager at Houghton-le-Spring, has been appointed to the management of the gas and water works at North Berwick.

At a meeting of the Shareholders of the Kinross and Milnathort Gaslight Company, on Wednesday afternoon, the yearly report was considered, and a dividend at the rate of 5 per cent. was declared. Mr. George Laing was unanimously re-elected Secretary and Treasurer.

The annual meeting of the Inverurie Gas Company was held on Thursday afternoon, when the Secretary submitted the annual report, which was considered highly satisfactory. After paying working and other expenses, a sufficient sum remained to enable the Directors to declare a dividend of 7½ per cent.

It is now fully six months since the Burgh Commissioners of Alva resolved to acquire the gas-works. The period prescribed by law during which no action can be taken having expired, overtures have been made to the Gas Company as to the terms on which the works will be sold. The Joint Committees of the Burgh Commissioners and the Gas Company met this week, when the Commissioners made an offer of £7800, based upon a valuation which the Commissioners thought proper to take before going into the concern. The valuation placed upon the works by the Company is £8500. The Committee have not accepted of the offer of the Commissioners, but a meeting of the Company will be held on an early day to decide upon the course which ought to be adopted.

In connection with the proposed water supply for Elie and districts, Messrs. Little and Boothby, C.E., of Kirkcaldy, have been appointed to survey the district, in order to ascertain the most likely spot from which a supply can be drawn.

Operations have been commenced this week with the view of extending the works and making the water supply of Alva more satisfactory.

The numerous bursts in the pipes from the Lintrathen reservoir to Dundee are causing much uneasiness in that important manufacturing town, as they are seriously affecting the continuity of the supply. The subject was under the consideration of the Works Committee of the Water Commissioners on Thursday, and ultimately it was agreed to ask the Manager (Mr. Watson) to report particularly as to the condition of the Lintrathen supply, and as to the means which, in his opinion, ought to be adopted in order to render it effective. It is thought that it will be necessary to lay a second pipe through the Howe of Strathmore. Meanwhile water is being supplied from Monikie, and it is said that it is not of the purest quality.

The Woodside Police Commissioners have been considering the question of introducing an additional supply of water, and they have obtained a report from Mr. J. Gordon Jenkins, C.E., on the subject. From this report, which was submitted to a meeting of the Commissioners this week, it appears that the present supply is only about 5½ gallons per head per day to a population of 5200. To meet modern domestic and sanitary requirements, and to provide for a possible increase of the population, the reporter reckons that provision ought to be made for an additional water supply of at least 20 gallons per head per day on the present population. Mr. Jenkins recommends that a supply should be introduced from the Goral Burn, which would cost about £8000. After some discussion a remit was made to the Water Committee, to inquire as to whether a sufficient supply could not be obtained from the Hilton and Garnethill Quarries, as to the quality of the water, and as to the cost and conditions of the supply.

When the present water supply for Edinburgh was sanctioned, the authorities were bound to send down the River Esk from the Gladhouse reservoir, 2,264,583 gallons per day of compensation water, but this obligation was to cease when the Rosebery reservoir was constructed, as the compensation was then to be given off below that reservoir. It seems that the Trustees were bound by their Act to complete this reservoir by June 1, 1883, but it has been allowed to stand over, there being already a superabundant supply after giving full compensation. At a meeting of the Water Trustees on Thursday, Sir James Falshaw moved that they complete the Moorfoot works by the construction of the Rosebery reservoir. According to the calculations of the Engineers, by the construction of these works the supply would be increased so as to provide 2,217,917 gallons daily, or 7 gallons per head to the present population of the district of supply. The estimated expenditure for the scheme so far as completed, including land for Rosebery, is £385,500, and a further outlay of £42,700 would complete the Rosebery reservoir, so that for an addition of 11 per cent. to the expenditure already incurred there will be an increase of 34 per cent. to the supply of water now available for the city. The cost of the additional supply of 2,217,917 gallons per day obtained by the construction of Rosebery reservoir would only be ½d. per 1000 gallons. The motion was opposed by Mr. Steel, who moved that they delay proceedings, mainly upon financial grounds. This amendment was seconded by ex-Provost Wood, of Portobello, who said that this Moorfoot scheme had, from beginning to end, been one series of blunders and mistakes. It was to have cost £300,000, but since 1874 they had borrowed £571,900, and they had spent £539,458. Ultimately, on a division, 14 voted for the motion and 6 for the amendment.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

At the last monthly meeting of the Town Council of Kilmarnock there was submitted the usual report from the Gas Committee. It stated that during the month of April, 1881, the gas sold amounted to 2,850,850 cubic feet, of the value of £653 6s. 4½d., as against 2,366,850 cubic feet, of the value of £542 8s. 0½d., in the corresponding month of 1880. The illuminating power of the gas sent out during April was—maximum, 27·5 candles; minimum, 26 candles; and average, 27·3 candles.

The annual general meeting of the Largs Gaslight Company was held on Thursday—Mr. John Glog in the chair. On the recommendation of the Directors in their annual report, it was unanimously agreed that the dividend should be at the rate of 6 per cent. Mr. John Mackie was appointed a Director in the room of Mr. Archibald Hill, deceased. Replying to a vote of thanks to the Chairman and Directors, moved by Mr. Glen, the Chairman said they had always done their best to keep the works in good order, and to supply good gas at as moderate a price as possible. By buying a first-class coal on the best terms it enabled the Company to dispose of a large quantity of coke, which could not be done if an inferior class of coal had been used.

Mr. Robert Cowie, Manager of the Cambuslang Gas-Works, near Glasgow, has been appointed to fill the vacancy in the managership of the Tillicoultry and Devonside Gas-Works.

At the annual general meeting of the Stonehouse Gaslight Company, held on Wednesday, it was resolved to declare a dividend of 5 per cent.

On retiring from the managership of the Bathgate Works of Young's Paraffin Light and Mineral Oil Company, Limited, Mr. R. Henry Brunton, M.Inst.C.E., F.R.G.S., &c., was recently entertained at a public dinner given in the Royal Hotel, Bathgate. In the course of his speech replying to the toast of the evening, Mr. Brunton said there was no manufacture in the country where so many different problems of scientific

importance were constantly calling for solution. The demands of the markets were constantly changing, and the products must change with them, and it was that which tested the scientific men connected with them. The most formidable of the new inventions affecting the oil industry was the electric light, and he had no doubt of its eventual universal application. When this occurred there would be the great problem to solve as to the larger part of their productions, both by paraffin oil manufacturers and gas companies. There was no doubt, however, that a means of outlet would be found for gas, if not for lighting at least for heating purposes; and he would have no hesitation, if he were the possessor of gas shares, in sticking to them. An utterance such as that contained in the last sentence, from a man of Mr. Brunton's experience, ought to instil some confidence in the minds of gas directors, gas commissioners, gas managers, and other persons who are interested in gas supply undertakings.

Since the water in the Knowes Dean reservoir, Galashiels, was turned off some ten days ago, the daily subsidence in the reservoir has been observed to be about 12 inches, which is certainly indicative of something radically wrong.

The talk that has been going on for some time in reference to the alleged pollution of the Tweed, combined with the threatened prosecution of certain manufacturers and several towns whose sewage is discharged into the river, has been the means of bringing out the fact that some of the riparian proprietors who threatened prosecution are themselves polluting the Tweed by putting their sewage into it. Some interesting correspondence on the subject is being circulated by the Local Authority of Melrose, amongst persons interested in the matter in Hawick, Selkirk, Galashiels, and other places.

With the view of improving their water supply the Police Commissioners of Langholm lately appointed a Committee to examine the different probable sources whence a supply may be obtained, and samples from at least two sources have been sent to Dr. Stevenson Macadam, Edinburgh, for analysis.

At Alexandria, in the Vale of Leven, the ratepayers are already put upon "short commons" in respect of the domestic water supply, which is now turned off daily at nine o'clock p.m. till seven o'clock next morning. Such a fact suggests the question—What may the inhabitants expect before the summer is ended, when the supply of water has become scarce before Midsummer-day? Port-Glasgow is very much better off, inasmuch as a few days ago the quantity of water in store was 156,845,775 gallons, or upwards of 31 million gallons in excess of that in store at the same period last year, being equal to a supply for all purposes for upwards of seven months.

The Glasgow pig iron warrant market has been stronger this week, and a good business has been done at advancing prices; the close yesterday being 46s. 10d. cash and 46s. 11½d. one month for sellers, and buyers 1d. less per ton.

A good deal of depression is now being felt in the coal trade, owing to the limited demand and the very low prices obtainable. Some coalowners seem to want a strike in order to get their stocks reduced.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

During the past week the Whitsuntide holidays have caused an almost complete suspension of business both in the coal and iron trades of this district. In the Manchester district the pits have been closed for a whole week. Many of the iron and engineering works have also been closed for a similar period, and so far as actual business is concerned there is really very little to report, except that the market generally continues to show a tendency towards weakness.

The season for placing out the usual gas coal contracts is now advancing, and during the past fortnight a moderate amount of business has been done in this direction. The pressure of all classes of round coal upon the market, owing to the very limited demand both for house-fire and manufacturing purposes, is, of course, tending to force down the price of gas-making coals, and quotations for these are now touching very low figures. For one or two important contracts which have recently been placed, sellers were not able to obtain any higher prices than those which were ruling last season, and the average prices now current may be given about as under:—Good qualities of cannel range from 14s. to 15s., and inferior sorts go as low as 10s. per ton at the pit mouth; good screened Arley gas coals average about 6s. 6d. to 7s., but common screened gas coals are to be bought at as low as 5s. 3d. per ton. I may add that the better sorts of gas coal maintain their price more steadily than the inferior qualities, as there appears to be a tendency amongst gas manufacturers to dispense as much as possible with cannel, by using a larger proportion of the good qualities of gas coals. For other descriptions of round coal the prices at the pit mouth are about 8s. 6d. to 9s. for best Wigan Arley, with common sorts from as low as 5s. 6d. per ton upwards; Pemberton four-faces, 6s. 3d. to 7s.; and common round coals, 4s. 9d. to 5s. 6d. Engine classes of fuel are tolerably steady, good qualities of slack, in fact, being the only description of fuel in which the market may be said to be really firm. Burgy at the pit mouth averages about 4s. 6d. to 5s., and good slack 4s. to 4s. 3d., with inferior sorts of burgy and slack 6d. to 1s. per ton below these figures.

In the iron trade there has been nothing doing to actually test prices, and quotations nominally are without alteration. Lancashire pig iron delivered into the Manchester district is quoted at 43s. to 44s. per ton, less 2½ per cent., and bars at £5 12s. 6d. to £5 15s. per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

Business at Cardiff during the past week has been very fair. Taking into consideration the holidays, one would naturally expect a considerable falling off in the shipments of coal, iron, &c.; but this has not been the case as far as Cardiff is concerned. Prices remain firm at recent quotations, especially for coal of the first quality; but there is no prospect of any immediate advance. Exports for the week:—Coal, 94,072 tons; iron, 3340 tons; patent fuel, 2965 tons; coke, 375 tons. There has been but little change during the past week in the trade of Swansea, but such as there is for the better, and the total tonnage cleared is some 3000 tons heavier than in the same week last year, notwithstanding that Whit-Monday was practically a blank day. There is an increase in the shipments both of coal and fuel. The trade of Newport during the past week has naturally felt the influence of the holidays. Work is very irregular at many collieries, but will, no doubt, by the end of a week or so, resume its former briskness. The shipments of coal are proceeding as fast as can be expected under the above-named circumstances; but owing to the quantity of tonnage in port, demurrage has accrued in some instances. Prices have in no way receded, and shippers are in no way inclined to give way in the quotations that have been current for some time past. In fact, firmness is so apparent that buyers who may have held back in hopes of a reduction are now ready to purchase. The iron trade is steady, and a fair demand for railway material is experienced.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade remains quiet, and prices continue to weaken. Notwithstanding these facts, it is strange to find reports of a misleading tendency issued from the district, giving unusual quotations and unfounded inferences of improvement. With the exception of a few of the largest proprietors, whose pits are running but little short of full time, though chiefly on account of contract orders, there is a considerable reduction in the output as compared even with that of a month or six weeks back. Both as regards manufacturing and household fuel there has been a growing weakness of prices for some time past. Forge coals are plentiful at 6s. 6d., and of useful qualities. In the Cannock Chase district, orders are scarce for best deep coals, and the pits are running only about four days per week. Owing to the Whitsun holidays the pits hereabouts were standing during the last week, and all have not yet resumed operations. Best deep coals are most in request, but only in small quantities and at very unsatisfactory prices. Manufacturing fuel of all qualities is in abundant supply, and but little furnace coal is now being consumed. Competition for the supply of the furnaces in the district is very keen, and the trade is mostly secured by the smaller proprietors, who are selling much below the recognized official lists.

The iron trade, though depressed, is not in a worse position than that reported a month ago. The holidays to some extent interfered with the business of the past week, and the markets were rather thinly attended; nevertheless, a few substantial orders were booked. Offers to buy at current rates for twelve months were firmly refused by makers, who hold that a change for the better cannot be far off. Marked bars, though rather slow of sale, are firm at their basis of £7 10s. Unmarked qualities of bars are in most demand. The sheet trade is reported a little better, and the brisker inquiry reported a week ago has been followed up by a few of the consumers of galvanizing sheets purchasing parcels of more extensive dimensions than has been noticed of late. Hoop and strip iron was also inquired after rather more largely. Girder and boiler plates were in fair request at £8 10s. and £9, especially the heavier sections. Sales are reported to be more numerous in the pig iron department, and rumours of some heavy parcels having changed hands during the week are current. It cannot, however, be said that a better feeling is generally expressed, for the majority of makers continue to complain. All-mine best qualities are abundantly offered at £3 2s. 6d., while cold blast is quoted £4 to £4 5s. Neighbouring made pigs are selling slowly, and cinder pigs are not much wanted at £2.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The week has been a broken one on account of the Whitsuntide holidays, so that most of the pits were set down for two and three days. Little inconvenience has, however, been caused, owing to the fact that large stacks are to be found at most of the leading pits. The house coal trade, throughout both the South and West Riding, is very quiet indeed, both Silkstone and Barnsley house coal being in moderate request. Although only about half time is being worked, it is none the less startling than true that the returns show that more coal is being sent away by rail to London than was forwarded in the corresponding period of last year, whilst both the Great Northern and the Midland Railway Companies are accredited with a larger tonnage last month than they forwarded in April. This is due to the great output caused by the New South Yorkshire collieries, eight of which, it is computed, are able to raise 2,800,000 tons per annum if such was required.

The steam coal trade is improving, and during the week intimations have been received from the Agent of the South Yorkshire Steam Coalowners Association to forward an extra tonnage. The quantity sent to Grimsby and Goole from both districts is on the increase, but prices are exceedingly low and unprofitable. The Hull traffic last month shows a falling off so far as the leading thick-seam pits are concerned when compared with the same period of last year. Seven of the leading pits forwarded by rail and water in May 24,274 tons, against 27,922 tons in the corresponding period of last year. Denaby Main headed the list with 6868 tons, being only four tons less than in the same month of the previous year. Manvers Main ranks next, with 7078 tons, against 6336 tons in May, 1880. Thyberghe Hall supplied 4224 tons last month, compared with 3584 last year. Wombwell Main only sent 2470 tons, against 5692; and Wharnccliffe Silkstone 1252 tons, as against 3584 tons in the corresponding period of last year.

There is very little new to note respecting the demand for gas coal, which is about an average one for the season. The Church Lane and Higham Collieries, which are noted for raising this class of coal, have been set down, owing to the affairs of the Company being in liquidation. Several contracts are still in the market, and seeing the low prices at which coal can be procured, some of the Gas Companies are asking for tenders for contracts extending over several years.

The coke trade grows quieter, and the output is being diminished almost weekly. The quantity forwarded to North Lincolnshire is much less than it was a short time ago, and prices are consequently lower.

The result of the Sliding Scale Audit in connection with the West Yorkshire coal trade is to the effect that the miners of the district are entitled to an advance of 2½ per cent. on their present rate of wages. This is based on the selling prices of coal for the four months ending April 30. A monthly audit of the books at one of the South Yorkshire collieries shows that the prices during May were rather lower than those of April.

Both the raw and finished iron trade has of late undergone but little change. The works are only partially employed, and the output of pig iron has been reduced.

THE COAL AND GENERAL TRADES OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The coal mines of the counties of Durham and Northumberland are doing an ordinary summer business. The coasting is but poor, but there are good shipments of gas coals to the Baltic, nearly all of which have been sold under contract. The price of gas coals is unaltered. Very few cargoes are sold in the open market. The business done is under contract. The steam coal trade is somewhat better, but the local demand for second-class coals of all descriptions is but poor. The coke trade, especially for the supply of the iron-works on the western side of the island, is dull.

The chartering business continues to favour shippers. The rate paid steamers on Saturday to load coals for London was 3s. 9d. per ton, and other ports were in proportion; while 7s. 6d. per ton was the figure for Cronstadt.

The general trade of the North is in a healthier position. There are many more inquiries than there were a fortnight ago, and it is leading up to business. The trade done in the better qualities of fireclay goods is quite as satisfactory as last reported; but the collieries and factories which manufacture second-class fire-bricks have to submit to moderate prices, if they desire to attract business. There has been a marked and steady improvement in chemicals over the fortnight. Soda, which had ad-

vanced 10s. per ton at least, receded a little in the latter part of last week on account of the appearance of cold weather, but other classes of chemicals more than upheld their values. The shipments of chemicals abroad have been very much better. The iron trade has somewhat recovered from the late depression. The business transacted has been more general, and the foundries and manufacturing iron factories are in a somewhat better position. The lead market has been rather dull, but the copper trade has shown somewhat improved prices. There is no change in the wood trade. Rates do not advance, and the supply, however merchants may attempt to limit it, is in excess of the demand.

CURRENT SALES OF GAS PRODUCTS.

MANCHESTER, June 10, 1881.

Very little doing here this week. No material change in quotations.

MR. HERMAN TAPLAY, who has been for the last 19 years connected with the Stafford Gas-Works—and for some years as Assistant Manager—has been appointed Manager and Engineer to the Stoke-upon-Trent Gas-Works, under the Joint Committee of the Stoke Town Council and the Fenton Local Board.

INCREASED STORAGE AT THE ALFRETON GAS-WORKS.—A new telescopic gasholder, to contain 20,000 cubic feet, is about to be erected at the Alfreton Gas-Works, in substitution for the one now in use. On the completion of the new holder, the storage capacity of these works will be raised to 30,000 cubic feet.

REDUCTION IN THE PRICE OF GAS.—At the meeting of the Newton and Earlestown (Lancs.) Improvement Commissioners on the 7th inst., it was resolved, on the recommendation of the Finance Committee, to reduce the price of gas to 2s. 6d. per 1000 cubic feet net to all classes of consumers.

TODMORDEN GAS COMPANY.—The annual report and balance-sheet of this Company for the year ending the 31st of March last states that the receipts at this date amounted to £7534 8s. 1d., the profits made upon the year's business being £2657 17s. 3d. From this sum the Directors recommend the payment of a dividend of 10 per cent. on the consolidated stock, and 7 per cent. on the share capital of the Company. These dividends will absorb £2188 11s. 5d., leaving a balance of £469 5s. 10d., which the Directors propose should be placed to the reserve fund.

HASTINGS GAS COMPANY.—An extraordinary meeting of this Company was held on the 2nd inst.—Mr. J. Rock presiding. Formal resolutions were submitted authorizing the Directors to borrow on bonds or mortgages the sum of £3750, and also to borrow the whole or any part of this sum, or of the £25,000 already secured, by bonds after the whole or any part has been paid off. The Chairman explained that the Directors considered that this course would be advantageous to the Company, the object of the increased borrowing powers being to extend the works. Both resolutions were adopted.

THE SHEFFIELD WATER COMPANY AND THE BATH-RATE.—The Sheffield Water Company are sending out notices to the occupiers of houses with baths, in which they divide the bath-rate from the ordinary water-rate, and express their willingness to accept payment of the latter, leaving the charge for baths to abide the result of the appeal against the decision of the Master of the Rolls in November last. (See JOURNAL, Vol. XXXVI., p. 769.) This is a course that the Water Company at first declined to take, inasmuch as with the ordinary water-rate they demanded the charge for baths. The concession has, it is stated, been the means of inducing many water consumers to pay up long-standing arrears.

THE LINCOLN TOWN COUNCIL AND THE GAS COMPANY.—At a meeting of the Estates Committee of the Lincoln Town Council on the 7th inst., the opinion of counsel, on a case submitted with reference to the reserve and contingent funds being accumulated by the Lincoln Gas Company was considered, and it was resolved that the Company be informed that the Corporation are advised that the Company are not keeping within their powers in creating a contingent fund at the expense of the consumers, and therefore the Company "be and are hereby required to apply the profits in reducing the price of gas in compliance with the provisions of the Gas Acts." On the motion of Alderman Glasier, seconded by Mr. Smith, the Committee's resolution was adopted.

ARTESIAN WELLS IN NEW YORK.—The number of artesian wells in this city steadily and rapidly increases, something like 40 having been sunk during the past year. Their depths range from 200 to 2000 feet, and the flow ranges from 1000 to 2000 barrels per day. These wells are used mainly by brewers and other manufacturers who require a large amount of water, and who find the artesian well water economical both from its cheapness and its coolness, which enables them to dispense with much ice. Usually the wells are vertical. In one instance seven holes were drilled in different directions and at different angles, only one being vertical. The boring was carried to a depth of about 260 feet on the average, the longest at an angle being 457 feet deep. Water was struck in all the borings, and an abundant supply has been obtained continuously.—*Scientific American*.

NORTH SHIELDS WATER COMPANY.—The thirty-fifth annual general meeting of this Company was held on the 31st ult.—Dr. J. B. Bramwell presiding. The Secretary (Mr. H. Clarke) read the annual report of the Directors, which was as follows:—

Since the last annual meeting 122 new consumers have been added to the Company's books, for the supply of which 74 services have been laid in. The gross receipts for the year have been £8351 8s., and the expenses, including interest on loans, £5424 6s. 5d., leaving a balance of £2927 1s. 7d. Your Directors recommend the payment of a dividend of 6 per cent., which amounts to £2400, and adding to this the sum of £132 8s. 9d., his Grace the Duke of Northumberland's one-seventh share of clear annual profits, there will remain (after paying these amounts) a sum of £394 12s. 10d. to add to the balance remaining last year at the credit of profit and loss account. The report was adopted on the motion of the Chairman, seconded by Mr. Middleton. The report of Mr. T. M. Favell, the Company's Engineer, stated that the whole of the reservoirs, engines, and other works have been kept in efficient working order. The supply of water has been maintained in a satisfactory manner, and has been constant during the whole year.

THE OLDBURY LOCAL BOARD AND THEIR GAS-WORKS.—At the last monthly meeting of the Oldbury Local Board, the Chairman (Mr. B. T. Sadler) read a statement with reference to the costs incurred in connection with the gas-works purchase. It showed that the estimated cost of it was £70,000, and that loans amounting to £51,500 had been already contracted for, of which sum £31,500 had been received. A further sum of £20,000 would be received in the months of July and August, and it was contemplated to raise a still further sum of £18,500. The expenditure was as follows:—Cost of opposition to Birmingham Corporation Gas Bill, £1463 2s. 1d.; promotion of the Oldbury Gas Bill, £1523 9s. 6d.; cost of arbitration, £4056 17s.; paid upon the gas-works account, £21,288 0s. 11d.; leaving a balance of £3168 10s. 6d. in hand. The estimated cost of the arbitration yet to be paid was £6000. The amount of the award to be paid to the Birmingham Corporation was £22,650. The Finance Committee were

endeavouring, it was stated, to negotiate a further loan of £20,000 to defray the contemplated additional expenditure. The award made for Oldbury would, it was asserted, compare very favourably with the awards obtained by the other purchasing districts.

SALES OF GAS SHARES.—Last Friday week Mr. R. Hall sold by auction, in Lincoln, two new £50 shares in the Lincoln Gas Company at £75 each. —Last Thursday, Messrs. H. R. Fergus and Co. sold by auction, in Bristol, £20,000 worth of capital stock in the Bristol United Gaslight Company, in lots of £100. There was a large attendance. The Auctioneer, in opening the sale, said the Bristol United Gas Company was one of the safest and best in the kingdom, paying a good dividend, and the present was therefore a most eligible opportunity for investors. The stock to be sold would begin to bear interest from the 1st of July. Lots of £100 were to be offered, but purchasers would be at liberty to take from one lot to five lots, as they felt disposed. Bidding then commenced, and the first lot was started at £165, and increased to £167, at which price the first 40 lots were disposed of. Afterwards 10s. per cent. more was realized for several lots, although occasionally some sold at £166 10s. In less than half an hour £10,000 of stock was sold. Then there was a further drop in the price, which went down to £165 and £165 10s., for which sum the bulk of the remaining lots sold. The whole £20,000 was disposed of in three-quarters of an hour.

THE PURCHASE OF THE NEWCASTLE (STAFFS.) GAS-WORKS BY THE TOWN COUNCIL.—Last Tuesday the ordinary meeting of the Newcastle (Staffs.) Town Council was held, at which the minutes of the Gas Committee were presented and adopted. They stated that a letter had been received from the Public Works Loan Commissioners, to the effect that a loan for gas-works purposes would be required to be repaid in 20 years, with interest at 5 per cent. A letter from the Local Government Board had also been received, in which the Board requested to be furnished with a copy of the resolution of the Corporation applying for sanction to the proposed loan of £75,000, and asking for information as to the amount of the Arbitrator's award, and how the difference (if any) between such amount and the sum of £75,000 was made up. The Committee recommended to the Council to apply to the Local Government Board for their sanction to a loan, on security of the general district rate and the gas-works, of the sum of £75,000, the purchase-money for the gas-works, and the costs and expenses incurred by the Council in relation to the purchase thereof, and also the estimated cost of certain additions required at the works. The Committee resolved to instruct the Town Clerk to negotiate a loan of £75,000 at 4 per cent. for a term not exceeding six months.

CONISBROUGH GAS COMPANY, LIMITED.—The annual general meeting of this Company was held on the 1st inst.—Mr. E. Crawshaw (in the absence of the Rev. J. G. Wood, Chairman of the Company) presiding. The Directors' report, which was presented, recommended the declaration of a dividend of 5 per cent. for the past year. The balance-sheet showed that the income had been £545 3s. 8d., which included gas and meter rents, sale of coke, lime, tar, &c., cottage rents, fittings, ammoniacal liquor, registration fees, gas-lamps, sale of old metal, &c. The expenses included wages, coal, lime, carting, renewals of retorts, repairs to cottages, &c., meters, fittings, rates and taxes, bank interest, tools, printing, advertising, &c., Auditor and Secretary's salaries, pitch, mains, coal, doubtful debts, and balance of debt at bank from capital account, and amounted to £386 7s. 5d., leaving a balance of £158 10s. 3d. The report was adopted. Messrs. Kilner, Farr, and Booth were chosen as Directors for the ensuing year, and Mr. S. H. Wright was re-appointed Auditor. A letter was read from the Rev. J. G. Wood, announcing his intention to resign the chairmanship of the Company, and to him and to Mr. Crawshaw the thanks of the meeting were accorded.

THE ELECTRIC LIGHT IN THE HOUSE OF COMMONS.—At the close of the morning sitting of the House of Commons, on Friday, the experiment of lighting the House with the electric light was tried. Twelve square lamps for the electric lights had been inserted in the glass roof, and soon after seven o'clock, when the House was cleared, the new light was brought into operation. The effect was, *The Times* says, doubtful; there was a difference of opinion among the members and others as to whether, on the whole, the skillfully applied gaslight from the glass roof was not softer and less trying to the eyes than the electric light. It was conceded, however, that in one respect the electric light was an improvement on the gas, inasmuch as the rising temperature always noticed in the House after the lighting of the gas above the glass roof was avoided last night. The electric light was severely tested before the House resumed business at nine o'clock, but it was thoroughly under control, and the House transacted the business of the evening, sitting under the new light. It is intended to make another trial on Friday next. Alterations will be made in the lights in the roof, and additional lamps will be placed under the galleries, where there are now gas-jets. The experiments were carried out in the presence of Mr. Shaw-Lefevre, First Commissioner of Works, and a large number of members and visitors.

THE following correspondence was sent to *The Times* last week for publication:—

"South Metropolitan Gas Company,

"70, Bankside, London, S.E., May 28, 1881.

"The Commissioners of Inland Revenue.

"Gentlemen,—Under sec. 18 of the Companies' Clauses Consolidation Act, 1845, it is our practice to require declarations, pursuant to the provisions of 5 & 6 Wm. IV., cap. 62, for the removal of impediments to the transfer of stock or receipt of dividends, and a question has repeatedly arisen as to whether these instruments require a 2s. 6d. stamp, under section 35 of the Stamp Act, 1870, or whether they fall within the list of instruments exempt from such duty.

"It appears to me that when made before a Justice of the Peace they may be held to fall within the scope of 'exemption 2.'

"I enclose an executed instrument of the character referred to, and shall be obliged by your informing me whether it is chargeable with any duty.

(Signed) "I am, &c.,
"GEORGE ENNIS, Registrar."

"Inland Revenue, Somerset House, London, W.C., June 3, 1881.

"George Ennis, Esq.

"Sir,—The Board of Inland Revenue have had before them your letter of the 28th ult., and, in reply, I am directed to acquaint you that declarations similar to the one forwarded by you, and which is herewith returned, when made before a Justice of the Peace, fall within the scope of exemption 2 in the schedule of the Stamp Act, sub-tit., Affidavit, or Statutory Declaration.

"I am, &c.,
(Signed) "FRED. B. GARNETT."

THE SALE OF GAS-COOKING APPLIANCES BY CORPORATIONS.—At the meeting of the Stratford-upon-Avon Town Council on Tuesday, the 7th inst.—the Mayor (Alderman Cox) in the chair—the Gas Committee reported that they had obtained a selection of gas cooking-stoves and apparatus which were exhibited in an adjoining room, and they applied

for permission to open a central show-room, where the stoves could be seen at work, and power to let the same out on hire, and to supply the public on the three-years' system, the object being to induce the use of gas for cooking purposes. The proposal met with a determined opposition from several members of the Council, who condemned the Gas Committee opening what they termed co-operative stores, to the injury of local tradesmen. The Chairman of the Gas Committee stated what had been done in Birmingham and other towns, and pointed out that the undertaking was no new experiment, but one which had been found to work successfully wherever attempted. The public required educating in the use of gas for domestic purposes, and it was clearly the duty of the Gas Committee to encourage an increased consumption of gas, and to offer facilities to the public to purchase cooking-stoves and other apparatus. The ratepayers would benefit by the increased consumption of gas. Mr. Newton contended that the Corporation would interfere with legitimate trade. If the public wanted gas cooking-stoves they knew where they could obtain them. The province of the Gas Committee was to make gas and supply it to their customers, and there they should stop. If the Council permitted them to sell stoves they would go in for chandeliers, gas-fittings, &c., and tradesmen would never know where this kind of thing would stop. The question was somewhat hotly debated for about two hours, Mr. Newton moving an amendment to the effect that the Gas Committee be not empowered to sell and let out on hire gas-cooking stoves, &c. Nine members voted for the amendment, and twelve in favour of the report being adopted, so that the Gas Committee have full power to carry out what they intended.

WEST BROMWICH IMPROVEMENT COMMISSIONERS GAS SUPPLY.—At the last meeting of the West Bromwich Improvement Commissioners a report on the gas undertaking was presented. The Chairman (Mr. Farley) stated that the sale of gas for the nine months ending March 25 was 118,809,000 cubic feet, and he added that the accounts showed a profit of £4825 upon the manufacture. "Practically," says the *Birmingham Daily Post*, "he took this as being the profit of the year, as the nine months included two winter quarters, so that, according to his calculation, the loss on the June quarter would thus be balanced. We shall be glad to find that the West Bromwich Commissioners are able to make a good profit upon their manufacture of gas, but we can scarcely consider the statement just referred to as being so favourable as the Chairman seemed to think. There is much force in the observation of Mr. Lees, a member of the Board, that the reduction of 3d. per 1000 feet recently made, and the cost of repairs at the works, would materially reduce the profits next year. As to the former of these sources of reduction—the lower charge for gas—it must be borne in mind that it will take effect not upon the three-quarters consumption of 118 millions, but upon the full consumption for the year, which will probably reach 143 millions. This would reduce the profit by about £1800. Then the cost of repairs is a very heavy item. In Birmingham it is estimated at 5d. per 1000 feet; in London, according to Mr. Silverthorne's tables, it averages 8½d. per 1000. Take Birmingham as the standard for West Bromwich, and the repairs—which begin immediately works are put in operation—would amount to not far from £3000, and this would swallow up nearly the whole of the remaining profit. Then, as we understand the accounts presented to the Board, there is no allowance for depreciation, or for contingencies, nor is any provision made for a reserve. The sinking fund for the repayment of capital outlay need not be commenced for five years to come; but this, of course, is a prospective obligation which must not be lost sight of. We do not wish to be misunderstood in making these remarks. We are not saying that West Bromwich cannot make a profit on the gas, but we doubt if a satisfactory profit can be made if the Commissioners think it necessary to keep the price down to the Birmingham level. Anyway, it is not desirable to form a sanguine estimate as to the yield of the undertaking. Until at least a complete year's experience has been obtained, and until allowance is made for repairs, and for increased cost of working, it is impossible to decide how the experiment will turn out, and therefore a word of caution seems advisable."

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 2367.—DENNERT, J. C., and LIND, G. G., Altona, Prussia, "Improvements in water-meters, also applicable to water-motors." May 30, 1881.
- 2374.—WEBSTER, G. E., Nottingham, "Improvements in gas burners, governors, globes, or shades, and heating apparatus by gas, applicable to various purposes." May 30, 1881.
- 2422.—LAKE, W. R., Southampton Buildings, London, "An improved fluid-meter." A communication. June 1, 1881.
- 2442.—CORBETT, J. L., and LOCHHEAD, W., Glasgow, "Improvements in taps or valves or apparatus for regulating and controlling the supply of water and other liquids." June 3, 1881.
- 2448.—ULLNER, C. H. VON, Euston Road, London, "Improvements in apparatus for regulating the flow of water and other liquids so as to prevent waste." June 3, 1881.

- 2498.—LAKE, W. R., Southampton Buildings, London, "Improvements in and relating to motor engines for utilizing the force of heated air or gas." A communication. June 8, 1881.
- 2499.—GRICE, W., Birmingham, "Improvements in retorts for the manufacture of illuminating gas, which improvements are also applicable to retorts used for other purposes." June 8, 1881.
- 2504.—SIEMENS, C. W., Westminster, "Improvements in gas motors and producers." June 9, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 5134.—WILKINS, F., Southampton Buildings, London, "Improvements in apparatus for producing light and heat by the combustion of hydrocarbon oils or other inflammable liquids and gases or vapours." Dec. 8, 1880.
- 5219.—FIDDES, A., Bristol, Gloucester, "Improvements in gas motor engines." Dec. 13, 1880.
- 5257.—CORBETT, J. L., Glasgow, "Improvements in the construction of burners and regulators for governing or controlling the supply or pressure of illuminating gas." Dec. 15, 1880.
- 5471.—HUTCHINSON, R., Mildmay Park, London, "Improvements in gas motor engines." Dec. 29, 1880.
- 370.—HOLT, H. P., Leeds, Yorks, and CROSSLEY, F. W., Manchester, "Improvements in connection with gas motor engines and locomotives worked thereby." Jan. 27, 1881.
- 1356.—KIRKHAM, T. N., HERSEY, T., Westminster, HULETT, D., High Holborn, and CHANDLER, S., sen., J. and S., jun., Newington Causeway, London, "Improvements in apparatus for condensing, washing, and purifying gas and other vapours." March 26, 1881.
- 1389.—BOULTON, M. P. W., Tew Park, Oxford, "Improvements in caloric engines wherein the working fluid is heated by internal combustion of gas or other fuel." March 29, 1881.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

- 1542.—LAKE, W. R., "Improved apparatus for regulating and controlling the pressure and quantity of gas supplied to gas-burners, and for other like purposes." April 17, 1878.
- 1604.—LONGSDON, A., "Improvements in apparatus, tools, and machinery for charging and drawing gas retorts." April 20, 1878.
- 1798.—HALLEWELL, R., "Improvements in gas-engines, applicable in part to other uses." May 4, 1878.
- 1844.—ASHWORTH, G. K., "Improvements in valves or taps used for steam, water, gas, or other liquid or fluid, such valve or tap being specially applicable for tallow cups for lubricating purposes." May 8, 1878.
- 1997.—THE HANNOVERSCHE MASCHINENBAU ACTIENGESSELLSCHAFT VORMALS GEORG EGESTORFF, "Improvements in gas-engines with two pistons." May 17, 1878.
- 2028.—BENNETT, P. D., "Improvements in apparatus employed in the purification of coal gas." May 21, 1878.
- 2037.—CLAYTON, S., "Improvements in gas motor engines, and in apparatus connected therewith." May 22, 1878.
- 2090.—LAKE, W. R., "An improved gas and water meter." May 24, 1878.
- 2095.—CLARK, A. M., "An improved apparatus and process for manufacturing illuminating gas." May 24, 1878.
- 2106.—MARTIN, R., "Improvements in the manufacture of gas, and apparatus suitable thereto." May 27, 1878.
- 2180.—SWEET, A., "Improvements in cooking and heating by gas." May 31, 1878.
- 2231.—HEATON, C. W., "Improvements in purifying gas, and in apparatus employed therein." June 4, 1878.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

- 1072.—JENSEN, P., "Improvements in modes of and means for producing and utilizing gas and heat, and apparatus therefor." March 27, 1874.
- 1287.—HULETT, D., and CHANDLER, S., "Improvements in apparatus used in the manufacture of gas." April 14, 1874.
- 1338.—WAUCHOPE, A., and COWAN, J., "Improvements in the manufacture of gas." April 17, 1874.
- 1732.—UNDERHAY, F. G., "Improvements in apparatus for drawing off water to prevent or reduce waste." May 15, 1874.
- 1824.—BELL, J., "Improvements in distilling coal shale for the production of oil and gas, and in the apparatus employed therein." May 23, 1874.
- 1944.—HOWES, W. H., "Improvements in means or apparatus employed in the manufacture of gas for lighting and heating purposes, part of which improvements is also applicable to gas-meters." June 4, 1874.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending June 8, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sulphuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.8	16.9	17.3	10.9	7.3	9.0	0.4	0.2	0.3	None.	In excess.
	Camden Town	17.4	17.0	17.2	13.8	10.0	11.6	0.2	0.0	0.1	"	"
	Dalston	17.4	16.5	17.0	11.4	13.0	12.4	0.0	0.0	0.0	"	"
	Bow	17.7	16.4	17.1	11.3	9.3	10.5	1.3	0.7	1.1	"	"
	Chelsea	17.2	16.8	17.0	13.5	11.0	12.4	0.4	0.0	0.2	"	"
	Kingsland Road	19.0	17.2	17.9	15.2	13.6	14.5	0.3	0.1	0.2	"	"
South Metropolitan Gas Company . . .	Westminster (cannel gas). . .	21.9	20.8	21.3	9.6	7.4	7.9	0.0	0.0	0.0	"	"
Commercial Gas Company	Peckham	17.4	16.5	16.9	11.2	9.0	10.4	0.4	0.0	0.2	"	"
	Old Ford	17.2	16.7	17.0	10.9	8.1	9.8	0.8	0.2	0.5	"	"
	St. George-in-the-East . . .	17.8	16.3	17.1	6.2	3.5	5.0	0.5	0.2	0.4	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolitan is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Sulphuretted hydrogen to be entirely absent. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

SUPPLEMENT

TO THE

JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XXXVII.

LONDON, JUNE 14, 1881.

No. 944.

BRITISH ASSOCIATION OF GAS MANAGERS. EIGHTEENTH ANNUAL MEETING.

INAUGURAL ADDRESS OF THE PRESIDENT, CHARLES HUNT, Esq., M.INST.C.E., OF BIRMINGHAM,

DELIVERED TUESDAY, JUNE 14, 1881.

It is my pleasing duty to return you my sincere thanks for having placed me in the honourable position of President of an Association of such great and growing importance, which year after year continues to establish new claims upon our attachment, and is destined, as I hope and believe, to furnish yet more convincing proofs of capacity for development and useful work.

If the pioneers of our industry could be with us to-day, I venture to think that with the gratification they would experience at witnessing this assembly, representative as it is of a growth such as the most sanguine of them could never have anticipated, would be mingled a feeling of justifiable pride at the position now assigned, by the almost unanimous voice of entire communities, to the system of artificial illumination which they so potently called into existence. For it was their lot to conduct a difficult and doubtful enterprise to questionable success; to lavish their resources of time, ingenuity, and money, for a very inadequate return. Theirs, it is true, was the satisfaction that belongs to those who are permitted to follow the bent of their genius; to sow the seeds of new industries; and to watch for the first signs of life in the quickened germ; but for a later period was reserved the spectacle of the abundant harvest. We of that period are privileged to dispense the advantages resulting from those early efforts; and, let us hope, to lay the foundations of further and more important benefits.

As a natural consequence of the position which coal gas has acquired as a necessity of modern life, it has followed that the arrangements for its supply have become matters of growing public concern. They have come to rank almost with those for the supply of the commonest necessities, and are canvassed with an eagerness second only to that which is provoked by the incidence of taxation. Such being the case, it is not to be wondered at that a conflict should have arisen between the representatives of private enterprise on the one hand, and of local self-government on the other, the ultimate termination of which has hitherto been found only in the assumption by the latter of the duties and responsibilities initiated by the former. This very general result, it is almost needless to say, has been greatly accelerated, if not entirely brought about, by that extended application, contemporaneously with the advance in the fortunes of Gas Companies, of the principle of popular representation as applied to municipal government, which dates from the passing of the Municipal Corporations Reform Act of 1835. That Act, which has not inaptly been called the Great Charter of the Municipalities, could not fail of being the precursor of notable changes, although it was not to be expected that these would be immediately apparent. The free institutions thus created were not all at once to be endowed with vigorous manhood. They were destined to encounter all the perils of immaturity and inexperience, and won their way slowly, though surely, to public confidence. But time has amply vindicated the wisdom of their authors. If local self-government has not yet ceased occasionally to provoke a taunt from those whose sense of ridicule is stronger than their sense of patriotism, at least it must be admitted to have contributed

most materially to the comfort and happiness of the population of our great towns.

It does not, however, fall within the scope of the observations that I am privileged to address to you, to dwell upon either the merits or the demerits of municipal institutions, although I may be permitted to pay a passing tribute to the eminent services rendered to their cause by a former Chairman of a Gas Committee. I allude, as may be supposed, to the Right Hon. Joseph Chamberlain, M.P. The mention of this gentleman's name will appear to be none the less appropriate from the fact that he may be said almost to have commenced his public career as a gas administrator. It is not too much to say that by his example and precept the work of local administration has acquired new significance and strength, and a breadth and dignity hitherto to a great extent lacking. If hereafter it should be determined still further to extend the power and authority of Municipal Councils, and so relieve the already overburdened national legislature, such a result will have been in no small degree owing to the spirit infused into their deliberations by the right honourable gentleman and his coadjutors.

It is upon the final aspect of the struggle to which I have referred—or that in which the gas undertakings, after what may be described as a vicarious existence, have passed into the hands of the Local Authorities—that I desire, in the first place, to say a few words; being emboldened to take this course from the circumstance that, as regards the office which I have the honour to occupy, this happens to be the first time that your choice has fallen upon the representative of a Corporation. The subject is one that it cannot be desirable should be approached in any spirit of partisanship, for this would be foreign to the work of the Association. Neither do I feel myself fitted for such a task; my present experience and associations being somewhat at variance with those of earlier and perhaps more impressionable years. But in the consideration of certain principles involved in this change of ownership, and, above all, of the prospects of gas lighting in the hands of its new masters, all of us—representatives of Companies and Corporations alike—are interested, and are able to meet upon common and neutral ground.

It may, then, be accepted as no slight testimony to the strength and character of popular representation, that it should be entrusted with the conduct of important industrial and commercial enterprises; and especially will this be felt when it is recollected that there exists in this country no precedent for the assumption, by the governing bodies, of the functions and position of private traders. Nor could such assumption be justified, except upon the high ground of public convenience and advantage. Not that the Gas Companies had in any way failed in the performance of the duties they had undertaken. On the contrary, they had served the public faithfully and well. They had performed all, and occasionally more than all of their statutory obligations. The convictions, under their penal clauses, throughout the entire kingdom had scarcely amounted to as many during the number of years that they had been in force, as are obtained in a single year against the law-loving and law-

abiding citizens of Birmingham under the Acts for the Prevention of Smoke. It could have been through no fault of theirs, but rather the reverse, that the article they supplied had grown from exceptional into almost universal use. It could have been through no fault of theirs, but rather the reverse, that they ultimately became prosperous. Neither could it have been justly charged against them that there had sprung up an impatience of privileged monopolies, increasing in intensity with the growing strength of the governing bodies. Nevertheless, it is in consequence of this combination of results that we find ourselves in contemplation of a movement which, in a comparatively short space of time, has, in most of our great centres of population, displaced the Companies in favour of the Local Authorities. And thus far there has been no reason to regret the change. On the part of the Corporations there has been uniformly manifested a disposition to pay a fair, and even a full price for the property they were desirous of purchasing, and this has been met by the Companies with a patriotic willingness to accept such terms; the result being that to the public have been secured the benefits of co-operation in its widest and most significant sense, and for gas lighting what may fairly enough be regarded as almost the highest pinnacle of importance.

I have said that the justification for these transfers is furnished by their promotion of the public convenience and advantage. For example, the desirability of securing to one central authority the undivided control of the thoroughfares, would seem to be self-evident; yet some are inclined to pay little heed to the objections urged by Local Authorities to the breaking up of the streets by an independent, and in some respects a rival power. The inconveniences arising therefrom they regard as imaginary; the grievance as sentimental, inasmuch as Parliament has provided in its enactments for the restoration, at the cost of the Companies, of all damage occasioned by them. But having been myself the instrument, during the last few years, and under both régimes, of about as much of this particular kind of "street disturbance" as falls to the lot of most gas engineers, I am enabled, perhaps in a peculiar degree, to bear testimony, not alone to the somewhat trying conditions under which the work of a road-mender has to be carried on, but also to the advantage, from an economical point of view, of that unity of action which is, or ought to be secured, when those whose operations are of so divergent a character no longer rank as representatives of opposing interests, but are engaged side by side in one common service. At the same time I feel bound to admit that in my own case one bone of contention still remains. I have never been able to persuade my esteemed friend, the Borough Surveyor of this town, to relinquish, in the interests of the gas undertaking, the use of that pernicious instrument, the steam roller!

It is commonly objected that the ruling motive of the Corporations in making these acquisitions, has been one of profit. They would not, it is alleged, have sought to displace the Companies had gas manufacture continued unremunerative. It was only as this became otherwise that they awoke to a sense of their responsibilities. There is much of truth in this, but of truth that cannot be, in any strict sense, a reproach. Even assuming the opposite of what we know to have been the case—namely, that the governing bodies were, from the first, fitted to undertake the management of the gas supply—their hesitation, in all but a few instances, was not without justification. We all know that coal gas was, for a lengthened period, upon its trial. It was held in doubtful esteem. It was looked upon with coldness, amounting almost to aversion, by men of high scientific attainments; and was even in some degree of danger from the favour with which they regarded a more brilliant and attractive rival. That danger has not ceased to recur, and was probably never more real than now; but then its influence to-day is more than counterbalanced by an assurance as to the future of gas lighting, solidly based upon a more just appreciation of its resources—as yet imperfectly developed—and of the strength and vigour to which it has so rapidly attained. But in the absence of such assurance, the materials for which are of a comparatively recent growth, it would have been both imprudent and impolitic to have adventured the public money in the purchase of these undertakings. It would have savoured too much of speculation—a course which, in regard to public funds, all are agreed in condemning. The employment of such funds, however, for purposes of general utility—as, for example, the establishment of the postal system or the purchase of the telegraphs—has, with equal unanimity, been recognized as not only perfectly legitimate, but even necessary to the general welfare. Nor can it be denied that the

same public opinion which placed these two great branches of the national service under the conduct of the State, eventually—although exercised, according to the circumstances, in a more limited sense—decided upon the principle to be applied to gas supply. That principle may be accepted as a maxim of good government; for it declares that profit derived from indispensable monopolies should revert, not to individuals, but to the community by which it is contributed.

Having succeeded to the possession of these flourishing undertakings, Corporations at once become the objects of a most touching solicitude. The greatest anxiety is manifested as to their department under the trying, albeit not unpleasant embarrassment of a balance on the right side. "What will they do with it?" is the inquiry from all quarters. What they ought to do with it is, according to the opinion of an influential section of their critics, clear enough. Of course, it is somewhat dogmatically asserted, they ought to apply it to a reduction of the price of gas; and so much satisfaction seems to be derived from this doctrine, that any appearance of disregarding it is visited with severe reprobation. Now, I do not happen to be one of those who conceive it to be within the province of the officials to tender advice as to the disposal of gas profits. That is a matter which may very safely be left to the discretion of the representative bodies, who are answerable to their constituents for their financial policy. Our chief, not to say sole duty lies in the pursuit of means for the attainment of the most economical ends. Our satisfaction is derived from the achievement of results. It is our privilege to create—at all events in a very great measure—the situation from which it is the task of others to work out a more or less satisfactory deliverance. But every individual may have something to say upon such a topic; and most of all we who have thrown in our lot, so to speak, with the fortunes of gas enterprise; while it is not unnatural that our opinions should be biassed in favour of the policy which promises most for the extended use of gas. So remotely, however, does it concern us whether the object of the Corporation be to sell gas at cost price or to relieve the rates, that, in our official capacity, the course that appears to me to be most properly ours is one of non-intervention.

Especially will this be felt when it is recollected how varied are the conditions that must affect the decisions of the Local Authorities, rendering almost nugatory any definition of a general principle, and also how absolute is the control of the consumers themselves. The consumers, in fact, are the masters of the situation. They constitute a large and influential majority of the ratepayers. They have it in their power to impose their will upon the management of the gas supply. They may, if they choose, legislate solely in the direction of their own immediate interests. They may, and frequently do, determine to supply themselves at the lowest possible price, regardless of the interests of that larger constituency in which are numbered every householder and every owner of property within the limits of the township to which they belong. I cannot but think that it is creditable in them, when other counsels prevail, when they acknowledge their indebtedness to the wider constituency of which they form the greater part; when they recognize the claims of the property which has been pledged for their benefit. For it can hardly be denied that if there be any advantage in Corporation management, it is by virtue of the machinery of self-government, of which the ratepayers are the components, thus brought into more active exercise.

The economies by this means made possible are, some of them, more indirect than apparent, although on that account none the less real; while others are tangible enough. There is, for example, the comparatively trifling one effected by the substitution of unpaid Committees for paid Boards of Directors; but a far more important one is that which arises out of the easier terms upon which the necessary capital can be raised by means of the security of the rates. The difference between the cost to the Companies of their capital, and the interest at which Corporations are enabled to place their loans—or, in other words, the difference in value, according to public estimation, of the two kinds of securities—is in every instance considerable, although varying with circumstances. Take, for example, the case of the Metropolis. According to the latest published accounts, the entire share and loan capital of the four remaining Companies supplying gas within its limits, as represented by its market value, amounts in round figures to 20½ millions sterling, which will be found to yield to investors an average return of 5½ per cent. On the other hand, Metropolitan Board of Works' stock yields only a trifle over 3½ per cent., and this may be safely taken as the rate at which any new loans could be negotiated. The difference between this and the average interest upon the gas

stock is 2½ per cent.; which, upon the capital of the Companies, represents a sum of no less than £493,896 per annum, or 6½d. per thousand cubic feet upon the gas sold. Doubtless this is a somewhat extreme case, the difference in the provinces being usually less marked; while, as a matter of course, it is impossible that any similar saving could be effected as the immediate result of a change of ownership. But it indicates a way by which Corporations might, if they chose, and if the law permitted them, participate in the profits of these undertakings, and even secure a certain amount of control over them without incurring the responsibilities of sole ownership—namely, by the investment, within certain limits, in gas stocks, of funds raised upon the security of the rates, after the manner of similar investments in docks or other public works of a remunerative character. Whether such a course, as recently proposed, in fact, by the Metropolitan Board of Works, upon the application of a Water Company for additional capital, would tend to the satisfactory settlement of what is still, to some extent, a vexed question, it is probably not yet entirely beyond the reach of events to determine. The main purpose, however, of this reference to the Metropolis is to exhibit the nature and possible extent of an economy rendered practicable only by the action of the ratepayers; and towards which the consumers, as such, are in no sense contributors. In common fairness, then, it seems only right that some return should be made to the former; and yet, when the consumers, of their own free will, as is abundantly manifest, from their numbers and influence, elect to be equitably taxed in recognition of their obligations to the responsible owners of the undertakings, the cry is raised, ostensibly in their interest, although clearly not with their concurrence, that they are being treated unfairly and oppressively, in a manner contrary to the principles that should guide the councils of the Municipalities.

I know it is argued that Corporations have no right to make profits, and, if I am not mistaken, the opinion of more than one high legal authority has been expressed to this effect. I hope, however, that it will not be considered presumptuous in me if I ask—By what law is this expressly forbidden? Is it held to be contrary to the letter, or to the spirit only of our statute-books? If to the letter, then it is plain that the remedy is a weapon that can at any time be wielded with effect against the Corporations; but if to the spirit, then I venture to suggest that this is susceptible of more than one interpretation. It is not at all difficult to agree with limitations that have for their object the prevention of competition between public corporations and private traders, although the latter are generally secure enough in the hands of the constituencies. Nor is it easy to conceive of parliamentary sanction being extended to Corporation enterprise undertaken for the sole and ostensible purpose of profit; but clearly a distinction must be drawn between profit that might be so derived, and that which may accrue from the performance of a necessary public service. For instance, any endeavour to extend the operations of the Government Savings Bank or Life Insurance systems is sure to meet with opposition not wholly confined to the interests most immediately affected; and one can understand, if not appreciate the jealousy with which such innovations are regarded. They interfere somewhat with the course of private enterprise, which, in matters of this kind, it is not absolutely essential, however desirable it may be to the public welfare, should be displaced by, or be put into competition with the State. But I do not suppose that there is to be found one British taxpayer who grudges the Government the surplus revenues of the Post Office. I will go further, and say that there is not one in ten who does not wish that the annual profit from this source could be increased tenfold, consistently with the maintenance of equal public facilities. The reason for this is not far to seek. The monopoly enjoyed by the Post Office interferes with no one. It accomplishes that which not any amount of competition could improve upon. In no other transaction in life is the taxpayer secure of such a cheap pennyworth, or, I should say, halfpennyworth. And in no other way could the expenses of the State be more easily and imperceptibly met. The Chancellor of the Exchequer, who may hereafter devise so facile—I had almost said charming—a method of augmenting the national revenues, will well deserve the gratitude of his countrymen.

But, it will be asked, "What has this to do with the question of gas profits?" My reply is that in the disproportion that exists between the value of the service rendered, and the almost nominal charge for such service, the case of the Post Office is not entirely without a parallel, since, in nearly every instance, gas lighting is worth, intrinsically, much more than is charged for it. The ordinary consumer knows very well

that he cannot replace it with its equal for convenience and economy. It would require, indeed, a very considerable advance upon present prices to put in jeopardy, or even to render uncomfortable, the existence of any gas undertaking of moderate importance. But a kind of fictitious value—if I may employ the adjective to express a meaning the reverse of that which is its generally accepted one—has been imposed upon gas by means of the restrictions to which from time to time its purveyors have had to submit. It is true that these restrictions are to be regarded in some degree as in substitution of competition; but it is also true that they have operated more favourably to the consumer than the keenest competition that ever existed amongst gas undertakings. In the hands of Corporations these limitations as to profits disappear or become inoperative; because in lieu thereof there arises a most effectual barrier against abuse in this direction—I refer to the public voice. And when that voice declares itself in favour of the policy of ensuring a moderate profit upon the gas supply—such profit to be devoted to the extinguishing of Corporation indebtedness, or to the relief of the rates, or to any other purpose affecting the general interests of the entire community—I, for one, not only fail to discover any impropriety in its utterances, but am fain to regard these as evidences of sound judgment and political capacity.

It is not to be inferred from these observations that I desire to be understood as seeking to defend the making of profit as a primary, or even as an inseparable object. On the contrary, it appears to me impossible to doubt but that there is between the positions of a Company and a Corporation an essential difference; the avowed purpose of the one being that of gain, while that of the other should be the common good. In this view it follows that, wherever the administration of a Corporation is conceived in an absolutely commercial spirit, there the full significance of the movement which placed the gas supply in their hands has not been grasped. In the pursuit of a successful balance-sheet, quite as much as under the influence of what is styled "officialism," there is the temptation to be resisted of imposing restrictions such as are unknown in ordinary commercial transactions, the tendency of which is to narrow the circle of consumers, and to withhold from the masses of the constituencies those blessings of cheap light and heat which it is in the power, and ought to be the valued privilege of their representatives to dispense with a prudent and liberal hand.

Other considerations affect us yet more nearly. It must be admitted that, as regards the extension of the uses of gas and the progress of its manufacture, an additional stimulus has been imparted by the aspirations of the Local Authorities, because these, whatever form they may assume, inevitably furnish the strongest possible motives, not only for increased consumption, but also for intelligent and economical management. Not that Corporations are at all singular in these respects, thanks to the tendency of modern legislation, although no instance has yet been supplied of progress made by a Company working under the provisions of the sliding scale, at all comparable with that which, during a corresponding period, has been achieved by some few Corporations. Neither has the pursuit of economy by Corporations been uniformly attended with the happiest results, for reasons that are sufficiently intelligible; but it is none the less true that these acquisitions, by establishing a practical identity of interests between producer and consumer, have marked the commencement of a new era in the economical advancement of gas lighting. At the same time, and bearing in mind the instances in which Corporation management has been upon its trial for a tolerably lengthy period, it is not to be denied, be the cause what it may, that if the course of gas manufacture has, during the past few years, been marked by any real improvement, little, if any, of this is attributable to the action of Corporations. It has, indeed, been urged against them that their profit-making proclivities have led them to ignore improvements which, when in opposition to the Companies, they had regarded as essential to the interests of the consumers; although, if I might offer to this accusation the reply that is dictated by my own experience, I should give it an emphatic and unqualified denial. I cannot, in fact, conceive of a more vigorous surveillance than that which is exercised, on behalf of the consumers, by a vigilant Corporation in the ordinary discharge of their functions; nor of a more sensitive regard for the wants, and I might almost go so far as to add the fancies of their customers. Those who are inclined to condemn Corporations because, occasionally, complaints are made against their administration, or in opposition to the policy of the majority, would do well to remember that the atmosphere of free discussion, whether through the

medium of the public Press or in the Council Chamber, is as essential to the life and vigour of municipal as to that of national government. It no more follows, because Corporations do not succeed in pleasing everybody, or in eliminating every source of complaint, that therefore they must be pursuing a mercenary and arbitrary policy, than it is to be inferred, from the existence of an active opposition in Parliament, that the Government of the day are not acting with a zealous regard for the well-being, and in harmony with the wishes of the majority of the nation.

As instancing the slender grounds upon which such criticisms are sometimes based, may be mentioned the controversy with regard to purification from sulphur compounds. How often has it not been pleaded, as a reason against the observance of a high standard of purity by Companies, that Corporations are in the habit of neglecting such observance. Yet what are the facts? Is it not a fact that agitation upon this question has been almost exclusively confined to the Metropolis? Is it not a fact that no instance can be cited of a Corporation or Local Authority having deliberately abandoned the standard of purity which they had been the means of enforcing against their predecessors? And is it not also a fact that in at least one conspicuous instance recently the Corporation have themselves taken the initiative, and become earnest in their endeavours to improve upon the method of purification which they may be said to have inherited from the former proprietors of the works?

If we should seek for other reasons to account for paucity of initiation on the part of Corporations, one such reason may probably be deduced from the estimation which the public have learned by degrees to attach to the art of gas manufacture. As their appreciation of the article itself has increased, so their respect for the methods of its production may be said to have declined. "Gas-making," it was observed to me not long since, "is a very simple process." "It appears so," was my reply, "until one begins to know something about it." Does not this little episode faithfully reflect the current of intelligent public opinion on the one hand, and on the other the common experience of gas makers? To men of real scientific culture our manufacture has appeared so absurdly simple that it is impossible to say how much it may have suffered from their neglect; while to others it has also appeared so simple that in our time there have never been wanting volunteers to remind us of our shortcomings, and who know so much better than ourselves how to conduct the business of a gas undertaking with economy and success. It is not needful to recall to your recollection the recent discussion upon a subject that is, without doubt, of increasing importance to all dwellers in large towns—namely, the avoidance of smoke as a means of preventing fogs—as illustrating the extent of unconscious misconception that unfortunately prevails, in otherwise well-informed circles, with regard to the economics of gas manufacture.

With this misconception we are all of us sufficiently familiar. Encouraged as it has been by the almost uninterrupted prosperity of the Companies during a long series of years, it has assumed a variety of phases, and has been attended with consequences most diverse. Gas proprietors have been led to seek for their dividends as the result mainly, if not entirely, of a series of ordinary commercial transactions. They have been content, for the most part, to know that their materials have been purchased in the cheapest, and their products sold in the dearest markets. This feeling is likely to be intensified in the case of Corporations, because they would be predisposed to regard gas manufacture as pertaining to the nature of an exact science. Their justification as possessors of these works would be incomplete if the extraction of gas from coal could be looked upon as a speculative industry; or, indeed, as being attended with anything short of an almost absolute immunity from risk. Consequently, it is not at all surprising that Corporations should bring to the discharge of their duties as gas purveyors a desire for improvement, it is true, but for such improvements only as may have received the sanction of experience and tradition. Nor is it any less surprising that, under the influence of a susceptibility to criticism which is at once the strength and the weakness of popular institutions, this disposition to narrow the purview of their administration should survive long after a more intimate acquaintance with the details of the manufacture not only will have made it apparent how much is dependent upon practised and intelligent supervision, but must also have suggested how much is to be anticipated from observation and research, stimulated and sustained by a higher knowledge of scientific truths. If this much can be said in extenuation of what, speaking, as a matter of course,

in a general sense, and certainly not from my own individual experience, may be described as the prevailing tendency of Corporation influence, is it unreasonable to expect that a more just appreciation of the art and of its resources will follow upon the advancement of public spirit, and an increased sense of responsibility with regard to municipal affairs?

If proof were desired of the uncertainties by which even the most experienced gas makers find themselves to be surrounded, or if we should wish to know in what directions it is likely that profit and advantage will accrue from the encouragement, not alone of a spirit of inquiry, but also of a higher standard of professional qualifications, we have only to turn to the chronicles of passing events. While, for example, it is a matter of common knowledge that temperature controls the principal operations comprised in gas manufacture, and governs their economy with an almost absolute force, how lamentably small, in comparison with its acknowledged influence, is our stock of reliable data as to its effect under varying conditions. Probably this was never made more apparent than during the discussion that followed the publication last autumn, in the columns of the *JOURNAL OF GAS LIGHTING*, of the article by Mr. George Livesey, on the "Economy of Carbonization." Started by the enunciation of a proposition not very far removed from elementary, in its conclusion it was felt that nothing had been concluded. It embraced perhaps a much wider range than had been contemplated by its originator, and yet the most conspicuous feature of it was the scarcity of facts, in support of the ideas, which it elicited. Nevertheless, it served a very useful purpose, by bringing into convenient juxtaposition opinions representative of the most opposite of proclivities. Speaking broadly, on the one side was sought to be disparaged the exercise of scientific skill in carbonizing; while, on the other, its importance was as stoutly maintained. It does not seem possible to extend towards the former view any great amount of sympathy; but it is not to be denied that, in existing circumstances, there is much that is favourable to the arguments by which it was supported. It is not the premisses so much as the conclusion arrived at by its advocates, that seems to be at fault.

In these fortunate times, when not unfrequently the entire cost of the coal is covered, or nearly so, by the value of the residuals, it would appear upon first thought to be a very small matter indeed, in comparison with the ready saving that may be effected by a judicious selection of materials, whether the return per ton be 500 feet more or less; and when the higher result is only to be obtained by the employment of a more expensive material, whether of coal or cannel, or a mixture of the two, it ought not to be very difficult to decide upon its comparative economy. Assuming, as we may do for all practical purposes, that the value of the residuals remains the same, the issue in such a case is narrowed to one of difference between the increase in cost of material on the one hand, and the saving effected in labour, wear and tear, and interest on capital outlay for retort plant on the other—both calculated at per thousand cubic feet produced. Certainly, when purchasing coals, it will not do to rely upon a high yield of gas, to the exclusion of other considerations, because the almost invariable concomitant of this is a disproportionately increased price; and hence it will be found, more often than not, that the most economical all-round results have been secured by the use of the cheapest suitable material, although in doing so the gas manager may have to run the gauntlet of criticism of no very enviable kind. As a matter of course, there are reasonable limits to this, as there must be to every method of selection, which each one may be left to define for himself, according to circumstances—such, for instance, as the value of coke in his particular locality, or the distance from it to the coal-fields—but upon the broad question of principle, I apprehend that there is little room for difference of opinion. To base our selection of coals solely upon their ascertained commercial value for gas-making purposes, and not with an eye to carrying on a kind of competition with our neighbours for the greatest make per ton, is neither more nor less than to assert our claim to the exercise of an untrammelled judgment upon matters of vital importance to the prosperity of a gas undertaking; and, as such, is secure, I venture to think, of a ready and complete acceptance.

With this general agreement, however, our difficulty with regard to the views under consideration may be said to commence; the correspondence having made it clear that the tendency to undue reliance upon commercial instinct is not altogether confined to the comparatively uninitiated. But what does it amount to? That benefit has followed, and is

likely still to follow, the assertion of what is, after all, little more than an implied principle of good management, no one will care to dispute; but that this justifies a diminished respect for skill applied in the retort-house, few, I trust, will be disposed to admit. On the contrary, it could scarcely be a difficult matter to show, by illustrations derived from current experience, that the familiar and oft-quoted axiom, that "dividends are made in the retort-house," is, in the warning and encouragement it conveys, as true to-day as it undoubtedly was true when first uttered. At all events, the opposite opinion may be accepted as an unconscious and, on that account, most valuable tribute to the average excellence of modern carbonizing arrangements; for this alone could induce so happy a feeling of confidence in results under all conditions. But by what means has this excellence been attained? Do we not know that it is not the achievement of a day or of a year, but that it has been built up by continuous and persistent effort, by patient attention to details and observance of effects? It is, of course, quite possible that our labour may have been expended for naught; or rather, that it has been pursued in this direction at a sacrifice of other advantages; but if a comparison of results should make it clear that the reverse has been the case, ought we not to derive from it encouragement to fresh enterprise, and confidence in following the lead of those who may claim to have established a further and perhaps more notable advance?

Most of us will have the materials for such a comparison ready at hand. Individual experience must be the best guide to future action. And will not this experience, more often than otherwise, furnish a record of steady progress in the attainment of what were at one time held to be next to impossible results? How frequently has it not happened that each succeeding year has been marked by an improvement in the make per mouthpiece, or in the yield per ton, with a proportionate diminution in the charges for labour, and with little apparent addition to the fuel account, or falling off in the receipts for residuals. It is, however, only reasonable to suspect that to such economy there must be a limit. Our perplexity is to find out this limit, which does not appear to be reached by the exhaustion of our resources for the prevention of waste. You cannot, it has been said, with an assumption of practical wisdom, get more out of a ton of coal than there is in it. We should be in a position to appreciate the observation better if we knew exactly what a ton of coal is capable of yielding, or it might even be regarded as the perfection of truisms if only we had arrived at a knowledge of the precise methods by which the most economical results are to be secured. But these are still the objects of our search. We continue to be in doubt as to whether the tendency of a higher heat is to increase the volume of gas at the expense of its quality, or whether it is to be considered simply as a means for quickening production; and also as to its influence upon the formation and composition of tar and of impurities.

These are all questions which are involved in so considerable an amount of obscurity, that only a few facts concerning them are at all plainly discernible. One of these, however, is of primary importance. That rapid production may be compassed in a remarkable degree by the application of a high heat, is in perfect accord with common experience; but that deterioration in quality does not follow as a necessary consequence, has not been by any means so generally accepted or understood. The opinion of Dr. Schilling, therefore, upon this point is deserving of our most careful consideration, because it is that of one who has devoted much time and attention to the study of this subject; and also because it is endorsed in a very practical manner by nearly every other leading gas engineer in Germany. Go almost where one will in that country, evidences are to be met with of a deeply rooted faith in the efficacy of high heats, and this can only be accounted for by the circumstance that no such deterioration is found to ensue. Dr. Schilling, indeed, is careful not to claim for the system with which he has so successfully identified himself, any greater merit, as regards the point under consideration, than that of improving the production per retort; but others, both in this country and elsewhere, are not slow in ascribing to it still higher virtues. According to these, it affects favourably not only the productive capacity of the retort-house, but also the yield, or the quality, or both, of the gas produced. Further evidence as to this, which, to be conclusive, should embrace the commercial value of the resultant tar, is much to be desired; but, in the meantime, the negative testimony, if such it may be called, of the German gas makers, supported as it really is by the results thus far of our own practice, cannot but be accepted as

satisfactory by those who are desirous of emulating their achievements.

In one particular—namely, in the saving of retort space—the advantage of high heats, as developed by the "generator" system of firing, is so obvious as scarcely to call for special remark. I am, however, tempted to bring under your notice one out of several illustrations of it which I met with during the autumn of last year, because it happens to bring into contrast two systems of retort management, the least advanced of which cannot be said to have received general recognition amongst us. At Dresden the new works in course of construction were originally designed with settings of six retorts, the furnaces being adapted for what has been called "hard firing," and the yield relied on 6000 cubic feet per mouthpiece. But in the interval which not unfrequently occurs between the conception of an undertaking and its commencement, the Engineer to the Municipality (Herr Hasse) had been able so completely to satisfy himself of the practicability and comparative economy of the generator system, that settings of nine retorts each, heated by generator furnaces, one to every two settings, in place of six, and occupying only the same ground space as the latter, were eventually determined upon. The yield from these is estimated at 8000 cubic feet per mouthpiece, or, per setting, exactly double that which was formerly obtained, and upon which the previous estimate had been based; the net result being that the retort-houses, as now constructed, while of the same productive capacity, are only about one-half the size that was at first thought necessary. It is evident what a relief the establishment of this system might prove to be in some of our overcrowded works, where it might tend to prolong the life of plant, the productive capacity of which has already reached the ordinarily accepted limits.

The influence of temperature upon the formation of impurities, amongst which ammonia may be reckoned, is a study that has hitherto been all but neglected; and yet how much might it not be found to contribute to a settlement of the comparative economy of high and moderate yields. It is not without value to know, for instance, that carbonic acid is evolved most rapidly at the commencement of a charge, when the heat within the retort is at its lowest; while carbonic oxide is formed in increasing abundance as the charge becomes worked off, and the heat is proportionately greater. But it might prove of much more importance, by putting it into our power to lighten the labour and cost of the subsequent process of purification, if we did but know, with anything like distinctness, the conditions most favourable to the formation of sulphur compounds. Above all, the production of ammonia is in the highest degree worthy of investigation; not alone on account of its rising value as an article of commerce, but also because of the hopes that are very properly based upon its known adaptability as a most facile purifying agent. It is not by any means certain that the combination within the retort of the two elements of which ammonia is composed is beyond our control; recent experiments tending to show that this is accelerated by high heat, or, at all events, that by far the largest proportion of ammonia is produced towards the end of the process of distillation. This, if confirmed, would furnish an additional argument in support of what may be called the "advanced" method of carbonizing; and, in conjunction with other considerations of no less weight, affords reasonable grounds for inferring, that the position taken up by the defenders of that which is now styled a moderate, but which not so long ago was looked upon as a high heat, is, to say the least of it, by no means impregnable.

In quite another direction this uncertainty about temperature still pursues us; but this time it is not the attainment of effect by its means, so much as the means by which heating effect may be attained, that form the objects of our search. During the last few years the heating properties of coal gas have come to be extensively recognized, and its advantages in this respect are regarded as no mean security for the permanence of our industry. It is, consequently, of growing importance to determine the correct principles upon which heating appliances ought to be constructed, in order to obtain from them a maximum effect; but there are indications of danger to be apprehended from overrating the resources of science to this end. It is evident that no good can possibly result from an undue exaltation of the heating properties of coal gas; nor can anything but serious mischief result to the cause we all have so much at heart, from the dissemination, however unintentional, of inflated hopes. With the object of avoiding this, it is above all things desirable that the

heating power of coal gas should be definitely ascertained; and we may therefore hail with considerable satisfaction the promise of authoritative information held out to us by the papers of Dr. Adams and Mr. F. W. Hartley.

Now, in the choice of a stove, or in deciding upon the details of its construction, we may very properly address to ourselves this rudimentary proposition: What are its functions? Is it to be considered as a means for developing or increasing the heat afforded by the combustion of gas, or must it be regarded simply as an instrument by which we are enabled to control the heat for our purposes, and carry off the products of combustion? I apprehend that only one answer to this is at all possible, or is capable of being sustained. There cannot be more than one source of heat, and that is the combustion of the gas; though whether its development is favoured by one burner more than another may, to some extent, be an open question. But as regards the apparatus itself there is little room for conjecture or uncertainty. It may be made to assume any possible shape, or be so contrived that its full thermal effect takes the form of a current of heated air capable of being measured with the greatest exactness; and yet its superiority over other appliances, depending for their effect to a greater extent, perhaps, upon the ordinary means of radiation, will not have been made manifest.

It is by no means clear that any ordinary burner, employed for the purposes of illumination, will not produce a greater heating effect, proportionate to the consumption, than the most elaborate gas-stove that has yet been produced. In a certain room, for example, there is a gas-fire and a three-light chandelier. The gas-fire is a modern contrivance, although I do not instance it as a model of economy, for it consumes 34 cubic feet per hour; the chandelier is fitted with burners of a very common kind, consuming together from 12 to 14 cubic feet per hour. A higher temperature is produced in the room—more than double the effect, in fact—by the chandelier alone than by the gas-fire alone; in other words, the latter requires fully five times as much gas as the former, to produce the same result. This is scarcely difficult to account for. The position of the gas-fire against one side of a square instead of in the centre counts for something in favour of the chandelier; then there is the absorption of heat by the sides and back of the fire, most of which is lost for useful effect; but more than all, there is the inevitable large percentage carried away with and by the products of combustion. This explanation is so simple as to be scarcely worth mentioning, were it not for the lesson that it teaches, and which is so frequently lost sight of. With the chandelier, as a matter of course, the whole of the heat is given off within the room, and consequently the highest economical result is obtained; but with this attendant drawback, that the products of combustion are not got rid of.

In the construction of a stove, then, the object that should be aimed at is to render available as large a proportion as practicable of the heat, by carrying off the products of combustion with the smallest percentage of loss. With this end in view, economy in design is usefully promoted by the application of the principle of an induced current of air, after the manner of an annular condenser; and this appears capable of extended application. In the highly important work of house ventilation, for instance, it is probable that a very wide field is open for the employment of coal gas, because, by its means, this is susceptible of easy and satisfactory accomplishment. What are the conditions of efficient ventilation? They are, that the vitiated air shall, by some continuous process, be withdrawn and replaced by an equal supply of fresh, without inconvenience to the occupants of the apartment or dwelling. Ordinarily, as we know, this is a matter that is left entirely to chance, fresh air being regarded as an intruder, to be kept out—in cold weather, at any rate—at all hazards. But this need not be. No one will dispute its value, if it can be admitted without injury or annoyance. A Ritchie, or any stove of similar construction, is capable of being turned to admirable account for this purpose. All that is required is to connect the vertical air-tubes alternately at the top and bottom with pipes leading to the exterior of the building. When this is done, and the stove lighted, two air currents will be set in motion, one proceeding inwards, and delivering fresh air, warmed in its passage through the stove, and the other outwards, expelling air that has become vitiated. Mr. Lawson Tait, of this town, has recently introduced a very simple modification of this arrangement, suggested, I believe, by what is known as the "Tobin" tube, and which is capable of being most cheaply and at the same time very effectively applied. It will be found described in Mr. Tait's pamphlet on "Bedroom Ventilation," a little work

which is deserving of study by all who are interested in extending the uses of gas.

Suggestions have been made for increasing the heating power of gas by raising the temperature of the air supply; though whether, in this respect, any analogy exists between gas combustion and the process of iron making, in which the introduction of a hot blast has proved so eminently successful, is at present a matter of almost pure speculation. Less doubt, if anything, surrounds the action of hot air in the development of illuminating power; but even with regard to this the evidence has hitherto been conflicting. Recently, however, attention has been directed to the regenerative burner of Herr F. Siemens, of Dresden (samples of which, I may mention, are to be seen at the Windsor Street works), by which most important results are said to be achieved. We shall hail with infinite pleasure any confirmation of them, as indicating an entirely new departure, the significance of which it would be difficult to over-estimate.

It is not surprising that the increasing appreciation of the convenience of fuel in a gaseous form should lead to the revival of proposals for the supply of a cheap gas to be used exclusively for heating purposes; and it may not be altogether futile to imagine it as one of the resources open to gas makers, by which the periodical embarrassment arising out of large accumulations of coke may be avoided. It is not, however, to be expected that the anticipations of success indulged in by the advocates of these projects can be fully realized. The prospect of a duplicate system of mains, services, and fittings is repugnant to our notions of economical distribution; although finding favour, if I am rightly informed, on the other side of the Atlantic. One powerful objection, likewise, is to be found in the fact that coal gas is already in almost every house, and every consumer has it in his power to help forward that good time to which we are to all appearance hastening, when it shall be applied with economy to all the purposes for which heat is required. Every penny per thousand feet taken off its price increases its chances of permanent employment in this direction, and removes it to a less measurable distance from competition with carbonic oxide. Apart from this, however, the subject is an important one, too, from its bearing upon the details of our manufacture; and we are, therefore, fortunate in being able to look forward to its treatment this evening by one of its greatest and most distinguished authorities.

While continuing in doubt as to the practicability of such projects, of which probably during the next year or two we may hear more, they furnish a hint which need not be lost sight of in the ordinary process of gas-making. Dr. Wallace has proposed that this should be supplemented by means for the separation of the gases given off towards the end of the charge, which are admittedly of much less value for lighting than for heating purposes. The provision of duplicate hydraulic mains, with valves for reversing the current of the gas at a given period, would seem to introduce a most undesirable complication of plant, and, for other reasons, is clearly inadmissible for the end Dr. Wallace has in view; but it points to a way by which the quality of the gas might be completely controlled, without recourse being had to any expensive enriching material. In substance, the idea bears some resemblance to that which formed the subject of an unsuccessful patent taken out in this country about four years ago, but in its present more practical shape it is said to have been applied at some German works; the gas issuing from the secondary hydraulic main being separately condensed to extract from it the valuable tar and ammonia, and then utilized in the retort furnace. It is not unreasonable to expect that economy should result from such a method skilfully applied; although not likely to recommend itself to those whose first consideration is a large yield of gas per ton of coal carbonized.

The lamented death of Mr. F. J. Evans, who was a member of this Association, which occurred shortly after our visit last year to the grand works with which his name is inseparably associated, has severed a prominent connecting link between the past and the present of gas manufacture. His long professional career embraced a period fruitful in events of a permanent and decisive character, in the shaping of which he bore a distinguished part. The history of the Company with which he was for so many years officially connected has been a somewhat chequered one. The struggles and vicissitudes in which he participated were essentially such as are everywhere to be met with upon the road to solid and enduring success; the ultimate triumphs in which he shared were the fitting rewards of sagacity and enterprise. Perhaps of all the changes that occurred during his time, the one

possessing the most abiding interest for us, is that which he was mainly instrumental in effecting. The transference of the manufacture of gas to a distance from the Metropolis was conceived in a happy moment for the fortunes and prestige of his Company, and not less happy was the manner in which it was carried into effect.

The works at Beckton have been justly designated "the most magnificent establishment of the kind in the world;" and if our admiration at the skill that is everywhere displayed in them should have a tinge of disappointment, this mingled feeling will not have been engendered by any sense of incongruity or incompleteness. It will have been occasioned solely by the unwelcome conviction, brought home to us with all the impressiveness of magnitude, of the apparent hopelessness of seeking for any radical improvement in gas-making appliances, having reference chiefly to retort-house plant. Here, it may be said, is unlimited scope, manufacture upon a gigantic scale, and every inducement to a new and economical departure; but this has not been taken. Yet ought we, even in the face of such overwhelming evidence, to acknowledge its impracticability, or cease asking ourselves why it is that, while in almost every other direction advances continue to be made commensurate, or nearly so, with the enlargement of our operations, retorts, within the limits of a few inches in size, remain the same; our largest works being, in this respect, little more than a multiplication of such as are infinitely less, and possessing over them little or no advantage in point of economy of production.

Can it be that every alternative has been tried, or that none is possible to the present costly method of carbonizing more applicable to the large quantity of coal with which we are now accustomed to deal? Some will say that machinery is a remedy; but machinery, at its best, leaves much to be desired. Is there nothing to be learned from kindred industries? We know, for example, that the manufacture of metallurgical coke, in which the labour per ton of coal is infinitely less than in that of coal gas, is becoming assimilated to the latter; the gaseous products from the coke-oven being treated, as regards exhausting and condensing, in much the same way as are those from a gas-retort. I do not go so far as to say that a coke-oven, even of the most modern kind, such as is employed in several parts of France, and in its earlier form by the Paris Gas Company, would be found applicable in its entirety to gas-making; or that other considerations, into which it is impossible now to enter, may not outweigh that of economy of labour. But it might offer a clue to the direction in which improvement should be sought. At all events, it seems only reasonable to suggest that we cannot too soon or too intimately become acquainted with methods so nearly allied to our own, if we are sincerely desirous of reducing a most considerable and wasteful item of the present cost of gas-making.

I had hoped that time would permit me to say something upon other subjects of no less interest and importance. Notably that of purification in closed vessels is one towards which hopeful glances continue to be directed, although sustained as yet by little substantial encouragement. Still, the different processes that during recent years have been presented to our view point to something more than a mere repetition of former failures. They are unmistakeable evidences of an increasing spirit of inquiry, and go far to show that this most desirable reform is not beyond the reach of skill and enterprise, and that no one need despair of its ultimate accomplishment.

But I must not further pursue these tempting topics. I am anxious, by way of conclusion, to direct your attention to a widely different matter—to a work which, a few years ago, was commenced, under the auspices of the Association, at the instigation mainly of one of our Past-Presidents, Mr. W. J. Warner, and which has since moderately prospered. It will be remembered that considerable objection was, upon various grounds, taken to the formation of the Benevolent Fund. It was believed to be unnecessary, or that it might to some extent inspire the needs which it was intended to relieve. But the cases that were speedily brought under the notice of its Committee effectually disposed of these objections, and it soon became apparent that a much larger income than was available could be usefully and beneficially dispensed. Accordingly, measures were taken to give greater prominence to the fund, with the gratifying result, last year, of a substantial increase in the amount of subscriptions. This has enabled the Committee to provide a larger measure of relief for the ensuing year, though not so large as would be justified if their income could be felt to be of a more permanent character. To

impart to it this desirable permanence, it is hoped that the fund will henceforth enlist the support of a greater number of subscribers. It has no ambitious programme to fulfil. Its work has no pretensions to that of a life insurance or provident institution. It is not for the encouragement of the improvident, neither is it for the benefit of the intemperate or the careless; these have no claims upon our sympathy. But when misfortune has done its work—when, perchance, the breadwinner is struck down without having had the opportunity of providing for those who are dependent upon him; or when the storms of adversity have broken upon a head bowed by the weight of years—then, to the home of the desolate, or to the couch of the weary, speeds our message of comfort and of healing.

PHOTOMETRICAL RESEARCHES.

IN the last number of the *Journal de Physique*, Mons. A. Cornu commenced a series of observations on "Photometrical Studies" made by him, in consequence, as he says, of having found the necessity, in many branches of physical science in which he has been engaged, for some simple arrangement of apparatus for measuring luminous intensities. He announces the completion by himself of various photometrical and spectro-photometrical appliances which he believes will prove useful in many ways, both in physics and astronomy. These arrangements are based upon the property of lenses, discovered and utilized by Bouguer, that the form of a focal image is independent of the dimensions and form of the aperture of the lens, and of an intensity proportional to the surface of the aperture.

In the first form of apparatus, intended for the comparison of the intrinsic brilliancy of real images received upon a white screen, M. Cornu makes use of two achromatic object-glasses, as similar in all respects as possible, of which the principal optical axes cross each other at about their common focal distance. Each of these throws upon a white screen the image of a small rectangular diaphragm placed at the conjugate focus from the screen, and behind each of the diaphragms respectively is placed one of the two sources of light, or rather the portion of the luminous object of which the relative brilliancy is to be compared. The equality of the two images is obtained by varying the area of one of the objectives, and for this purpose each of the glasses is covered by two metallic plates sliding one over the other by the action of a pinion working in two ratchets. The orifices in the plates are square, and by revolving the pinion the two perforations are made to allow a smaller or larger amount of light to pass. As the holes are placed diagonally with each other, the movement of the ratchets always preserves a square opening, and as the pinion is fixed while its rotation causes the two plates to approach or separate the holes, it follows that the centre of the square opening is always in the optical centre of the lens. This is what is generally known as the "cat's-eye" arrangement of sliding screens.

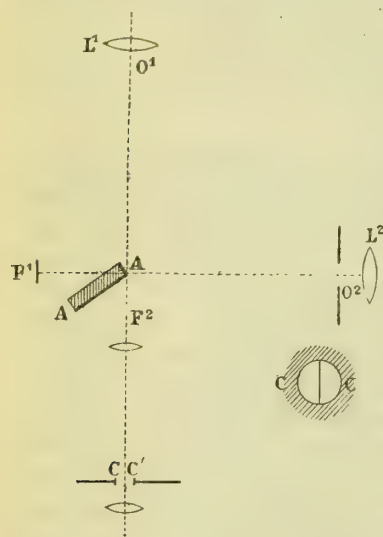
To measure two lights comparatively, the light-sources are brought as close as possible to the rectangular diaphragms, and their position is then regulated by two conditions. (1) The images on the screen should be as clear as possible, to effect which they must be advanced or receded by a convenient distance. (2) The opposite edges of the two images should coincide, so that the line of separation between the two fields may become invisible by the equality of the respective brilliancies. The points of luminosity which are to be compared must then be selected, and their images projected on the screen so that the edges are uniform. All being ready, the square diaphragm of the objective corresponding to the feeble light is opened to the full dimensions, and equality of the images is obtained by operating with the rack and pinion of the other diaphragm until the line of separation disappears. The diaphragms being provided with conveniently graduated scales to show the extent of the openings, the illuminating power is found by taking the inverse ratio of the squares of the graduation. The means of measurement may be infinitely varied by slightly diminishing the area of the diaphragm of the weaker source of light. A fresh point of departure is thereby attained, and by measuring the relative power of the two lights on this basis, a means of correcting the first result is obtained, the square of the difference thus shown being inversely proportionate to the relative power of the light, and so on. When the sources of light are very intense, the apertures of the two objectives may be diminished as required, to decrease the brilliancy of the images on the scale in order to better judge of their relative value.

It may happen that the two lights are not of the same colour; in which case their comparison on a plain white screen is not precise. Similarity may, however, be restored by examining the two images through a coloured glass of a tint having some relation to the use which is proposed to be made of the lights. To eliminate light inequalities of apparatus, the sides may be transposed; that which was at first used for the stronger light being used for the weaker, and *vice versa*. This is easily done in consequence of the construction of the apparatus, for in reality each part is fixed on the end of a large cylindrical pillar, which slides on a fixed internal rod. This arrangement permits of the principal axis of the objective being inclined, and of its being raised and lowered at will. As an instructive example of observation, the comparison of the intrinsic brilliancy of the middle of the flame of a flat-wick petroleum lamp with that of the same flame viewed edgewise may be named. It will be found that the brilliancy of the edgewise flame is more than ten times superior to that of the flat side of the same flame. To make this comparison, an auxiliary source of light is taken (such as a

moderator lamp with a double current of air), and for the point of comparison an apparently homogeneous part of the flame is chosen, particularly the edge, which possesses a high and constant brilliancy. On the other side the petroleum lamp is fixed upon a support capable of revolving so as to present the side or edge of the flame in any direction. The brilliancy of the two aspects of the flame may thus be compared with that of the standard employed. The method of using an auxiliary or standard lamp is, in M. Cornu's opinion, to be generally preferred to that previously described, since it eliminates all inequalities of construction of diaphragms or of transparency of objectives.

Another form of apparatus, called by M. Cornu the microphotometer, dispenses with the white screen. The preceding arrangement, modified by the substitution of a sheet of oiled paper or clouded glass, permits of the two images being observed from behind with the help of a magnifying lens, thus making the operation more easy and precise. Even this screen might be suppressed, and the images observed directly, these being, under such circumstances, infinitely more delicate and vivid; but as the principal axes of the two lenses form an angle of 15 degrees, the two images could not be observed simultaneously in the same position of the eye, because the two ocular rings are separate. The comparison is therefore difficult, and can only be rendered accurate by making the two axes of the objectives coincide. To accomplish this M. Cornu at first employed the well-known means of a plate of plain glass at 45 degrees, which allowed the rays from one objective to pass by transmission, and brought forward by reflection the rays from the other objective. By suitable means of regulation the two actual focal images may be easily obtained in the same plane, to be observed by a hand-glass, or a microscope of low power. The unequal proportion of reflected and refracted light does not permit, in this case, of a direct comparison of two light-sources; the auxiliary light must be used. The employment of this plain glass plate results in two possible inconveniences; it partially polarizes the two bundles of rays—the one by reflection, and the other by refraction. If, therefore, the lights to be compared are themselves partially polarized in an unknown plane, the relations of the intensities are altered in proportions which might be ascertained at the price of various subsidiary operations which would complicate the method. The second peculiarity is the influence of the two surfaces of the plain glass, each of which gives a reflected image of the source of light. There will thus be two images in slightly different focal planes. One of these may be got rid of by using a glass of sufficient thickness, or giving a slight inclination to the two faces. On the other hand, this arrangement lends itself to several physical and astronomical purposes not readily accommodated by the preceding method.

In his defining photometer M. Cornu has adopted the arrangement shown in the accompanying diagram.



The plain glass is replaced by the plate of black glass, A A, finished off by a straight edge, A, normal to the plane of the principal axis of the objectives. The focal planes, A F¹ and A F², are arranged to pass exactly by this edge. A microscope of low magnifying power (from 25 to 50 diameters) permits of the simultaneous inspection of the two images of the two luminous sources. By regulating as required the position of the sources of light, the two lighted areas to be compared are brought into contact with the edge of the glass. To render the comparison still more complete, the two areas are isolated by the aid of a circular diaphragm, C C', introduced into the optical plane of the microscope. The visible field will then consist of a small circle equally divided by the almost invisible line formed by the edge; one moiety will show a constant intensity, the other will be variable by the help of the photometrical screen. In these circumstances, and above all if care has been taken to bring down the intensities to a certain limit, the eye acquires such great sensibility, that the smallest differences of composition of the lights translate themselves by a difference of colour which becomes irksome in the estimation of equality; none but sources of absolutely similar or monochromatic light give by this means a completely satisfactory impression of equality. The areas for comparison may be extremely minute; if the focal images are clear, and obtained by the aid of achromatic objectives, the microscope, acting as an eye-piece, will magnify them to any extent, and from the apparatus being thus applicable to the measurement of the brilliancy of extremely small images it has been called by M. Cornu the microphotometer.

This kind of photometer measures not only the intrinsic brilliancy of the focal image which is projected in the plane A F¹, it also allows of the measurement, when the objective L¹ is removed, of the lighting power exerted by any source whatsoever in the plane A F¹. In fact, the intensity of a luminous wave tangent to the plane passing by the edge A and the path A F¹ may be measured. It may be observed that this photometrical apparatus only fulfils its duty when the pupil receives all the light which has passed through the apertures of the lenses, or which comes from the luminous source; it is

therefore necessary to verify, by the use of an additional magnifier—(1) that the minimum square aperture of the photometer L² is entirely visible in the ocular ring; (2) that the aperture of the objective L¹, or the image of the light-source, is also completely visible and concentric with the image of the square aperture. This form of apparatus is applicable to the measurement of the intensity of different parts of the spectrum by the use of a spectroscope in conjunction with the photometer.

M. Cornu promises further communications on this highly interesting subject, which is now attracting much attention in view of the admitted imperfection of existing kinds of apparatus.

MECHANICAL ENGINEERING.*

THIS latest addition to the admirable Weale's series of rudimentary scientific and technical manuals is worthy of its place among the well-known little green books, some of which are to be found in the library of every practical student. The present is an abridgment of the author's more important work on the subject, published some years since; but the text has been re-written, with the object of including as many as possible of the modern improvements in mechanical work. Still the chapters are slightly disjointed, thereby betraying their origin, and the little volume shows clear evidence of an attempt to crowd within its covers an amount of matter which could scarcely be satisfactorily contained in a much larger book. This, of course, leads to other evil effects besides cramming, and it must be deemed the author's misfortune rather than his fault, that the introduction of some particular information on a technical point occasionally leads the reader to expect more details of a similar character in respect of something else, which are not to be found. Mr. Campin commences by describing some of the more ordinary operations and principles of metallurgy, which is, however, dealt with in a very rudimentary and superficial manner. We never find this part of the necessary instruction of a student satisfactorily treated in books of this class. Authors of all manuals of construction-trades think it incumbent upon them to describe the reduction of ores, puddling, steel-converting, &c., and to illustrate the principal apparatus used in such processes, but in a purely encyclopædic way, and in the most general terms; so that any two books, one treating, say, of clock-making, and the other of boiler-making, contain introductory chapters of similar character. This is a mistake, for a student of mechanical engineering naturally wants to know not merely how the raw materials he uses are produced, but also how the different trade classes of metal are made up, and what qualities he should require in his materials, what to avoid, and how to detect imperfections. These details are of the greatest importance to students and older practitioners, but they are seldom to be met with in even professedly trade manuals, although it must be admitted the author has tacked on to the present work a chapter that is intended to supply this want, which, however, it does only partially. Mr. Campin carefully points out the tendency of modern smiths' work in the direction of hydraulic pressing and shaping in preference to the older method of hammering, and describes how some classes of work are finished in the new style. In treating of moulders' work, Mr. Campin gives us a French spelling of the substance which is frequently found in castings where iron should be, and refers to the disastrous Tay Bridge affair as a warning against the extensive use of what he calls *beaumontague*. We never saw the word spelt in this way before, but as it is a term not likely to find its way into specifications, a little uncertainty as to the orthography is of small moment. The author goes on to describe the principal kinds of machine tools, and gives some useful hints respecting their use. After this follow a few chapters on force, the principles of machine construction, and matter in motion, the latter being very clearly discussed; though we should like to have seen the doctrine of the conservation of energy brought forward more conspicuously, since it is so generally found that students and skilled mechanics are continually being led to waste their time and energies in the search for perpetual motion. Steam engines and boilers, and their subsidiary fittings and appliances, are dealt with in the last chapters of the book. Mr. Campin brings his collection of examples down to very recent innovations, and does his best, in the limited space at his disposal, to draw from them information which will be useful to the readers for whom he principally labours. Altogether we may say that this is a very useful little book, and no student of practical mechanics can afford to despise its teachings.

A QUALITATIVE TEST FOR CARBON DISULPHIDE AND CARBON DIOXIDE IN COAL GAS.—According to *Science*, at the meeting of the American Chemical Society on the 6th ult., Dr. T. O'Connor Sloane gave the following description of a new qualitative test for carbon disulphide and carbon dioxide in coal gas:—A piece of caustic potash, a few millimetres long, is added to 10 or 20 cubic centimetres of alcohol, into which a piece of potassium carbonate has been added. The alcoholic solution of potash is placed in a suitable absorption tube and a cubic foot or more of gas passed through it. It is then removed from the absorption apparatus and poured into a test tube. If the gas contains any carbon dioxide, an oily-looking layer, nearly colourless, of a solution of potassium carbonate will underlie the alcohol, which latter will have acquired a reddish colour. The alcoholic solution, which, if any carbon bisulphide be present, will contain potassium xanthate, is boiled and tested for hydrogen sulphide. Another method is to add an excess of a copper salt, filter out the precipitated copper compounds, and pour ammonia through the filter-paper, when a highly characteristic yellow precipitate of copper xanthate will remain behind.

* "A Practical Treatise on Mechanical Engineering." By Francis Campin, C.E. London: Crosby Lockwood and Co. 1881.

London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 14, 1881.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 21, 1881.

THE GAS MANAGERS AT BIRMINGHAM.

THE Birmingham meeting of the members of the British Association of Gas Managers has passed into history, along with the Association itself. The last meeting of the old society has been held amid circumstances so peculiarly favourable, that the task which now devolves on the new organization, of surpassing or even equalling, at a future time, the interest of the last occasion, is no easy one. We have now The Gas Institute, from which great things may be expected; but unless its career, as marked most obviously by the annual meetings, is to be exceptionally brilliant, the Association which has proved itself capable of making such a brave show as that of the Birmingham congress will be naturally regretted. We have repeatedly prophesied, when mentioning the Birmingham meeting while it was *in futuro*, that the occasion would be a memorable one; but in the actual event a degree of success must be recorded which few could have expected. Favoured in the main with fine weather, nearly five hundred members and friends of the Association assembled in the Masonic Hall on Tuesday last, and the attendance was well maintained during the whole of the proceedings. With reference to the transactions of business and pleasure which lasted four days, the part taken by the President, Mr. Charles Hunt, is the most notable. It is not too much to say that from the first appear-

ance of Mr. Hunt on the platform, to the last moment when he yielded up to his appointed successor the authority he had held, his influence upon his hearers, and their respect and admiration of him in his official capacity, continuously increased, until at the last it had become a mutual relation of extraordinary strength. The Association has had many excellent Presidents, and the Institute may have many more; but the year, or rather years, of Charles Hunt, of Birmingham, will never be forgotten by those present, as being the times when of the occupant of the chair it could pre-eminently be said: "The gentleman is learned, and a most "rare speaker."

The late occasion was memorable also for the quality as well as number of those who supported the President with their presence and active participation in the proceedings. The Mayor of Birmingham, Alderman Richard Chamberlain, although especially pressed, during the week of the meeting, with the duties devolving on him as the chief personage of a large and busy Municipality, came forward on the morning of the opening day to deliver a warm welcome from the Corporation to their visitors; and to testify to the high place held by the President and his colleague, Mr. Henry Hack, in the estimation of all their fellow-townsmen. Besides this external support, there were present at different times during the meeting an unwonted number of men who have made themselves eminent in the art and science of gas lighting. We could not pretend to give a list of the well-known names whose possessors were to be there seen, attentive to the business transacted under Mr. Hunt's administration. Suffice it to say that from the veteran Alderman Ebenezer Goddard, of Ipswich, to the latest recruit to the happily numerous body of younger men who seem determined to lift themselves above the crowd, the names of the absent, whose presence could have been desired, were almost numerable on the fingers of a hand. And not only was Great Britain, in all its divisions, completely represented, there were also to be seen friends from the United States and the Continent of Europe, who had come to receive the renewal of an accustomed welcome. On the whole, the gathering must be conceded to have been to the full as brilliant as it was strong in numbers. And we do not believe that any one of the visitors, howsoever occupied in important affairs at home, could have returned to his usual work dissatisfied with the time spent in Birmingham, or otherwise than mentally invigorated by communing with his fellows.

Some of the papers read at the morning sittings were of much interest, and if called upon to formulate an opinion as to the respective merits of all the contributions, we should unhesitatingly assign the first place to Mr. Henry Woodall's paper on some of the higher politics of gas administration; and after this, regarding the interest of the papers as distinct from the question of intrinsic value, we should have some difficulty in deciding between Dr. Siemens, Mr. D. F. Goddard, and Mr. Gandon for the subsequent positions. It must be understood that we are now referring to the more popular side—if we may so term it—of the subject of the reading of papers at a large meeting. To make up a good, instructive, and debateable paper, certain qualities are required which are quite distinct, although not necessarily different from a communication which might serve, say, as a useful article for a scientific journal; and we are constrained to observe that some of the papers, however instructive when printed, were about as interesting when read aloud as a fantasia on the multiplication table. Listeners cannot possibly follow a reader through pages of figures, and these should consequently be "taken as read," or summarized as far as practicable, in order that results may be brought more prominently forward. This process, rigidly carried out, would perhaps curtail many papers of what the authors might consider their fair proportions; but they would have earned the gratitude of their hearers. People do not meet together on these rare occasions to hear masses of data on which they cannot be expected to form a sudden opinion; but to be instructed in results, which should be announced with full reasons most concisely but powerfully stated, and upon which they may ask any questions or make any remarks that may occur to them. There is no doubt that the time of the late meeting was wasted in the beginning by the reading of needlessly detailed calculations, and perhaps also by superfluous discussions of unprofitable themes; so that the last papers read did not receive the consideration which they undoubtedly deserved, and which the meeting would have gladly afforded. The decision on the class of papers to be read, and the portions of them, if any, which can best be given by means of wall-sheets or distributed prints, must undoubtedly form a

serious part of the duty of the Council of the Institute, in order that the time of the meetings may be spared, and the willing attention of members be saved from excessive strain.

The plan of breaking up the daily proceedings succeeded admirably, as we anticipated; and the opportunities thus made available for visiting the various works and places of interest in the neighbourhood were much appreciated and utilized. The two great establishments of the Gas Department at Windsor Street and Saltley, which are respectively under the direction of Mr. Hunt and Mr. Hack, were visited by many members on the afternoon of Tuesday, and the constructive skill displayed at both places was universally admired. Especially should be noticed the impression evidently made on all observers by the immense work in progress at Windsor Street, where the largest retort-house and the two largest gasholder-tanks yet attempted are being constructed from the designs of Mr. Hunt, in a style at once most substantial and economical. Messrs. Tangye's works at Handsworth were visited on Wednesday, the arrangements in which, with the evidences throughout the establishment of the organization of men and appliances on a most praiseworthy model, are very pleasing to see. The Corporation *conversazione* at the Town Hall (mainly arranged by Mr. E. Smith, Secretary to the Gas Department of the Corporation), the annual dinner on the following evening, and the concluding excursion to Enville, on the invitation of the Stourbridge Committee, can only be mentioned here; but none who took part in any of them will be unmindful of the generous cares of those who so willingly undertook the necessary arrangements.

In all respects, the meeting, which was the occasion of the extinction of an Association, only to give rise to an Institute charged with gathering into its organization a wider constituency with broader aims, was fraught with interest for the time, and also for long after it shall have receded into the past. We cannot now enlarge on the subject of the change which has taken place in the society, nor even dwell on the pleasant incident of the presentation to the Institute of the Birmingham Medal. These matters will be better commented on after a little time shall have allowed of their being surveyed from such a distance as will permit of a proper appreciation of their dimensions; and for this we shall reserve them.

THE DISPOSAL OF GAS PROFITS AT NOTTINGHAM.

THE Finance Committee of the Town Council of Nottingham have curious notions respecting the incidence of rating, but the majority of the Council itself are just as eccentric. It appears that last year, from some undefined cause—or rather following the general custom—all the spending Committees of the Corporation exceeded their powers very considerably, and consequently find themselves in sore want of relief. At the same time the Finance Committee, for reasons which are sufficiently apparent, wished to reduce the amount of rating in the town. The Council applauded this laudable desire, for ratepayers are always tickled at the idea of a remission of rates; but the fact that the rates as they stood had not proved sufficient to meet the expenditure was, to say the least of it, unfortunate. In this difficulty it seems to have occurred to some genius on the Finance Committee that to "lift" the neat sum of £10,000 from the Gas Committee's income would be the easiest way of discharging the existent liabilities of the other Committees, and would also make up for the diminished income to be expected from a reduced rate. The idea was taken up by the Finance Committee, embodied in the report, and, despite the strong protest of Alderman Thackeray, Chairman of the Gas Committee, it was eventually adopted by the Council. The ratepayers of Nottingham are therefore to be amused with the idea that they only contribute rates amounting to 3s. 6½d. in the pound, while the expenditure amounts to 4s. There may, of course, be people who prefer being deluded in this way, to having a plain understanding of what their rulers are doing; but they must be few, or the good folks of Nottingham are not so sharp as we are disposed to credit them with being. The Finance Committee are striving for the reputation of economists, and blazon the statement that they have reduced the rates by fivepence in the pound within two years, while at the same time every penny has had to be made up out of the gas revenues. The Nottingham practice of public economy, in short, does not consist, as might be supposed, of retrenching expenses, but of lessening their apparent income; meanwhile dipping more deeply than ever into the pockets of such ratepayers as happen also, to their sorrow, to be gas consumers. There is, of course, no reason why the system should not be carried out to its full perfection, and all rates remitted in order to gain for the Municipal Authorities of

Nottingham the unique distinction of carrying on their work without any revenue at all. The slight circumstance that the price of gas would be increased should not logically have any weight with the authorities; since the amounts they at present draw from the consumers do not count in the tale of municipal expenditure.

GAS AFFAIRS AT DUDLEY.

THE Corporation of Dudley are not yet happy. They failed in their opposition to the Bill of the Dudley Gas Company in the present session, although they tried every means of securing their ends, and carried the conflict as far as the forms of Parliament would permit. Possibly they failed because they did not exactly know what they wanted, and this uncertainty still haunts them. On a recent occasion, immediately after confessing before the Town Council that their parliamentary campaign had resulted in disaster, at a yet unknown cost to the ratepayers, a motion was brought forward for obtaining tenders for lighting the Market Place, and one or two adjoining streets, with electricity. The motive expressed for this step was, of course, the usual one in favour of a better and cheaper light than gas. In furtherance of this desire, it is only natural, from the average Common Council way of thinking, that the Corporation may entertain with favour the idea of paying five times the cost of gas for the lighting of the leading thoroughfares of their town. We are so used to this style of retributive action on the part of disappointed local magnates, that a new instance of it would not be worth notice, were it not that it affords proof of the overweening sense of their own worth as gas consumers on the part of Local Authorities. We have no wish to step between the Council and the Gas Company; but on every account it would be well if the parties, having had their fight out, could agree to live together in amity. At the same time it may be remarked that whereas, by their late magniloquent speeches and bold action, the members of the Council perhaps imagine they have sounded a note of reprisal which will shake the local Gas Company to its centre, the loss of the small amount of public lighting referred to will not be felt by the Company, while the Council will probably be astonished when the estimate for the alternative method of lighting is brought before them.

A NOVEL CLAIM AGAINST A GAS COMPANY FOR WATER-RATES.

ONE of the most ridiculous actions that has been heard of for many a day was decided last week by Sheriff Mair, at Airdrie. The point involved is said to have been one of importance to Gas Companies; but wherein it is important either to Gas Companies or any one else it is difficult to discover. Novelty and absurdity may give a certain amount of transitory interest to a subject, or even to a legal point; but it does not of necessity follow that it is therefore important. Without further preface, the question may be briefly stated thus: The Coatbridge Water Company sued the Gas Company of the town for the sum of 10s. for water supply to gas-meters within their district, from Whitsunday, 1880, to Whitsunday, 1881; and the ground on which the claim was based was that the supply to dwelling-houses was for "domestic use" only. The contention of the Water Company before the Sheriff was that the water occasionally required for meters must be held to be other than a domestic supply. Were such a doctrine to receive effect, or meet with the slightest favour, the imagination hesitates to say to what extremes it might be carried. On such an assumption Water Companies would immediately frame regulations for households, giving directions as to how far it would be safe to use the water in their establishments, and a system of *espionage* would be organized to endeavour to detect offenders. If a live coal were to fall upon the floor and set fire to the house, the occupant would either not be permitted to use the water to quench the flames, because this is not a "domestic use," or a special sum would be charged for it if so used. A tumbler of water given to a thirsty traveller at the door would be reckoned a non-domestic use of the water, and, in all likelihood, the donor would be subject to a fine for his Christian act. In fact, as the Sheriff pointed out, a host could not give a glass of water to a guest, or supply water for the toilet, without infringing the doctrine of the Water Company. Unquestionably water is a valuable adjunct of daily life, and the more freely it is used the less liable is a community to be attacked by a particular class of diseases. It can hardly be said that the people are not fully alive to the importance of an abundant and pure water supply, nor can it be maintained that they demur to pay for it. However, if such claims as the one under consideration are to be trumped up, they may well raise their voice against its unjustness. At

present the claim is made against a corporate body; but, had it proved successful, it might have been the precursor of a series of claims against consumers individually, which would have been of a very irritating nature. The Sheriff, looking at the question in its legal aspect, and also taking a sound common-sense view of it, has dismissed the action as absurd. He holds that when water is put into a meter it is for the convenience and accommodation of the person in whose house the meter is; and further, that the water used for this purpose by the servant of the Gas Company is the water in the house for which the occupier is charged.

SIR W. THOMSON ON THE FAURE BATTERY.

THE secondary battery of M. Faure has afforded Sir William Thomson and other scientific notables a good exercise in correspondence in the columns of *The Times* during the past week. The Glasgow professor commenced the episode by describing, in his accustomed striking manner, the powers and possibilities of a Faure battery which had been sent to him from the laboratory of the inventor in France. His words aroused much attention, and the staff of the leading journal being on the alert, a cleverly constructed leading article on the subject helped materially to intensify the interest. The main point made by the professor was in the announcement that a million foot-pounds of energy, available for the production of power, light, or heat, was stored up in the 75 lbs. weight of metal composing the battery in question. Large numbers have a wonderful influence on the popular mind, and therefore it is not surprising that such a nominally great power, boxed up in a few sheets of lead, should have dazzled the newspaper writer, and probably many others besides. It was not long, however, before another scientific man arose to state that Sir W. Thomson's figures meant so little that the wonderful box of M. Faure was equalled in value, as a source of work, by a piece of common coal weighing 1½ ozs., which could be sent anywhere in a letter. Much of the dispute between the two professors and their respective followers, which ensued upon this striking disclosure, is mere fencing with the main issue. The facts appear to be that Sir W. Thomson had allowed himself to indulge in a little imaginative computation, strictly true, of course, from a theoretical point of view; and that Mr. Osborne Reynolds, in answering him in such a peculiar manner, also dealt in an imaginative manner with facts which, although real enough in their way, are scarcely capable of practical interpretation. In other ways, however, Mr. Reynolds shows a capability of sticking to hard every-day truths which it might have been hoped Sir W. Thomson would have also shown, instead of making a parade of strictly theoretical considerations without qualifying them as such. Mr. Reynolds maintains that even when the source of power to be converted into electricity and back again costs nothing for maintenance—such, for example, as the water power of Niagara, to which Dr. Siemens looks, as promising a supply of energy for almost the whole of the United States—the bare cost of the conductor, and means of converting the current into work, must be more, even as a matter of carriage, than the transport of so much coal as would be needed to develop the same power at a given distance. He also considers that the effect of the use of electricity for conveying power, &c., will only tend to enhance the value of coal, rather than to supplant it. These fundamental considerations are, of course, unaffected by the discovery of the secondary or storage battery, for if electricity in current will not compare favourably in cost with coal as a carrier of power, so much less will the bottled article affect the value of anything in which coal is used. The discussion is interesting as a specimen of scientific fencing; but we are disposed to question its utility, whichever side may be considered to have the weight of evidence in its favour.

SALES OF GAS SHARES.—Last Wednesday, a quantity of stock in the Barnsley Gas Company was offered for sale by public auction, at Barnsley, by Messrs. Lancaster and Sons, and realized fair prices. £300 of the original stock, entitled to 10 per cent. dividend, was sold at the rate of £211 per £100 of stock. £345 14s. 10d. of the same class of stock was knocked down at £210 per £100. Ten £10 "C" shares, bearing 6 per cent., were sold at £13 2s. 6d. per share. Ten £10 "D" shares, on which 7 per cent. is paid, were sold at £14 15s. per share. Ten similar shares, paying 7 per cent., were bought at £14 2s. 6d. per share. Ten "E" shares, also paying 7 per cent., realized £14 each, 16 £10 "F" shares (£8 paid), paying 10 per cent., were sold at £16 per share.—On the same day, Mr. Evans sold by auction, at Newport (Mon.), 1250 "C" shares in the Newport Gas Company. The statutory dividend payable on the shares is 7 per cent., and the prices realized ranged from £3 to £3 15s. per share.—Last Thursday, Mr. S. Aldred offered for sale by auction, at Yarmouth, two £30 shares and 30 £7 10s. shares in the Great Yarmouth Gas Company. The price realized for the former was £51 5s. per share, and the £7 10s. shares were disposed of at the average rate of £12 16s. 3d. each.

Water and Sanitary Affairs.

ACCORDING to the reports of Dr. Frankland, the Metropolitan Water Supply is getting better and better month by month. The Thames water supplied by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies, which was "unusually free from organic matter in April," exhibited "a further improvement" in May, and is declared to have been of better average quality than at any time during this or the preceding year. So much for the five Thames Companies. The supply furnished by the New River Company is pronounced "but slightly inferior to the best of the deep-well waters." The East London Company's supply is described as being delivered "in an efficiently filtered condition." The water distributed by the Kent Company is, of course, approved. But why is the water supply in the case of the Thames and the Lea Companies so free from blame at the present time? If sewage mingles with the water in any portion of the year, why not now? What are those pollutions of which Dr. Frankland makes mention when he condemns the London Water Supply as "unfit for dietetic purposes"? Do not his analyses point to the conclusion that the organic matters of which he speaks owe their origin to other causes than the influx of town sewage? Of all sources of pollution, this is the most constant, supposing it to exist at all. But the extent to which the sewage of the up-river towns is now excluded from the Thames and the Lea would lead us to expect an abatement in any tokens of sewage pollution, if not their entire extinction. It will be observed that at the worst of times there is no proof of anything more than "previous animal contamination," and the proper inference seems to be that this is due to other causes than those in which the towns are immediately concerned. The health of London, excepting small-pox—which happily is now on the decline—is certainly good, the death-rate last week being as low as 18·3. Dr. Frankland states, in his last annual report, that the water supply derived from the Thames and the Lea is persistently degenerating. But this ought not to be the case, if sewage has anything to do with the phenomena, seeing that there must be less sewage entering the rivers now than formerly. If Dr. Frankland's analyses do not indicate this fact, there must be something wrong in the process, or in the interpretation of the results.

On previous occasions we have mentioned the ill-fortune which has attended the efforts of the Stafford Corporation in their search for water, three bore-holes having proved failures. About two months ago, the Corporation resolved to consult "one or more mechanical engineers" as to the course they should pursue. They have accordingly sought the advice of Mr. G. D. Harrison, of Hanley, and Mr. Stooke, of Shrewsbury. Mr. Harrison tells them there is a fault of considerable magnitude in the new red sandstone formation contiguous to the town. The fault runs nearly north and south, and the principal water-bearing strata on the east side lie to a great extent immediately under the surface, while the same strata on the west side lie "at a great and unproved depth," covered for several miles to the west by the water-stones and impervious marls. The position of the bore-holes is about a mile and a half to the west of the fault, and at a point "where the overlying marls probably approach their 'greatest thickness, and the water-bearing strata their 'greatest depth.'" Mr. Harrison considers that it would be possible to reach the water-bearing strata of the Bunter sandstone at this spot; yet "at what depth these 'beds would be reached, and in what quantity and at what 'level the water would be obtained, and be available for the 'purposes required,' are matters which, in his opinion, lie beyond the bounds of reasonable prediction. The gravitation scheme brought forward by Mr. Dennis, C.E., by which it is proposed to collect the water in the Sherbrook Valley, near Cannock Chase, is considered by Mr. Harrison open to objection, owing to the risk that coal exploration will carry off the water at some future time. The proposal of Mr. Henry J. Marten, C.E., to sink a well and make a boring into the conglomerate beds near Berkswich, is the plan to which Mr. Harrison gives preference, and which he recommends for adoption. The report of Mr. Stooke objects both to the Sherbrook and to the Berkswich scheme, reasons being given for pursuing the search in the locality of the present borings, the scale of the operations to be enlarged. The water to be obtained from this source would be of excellent quality, and would not be interfered with by any mining works. These reports will evidently call for the exercise of a good deal of

wisdom on the part of the Corporation, and we hope they will be more fortunate henceforth than they have been.

The completion of the Ipswich sewerage works was celebrated on Wednesday last, when Messrs. Pearson and Son, the contractors, invited the Mayor and Corporation, with other personages, to a visit of inspection, and afterwards handsomely entertained their visitors. The history of the Ipswich sewerage scheme is a long one, dating from 1857, when Mr. Bruff presented a report to the Sewerage Committee recommending the adoption of a plan substantially the same as that which has just been carried out. The Corporation not being quite satisfied with Mr. Bruff's proposals at the time they were made, proceeded to consider a variety of sewage schemes which from time to time presented themselves. About the year 1871, the health of the town became so bad that the Sewerage Committee pressed the Corporation to take speedy steps in regard to the drainage, the result being that in 1872 the Committee received authority to seek further professional advice. Accordingly, as stated at the proceedings on Wednesday by Alderman Turner, the Chairman of the Committee, they took counsel with Mr. Bailey Denton, who for a time "nearly annihilated Mr. Bruff's "scheme," the latter being a proposal to intercept the sewage and discharge it into the tidal portion of the Orwell. Mr. Bailey Denton preferred a sewage farm, which was to raise the value of land from 2s. 6d. to £7 an acre. To satisfy themselves that this calculation was correct, the Committee called in Dr. Voelcker, who forthwith proceeded to annihilate Mr. Bailey Denton, telling the Corporation that the sewage farm would be attended with great loss, and advising them to put the sewage bodily into the river. Finally, this has been the plan adopted. For the purpose of carrying out the works, the Corporation, acting as a Local Board of Health, borrowed in the first instance £44,500, followed by a further sum of £16,234, and a third application is now being made for power to borrow £12,000, to defray the cost of additional arterial sewers to bring districts at present undrained into connection with the intercepting sewer. Mr. George Pearson, who presided at the luncheon, stated that the borough had incurred "a first "expenditure which would be sufficient for a population of "more than 100,000." But he observed that "the question "of what might be done with the sewage eventually was, of "course, a thing entirely apart from what had been already "done." Somewhat in the same strain, Alderman Ransome told the meeting that the works seemed admirably adapted for getting rid of the sewage, "and they had this "advantage, that if the river did not quite relish their "freewill gifts, there was a great deal of very hungry land "at the back, on which, with a little more engineering skill, "and a little more willingness to pay rates, the sewage "might be placed." The luncheon having been disposed of, the Mayor proceeded to open the penstocks and let the sewage into the river, expressing a hope that "it would never come "back again." By some little oversight, the opening of the penstocks had the effect of letting a portion of the sewage into the reservoir where the banquet had taken place. The consequences, "happily, were not serious;" but the waiters were the worse for it, and the tables were cleared with unusual celerity.

We understand that this year's publication of Mr. Field's well-known *Analyses of the Metropolitan Gas Companies*—viz., that for 1880—will be ready to-morrow; and will be extended so as to embrace for the first time the accounts of thirteen Suburban Gas Companies.

We have just received a small but very interesting pamphlet containing a reprint of the report which appeared in one of the local newspapers of a lecture delivered some short time since by Mr. Samuel Hunter, A. I. C. E., at a meeting of the Salford Corporation Gas Department Mutual Improvement Society. Though the report has not passed through the author's hands for revision, it contains a fair account of Mr. Hunter's visit, with some of his personal friends, to the East—a tour in Palestine—and may be read with pleasure and profit by all who were not present at the lecture.

SERIOUS INJURY TO MR. TRAVERS, OF CORK.—Members of the British Association of Gas Managers at the Birmingham meeting last week heard with regret, which will be generally felt by all those who know the gentleman, of a sad incident that has recently befallen Mr. T. Travers, of Cork. The cause and nature of the injuries will be gathered from the following statement, which is to be asked in the House of Commons by Mr. Daly:—"To ask the Chief Secretary to the Lord Lieutenant of Ireland whether it is true that, on the evening of Thursday, the 9th of June, Mr. Thomas Travers (at present and for many years past Engineer to the Cork Gas Consumers' Company, at Cork) was wantonly assaulted by five policemen near the site of the old Cork and Passage Railway Station at Cork; whether it is true that, on the occasion referred to, Mr. Travers was standing on a small bridge, the only other occupants being a few little children, and that, seeing the policemen about to cross the bridge, Mr. Travers stood aside to allow them to pass, when the police attacked him, knocked him down, and beat him most cruelly with their bâtons; whether it is true that, whilst down and being beaten, one of the policemen stabbed him in the groin with his bayonet, inflicting a severe and dangerous wound; and whether, if the above-recited facts be correct, he will take steps for the prosecution of the perpetrators of this assault."

Communicated Article.

GAS LIGHT—ELECTRIC LIGHT.

By J. O. N. RUTTER.

At no period in the history of gas lighting has there been so urgent a necessity, as at the present, time for vigilance on the part of directors of gas companies in sustaining them commercially, and of managers and other officials in skilfully conducting the manufacturing and distributing processes. Gas, in the highest sense good—that is, good in the essential properties of light and purity—was never more needed than now. All that can be done ought to be, and must be done to entitle gas making to occupy the position claimed for it as a scientific process.

Gas lighting is confronted by a rival and a competitor the most formidable of any before known, or with which it has been brought into antagonism. Already there are proofs that electric lighting is destined to occupy a permanent place amongst the great, the useful, and the philosophical developments of the age. Scarcely three years have passed since almost all that was known about the application of electricity to public lighting seemed only as clouds low down upon the horizon; drifting along, and not likely again to be seen. There was a large supply of guessing and conjecturing and forecasting, of believing and doubting, of asserting and denying. This has passed. We must now think about, and, if able and willing to do so, look at realized facts. There need be, and should be, no hurrying to conclusions. Of this there has been too much already. It was to be expected; for in matters engaging, at the same time, so many minds and so many pairs of hands, the ill-doing often occupies more time and costs more money than well-doing. With such marvellous issues as were at first predicated in relation to electrical lighting, it would have been at variance with all experience if there had not been undue haste.

Notwithstanding the amount of work done and experiences acquired, only in some few cases can it be said that the electric light has emerged beyond experimental processes. It is on its way to definite results. Not the least important work yet to be done is selecting from among the various systems what are considered the best. Caution is necessary, for precipitancy would be a mistake. For aught at present known, or possible to be known, there may be concealed not far behind the best of the processes hitherto invented another, and another, and another; each possessing superior claims to its predecessor. So we are reminded that in peering into the future the lenses used are of short focus. Is an illustration of this required? Here it is.

Another mystery has been revealed. The storing (accumulating) of electrical energy, keeping it under restraint until its services are required, has been a life-long dream with many who have dabbled in this branch of science. That which had been so often hoped for, and several years ago assumed more than a hopeful form, and then failed, has now been accomplished. By the (secondary) lead battery invented by M. Faure, of Paris, it is possible to pack up electrical energy in its cells, convey it hundreds of miles without appreciable waste, and at the end of the journey produce the effects of a newly-charged battery. Here is a broad margin for indulging in speculation and exercising patience. We shall want to know the tension of the imprisoned electricity; how long it will endure restraint; whether to be reckoned by days, or weeks, or months; what, if any, are the special conditions, and how it behaves, when set at liberty.

Judging by what has been published relating to the (secondary) battery, we may expect it greatly to enlarge the area and supply additional means for the uses of the electric light. There will be increased facilities for its adaptation to the interiors of buildings; and, looking beyond, it is impossible to enumerate even a small portion of the appliances in which it would find itself at home. We must wait awhile; not, however, forgetting that outside all which might be expected from electricity, it is itself only as an unit in the world of mechanical art and other sources of scientific industries.

Supposing that all, and yet more, which might be said about lighting by electricity should be realized, What about gas companies and the manufacture and sale of gas? I know of no reason why the companies should not be as successful as they are now; the quantities of gas produced greater than they have ever been; just prices maintained; and full dividends paid. The manufacture of gas must go on; areas of supply will be extended; and what will be preferable, because more profitable, existing areas will be better worked by the uses for gas being increased—say, for warming, cooking, driving engines, and other useful and economical applications. Why should gas not be an auxiliary to electrical lighting by working dynamo machines?

All the principal streets in the large cities and towns will not be without gas this year, nor next year, nor the year after. The changes thus to be effected are not solely dependent on amateur gentlemen in town councils and parish vestries. The comparative costs of the two systems of lighting will be very proper subjects for consideration by ratepayers. Nor is it likely that we shall soon see whole streets of houses all ablaze with electric lights. Whether near future, or far future, there will be a future.

Now a few words about gas light and electric light. One has long been known, and with the other we have to become better acquainted. Perpetual grumblings notwithstanding, gas light has a world-wide reputation. It is at the tip-top as a medium of artificial illumination. So little has it in common with electric light, that the contrasts are more numerous than the similarities. Gas lights with suitable burners and glasses, fixed in proper positions, and the rates of consumption readily adjustable, require no commendations. The light they supply is not sunlight; yet in some of its properties, by

simple arrangements, it approaches very closely the emanations from the great luminary. Electric light is not sunlight. With its dazzling effulgence far—very far—surpassing all other processes for artificial illumination, it is still electricity. What do we know about it? That the world is charged with it; that in some of the wonderful phenomena in nature it breaks out in intermittent flashes; whilst in the electric light it is so kept under control that, instead of terrifying by sudden flashes, it passes in a gentle and continuous outflow.

Black Rock, Brighton, June 14, 1881.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JUNE 13.

Petitions against the following Bills were presented:—

London Sea Water Supply Bill, from Wandsworth and Putney Gaslight and Coke Company.

South Metropolitan Gas Bill, from (1) Metropolitan Board of Works; (2) Thomas Matthias Weguelin and Messrs. Thomson, Bonar, and Co.; (3) Alfred David Lewis, Samuel Hyam, and the Biphosphated Guano Company, Limited.

Water Provisional Orders (Newhaven and Seaford Water) Bill, from London, Brighton, and South Coast Railway Company.

The CHAIRMAN of COMMITTEES informed the House that the opposition to the Reading Corporation Bill had been withdrawn.

TUESDAY, JUNE 14.

The Birkenhead Corporation Gas and Water Bill was referred to a Select Committee, consisting of Lord Romilly (Chairman), Viscount Gough, Earl of Mar and Kellie, Lord Rayleigh, and Lord Strathspey; to meet on Monday, June 20.

THURSDAY, JUNE 16.

The CHAIRMAN of COMMITTEES informed the House that the opposition to the London Sea Water Supply Bill had been withdrawn.

WATER PROVISIONAL ORDERS BILL.—This Bill was read a second time, and committed.

FRIDAY, JUNE 17.

GAS PROVISIONAL ORDERS BILL.—This Bill was read a second time, and committed.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill was reported without amendment.

Miscellaneous News.

THE DUDLEY TOWN COUNCIL AND THE GAS COMPANY.

At the Meeting of the Dudley Town Council on Tuesday last, the MAYOR (Alderman Wainwright), who was in the chair, informed the Council that since their last meeting the Bill of the Dudley Gas Company had been before Parliament, and the result was, he considered, as far as the Council were concerned, very unsatisfactory. The House of Lords had given the Company their Bill, and granted them all the powers they asked for, and refused to listen to what he believed to be the just and reasonable complaint of the Council. He thought the Company had acted very injudiciously in refusing to take advantage of the opportunity of their being in Parliament to remedy some of the evils of which the public had complained. As the matter now stood, the Company had obtained their Bill, and the Council had failed in their opposition.

Mr. GORDON said he should like an account of the expense incurred in opposing the Gas Company's Bill to be laid before the Council as early as possible.

Some general business having been disposed of,

Alderman G. BAGGOT moved—"That the Borough Surveyor be hereby instructed to take the necessary steps to enable him to lay before the Streets and Gas Committee a scheme for lighting the Market Place and other large spaces in the borough by electricity, with an estimate of the cost of the same, with full power for the Committee, without any other or future authority from the Council, to obtain a tender for the execution of the work; and that the Committee report to the Council thereon." He said the question was one of great importance to the borough, as the lighting of the streets had been a vexed question for many years. The Corporation had from time to time tried to get a more economical supply of gas, with a better illuminating power, but had failed in their efforts. Now, the question appeared to him to be whether they should not introduce into the borough a new system of public lighting. He believed he was correct in saying that the electric light was a complete success so far. It was now in its infancy, but great improvements were daily being made in connection with it. He thought it should be tried in the borough, as the Market Place and the surrounding thoroughfares were peculiarly well situated for the trial. It was not at present proposed to spend any money, but simply to obtain tenders, and before any outlay was made the sanction of the Council would be asked.

Mr. GORTON seconded the motion: No expense would, he said, attach to obtaining tenders, and he, having witnessed the success of the electric light in London, thought the resolution should be adopted.

The MAYOR also thought it was extremely desirable that the resolution should be passed.

Alderman SMITH moved, as an amendment, that the latter part of the motion, after the words "with an estimate of the cost of the same," be omitted.

Mr. CHALLINGSWORTH seconded the amendment.

Mr. BRETTELL remarked that it would doubtless be a good thing to try the electric light, although he was doubtful as to the results, because he saw that in Liverpool it cost five times the amount of gas. However, it probably afforded five times the illuminating power.

Upon the vote being taken, the amendment was carried by 16 to 9.

NEWBURY CORPORATION GAS SUPPLY.

At the Meeting of the Newbury Town Council on Tuesday last—the Mayor (Mr. C. Lucas) in the chair—a report was presented from the Gas Committee, stating that at their meeting on the 16th ult. the balance-sheet for the year ending the 25th of March last, prepared by Mr. Alfred Lass, and the working statement for the same period, together with Mr. Lass's report, were laid before the Committee and discussed.

The adoption of the Gas Committee's report having been moved and seconded,

The Mayor said that previous to the receipt of the balance-sheet the hope was expressed that the profits made by the gas undertaking during the year would admit of a reduction in the price of gas, but this was now

found to be impossible. Reviewing the statement of accounts, he said that all the capital allowed by Act of Parliament, amounting to £25,000, had been raised, and the whole of the money expended, save £118 14s. 4d., included in which was £300 taken from revenue for depreciation of old plant pulled down. Turning to the revenue account, it would be found that the balance to be carried to profit and loss account was £118 4s. 4d.; £801 18s. 9d. of which went to pay interest, and £238 was carried to the reserve-fund, leaving £32, the net balance of profit, to be carried to the previous balance of £1940 7s. 6d., which made the Gas Committee indebted to the borough fund, including previous profits, in the sum of £1972 7s. 6d. By their Act they were to set apart certain money as a reserve fund, until it should amount to £3000. It was impossible that this net profit of £1940 7s. 6d. could be handed over from the gas account to the borough fund, but it appeared to him that the gas undertaking would be helped if the Corporation were to recommend the Auditor to pass this £1972 odd to the reserve fund, which would then bring it into the working capital, and go a long way towards making up the £3000. Before, however, this could be so applied, there would be £800 which the borough owed the gas undertaking; so that in point of fact there would be £1170 to be applied to the reserve fund, which, with £238 now standing to the account of the reserve, would bring it up to over one-half of the required amount. Out of the balance of £1840 14s. 4d., standing on the capital account, they would have to provide for whatever accounts might be outstanding. While the entire capital of £25,000 had been raised, a great part of it was not raised until the latter part of the year, so that the sum of £801 18s. 9d. charged in the present balance-sheet would not represent the whole of the interest to which the Corporation would be liable another year, when the total amount required for interest would be £1125. Their expenditure would, therefore, be £310 more than had been charged this year in respect of interest. In addition to this they would have to commence putting aside their sinking fund, which the Auditor had told them would amount to £205 per annum for 53 years. It would thus be seen that next year they would have to face an additional sum of £530, which had not been brought into this year's balance-sheet. This year there had been an amount of £238 carried to the reserve fund, so that setting this provision in favour of a reserve fund against a sinking fund, they might say that in round numbers £300 additional would be required to meet the excess of interest accruing each subsequent year. It would be seen that their position was not particularly sound, as they would have to make this additional profit if they were to maintain their present position, or to be able to think seriously of making any reduction in the price of gas. Last year they manufactured 12 million cubic feet. A reduction of 6d. per 1000 feet upon this would be £300; therefore, if they wanted to make the reduction, they must earn a profit of £625 more than they did last year. It would thus require all the care, time, attention, and best efforts of the Gas Committee to keep the gas undertaking going in the most economical and remunerative manner possible.

Alderman JACKSON (Chairman of the Gas Committee) remarked that it was necessary to supplement the Mayor's statement by showing that there were special difficulties last year which would not exist another year. They had been obliged to buy cannel coal to keep the works going, besides which they could not supply all the gas that was required. Now they were in a position to supply any demand which might be made upon them, and their profits would be proportionately increased.

Alderman LUCAS observed that they had all been anxiously looking forward to Mr. Lass's report and the balance-sheet, which, instead of affording them encouragement, confirmed the view he had taken from the first, that if they removed their works and expended their capital, they would have no profits to relieve either the ratepayers or to reduce the price of gas. Plainly stated, for 53 years they would have to pay £1125 in repayments and interest, and £205 by way of sinking fund, before one penny could be claimed as profits. They would now all of them be able to see that it was unwise to have gone to such a cost, and thus burden themselves and the town for this and successive generations. If they had remained at their old works, and made such alterations as would have enabled them to have provided for the increased demand for gas during the next ten years, they might by this time have paid off most of their borrowed capital as well as have reduced the price of gas. It was melancholy that they should be in their present dilemma; still they must do their best to make the undertaking succeed as far as it was possible.

The motion was then put and carried.

LIABILITY OF GAS COMPANIES TO BE RATED FOR WATER SUPPLIED TO GAS-METERS.

A novel and interesting case was raised some time ago in the Sheriff Court at Airdrie, before Sheriff Mair, by the Airdrie and Coatbridge Water Company claiming payment from the Coatbridge Gaslight Company for water used in gas-meters. As the action was one of some importance alike to gas companies and gas consumers, Sheriff Mair gave it very careful consideration after it had been debated before him, and on Friday last delivered judgment in the case.

His LORDSHIP said the claim which had been raised by the pursuers against the defenders was as follows:—For water supply to the service gas-meters within their district from Whitsunday, 1880, to Whitsunday, 1881, 10s. It was explained on behalf of the Gas Company that they paid for the water required for their works and offices, and that the occupiers of the houses in which the Company's meters were placed also paid water-rates. On the other hand, it was contended that under the Water Company's Act of Parliament the supply of water for dwelling-houses was only for domestic use; that this did not include the supply of water occasionally required for the meters in those houses; and that the water so supplied must be held to be for other than domestic purposes. The learned Sheriff said that he had gone carefully over the pursuers' Act of Parliament, and had been unable to find in it any warrant whatever for the claim now made; and they could not refer to a single instance, either in England or Scotland, in which such a claim had ever been sustained. The defenders had put themselves to the trouble of making inquiries on the subject, and they produced a number of letters from gas companies, both in Scotland and England, all of whom regarded the claim as utterly unreasonable and unprecedented. His Lordship was of opinion that the claim was absurd. The meters in dwelling-houses were, he said, unquestionably there for domestic use, and if they did occasionally require to be supplied with water, the water so used was that which was supplied by the Water Company for domestic purposes, and for which the occupiers of the houses were charged. It would be a perversity of language to hold that the water used for the meter was not a domestic use or purpose. If gas was used in a house, it was for domestic purposes. In many instances there was no meter in the house, and sometimes the gas went away, and might require that water should be put into the pipes. Were the companies to make a claim in such a case as this for the "supply of water"? Did it make any difference, he asked, that there was in the house a meter into which, perhaps once or twice a year, a pint of water might be put? The gas was used for a domestic purpose, and the water supplied in either of the cases adduced was used for the same purpose. If the claim of the Water Company

was well founded, it would lead to somewhat ludicrous consequences. For if there was anything at all in their contention, it would come to this—that the water supply of a house could not be employed for other than the personal uses of the occupant. If, therefore, the occupier of the house had a dinner party, the extra supply required for the guests would have to be paid for; or if friends should stay with him for a time, the water required for toilet purposes, it would be said, did not fall under the head of domestic use. Other instances equally ridiculous would readily suggest themselves to one's mind. But it might be said by the Water Company that the water was put into the meters occasionally by the Gas Company's servants. This was true, but it did not in the slightest degree affect the question of liability. In the first place, where this was done, it was for the convenience and accommodation of the person in whose house the meter was; but, in the second place, and in any view, the water used by the Gas Company's servants was the water of the house, and for which the occupier was charged. The learned Sheriff concluded by saying that he had no hesitation in dismissing the action.

NOTES FROM SCOTLAND. (FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, Saturday.

Although the gas accounts of Dundee are not so satisfactory as the Convener of the Gas Committee, or the Commissioners, or the public could desire, the authorities of that town are by no means inclined to write the ominous word "Ichabod" over the gateway of their works. They do not think that the glory of their property has departed; on the contrary, despite the progress which is claimed for the electric light, and the importation of that *enfant terrible* of M. Faure, they have bright hopes for the future. Indeed, their estimates for the coming year are based upon data which show that the Gas Commissioners of Dundee are sanguine of better financial results during the approaching than have characterized the past twelve months. A fortnight ago I gave a summary of the leading figures of the Dundee accounts, and it is therefore quite unnecessary now to refer to them in further detail than to illustrate a few observations upon the proceedings of the Gas Commissioners who met to consider the accounts and other matters on Wednesday last. According to the estimates of last year, it was calculated that 288,638,500 cubic feet of gas would be sent out to consumers; but the actual demand fell short of this quantity by 6,361,500 cubic feet. Now, unless there were good reasons to believe that the consumption would exceed this quantity during the next financial year, one would naturally have supposed that the Committee would have made arrangements for a decreased make. The Convener has evidently grounds for believing that there will be no further retrocession, but a decided advance, because in the estimates provision is made for manufacturing 360 million feet. I take it for granted that this is the total make, and that the figures are arranged so as to include leakage, which is calculated at 16 per cent., in addition to 2,500,000 cubic feet used at the works. It would be unfair to comment upon these latter figures, as details are wanting which would enable one to form an idea of the various purposes to which gas is applied at the works; but surely with a decrease in the consumption to the extent of upwards of 6½ millions, and with no reasons given for expecting an increased consumption in the future, one has cause to wonder at the way in which these things are managed in Dundee. Twenty or thirty years ago a leakage of 15 or even 20 per cent. was not considered very much out of the way; but in these times, when competition spurs all branches of industry to produce cheaply, economy in every item ought to reign supreme. Cheap as the gas is in Dundee, it might be cheaper, or at any rate the balance might be on the right side of the ledger, were the leakage account reduced to proper limits. I have no doubt that if the percentage of unaccounted-for gas is not reduced by the time the Commissioners meet to discuss next year's estimates, the fault will not lie at the door of the Manager. The Convener tried to convince his brother Commissioners that the great leakage of the past year—upwards of 16½ per cent.—was due to the exceptionally severe winter, which had caused numerous bursts and leaks, and to the fact that the gas was sent out at a higher temperature than the atmosphere. Then again the station-meters, it has been discovered, have not been registering with accuracy. These are considerations which may to some extent explain the large amount of leakage. But heavy as this item is, it is nothing to what it was when the Commissioners acquired the works, because during the first year of the existence of the Commission the leakage was 24·25 per cent. Leaving this consideration aside, it is to be hoped that the provision made for the increased production of gas will be taken advantage of by the public. In order to manufacture the estimated quantity of 360 million cubic feet, 31,858 tons of coals will be required. These have been contracted for at an average price of 17s. 7½d., or with firemen's wages and haulage 21s. 5½d. per ton. The Manager has gone in for a higher class of coal, so as to improve the quality of the gas, although hitherto gas of 26·28 candles, or 10·28 candles above the illuminating power provided for by Act of Parliament, has been supplied. Greater attention is to be paid to the sale of the bye-products, and it was intimated to the meeting on Wednesday that a contract has been entered into for a new apparatus for the manufacture of sulphate of ammonia. It is anticipated that by this means the Commissioners will be able considerably to increase the quantity of this valuable product, and at the same time to improve its quality, and consequently its market value. The Convener, in the course of an interesting speech, moved the adoption of the estimates. The Provost, in seconding the motion, expressed the hope that the leakage account would be reduced next year, and congratulated the Commissioners and the public that the quality of the gas was to be increased. The Provost pointed to one fruitful source of leakage, and that was the long distance to which the gas is conveyed in order to supply outlying districts, and he suggested that means should be taken to ascertain the amount of leakage beyond the bounds of the burgh.

It is to be regretted, in view of the state of affairs which the annual statement contains, that the Commissioners of Dundee should have rejected the proposal made to them on Wednesday to provide and sell, or let out on hire, cooking and heating stoves. Such a decision does not proceed upon the ground of want of funds. Under their Acts of 1868, 1872, and 1877, the borrowing powers of the Commissioners amount to £200,000. They had availed themselves of these powers to the extent of £93,512 10s. borrowed on mortgages, and £36,568 on loan receipt, leaving £66,919 10s. unexhausted. The Commissioners then have the funds wherewith to obtain the goods; but, as the Provost facetiously remarked: They ought to increase the sale of gas by every means in their power, but they ought not to go into an ironmongery business; they might as well seek to provide sewing-machines for the public. These statements were received with laughter, but it is difficult to see "where the laugh comes in," except it may have been occasioned by the illogical nature of the observations. It has never been maintained, so far as I know, that the providing of heating and cooking stoves for the use of the public constituted a corporation an ironmongery firm, but if this is to be maintained now, it might well be answered that corporations are already in that line of business, because they provide meters for consumers. The analogy of a cooking-stove and a sewing-machine is about

as close as that of a needle and an anchor. But perhaps the most absurd part of the Provost's argument is where he says the Commissioners ought to increase the sale of gas by every means in their power, and in the same breath he tries to ridicule a "means" which every sensible man, except the Provost, sees would, if properly cultivated, materially increase the annual revenue of a gas corporation. The minute recommending the adoption of the system has been disapproved of by a majority of eight to five, but the loss will be that of Dundee. It is to be hoped that other gas corporations in Scotland will have a keener appreciation of their own interests.

At the annual general meeting of the Perth Gas Commissioners on Wednesday evening, it was stated that the year which had just closed had been a prosperous one. The total make of gas for the year was 60,426,400 cubic feet, being an increase of 3,092,700 cubic feet over the previous year. The amount of unaccounted-for gas during the past year was 6,463,550 cubic feet, or 10·7 per cent., an increase of 2 per cent. on the previous year. This increase was attributed to the severe winter weather. After meeting all claims, and making allowance for depreciation, &c., a balance of £100 remains with the Treasurer. From the Manager's report it appeared that the quantity of gas made during the month of May was 2,746,500 cubic feet, as compared with 2,176,400 cubic feet in the same month last year. The average illuminating power was 27·8 candles.

At a meeting of the Broughty Ferry Police Commissioners on Wednesday, it was stated that the Gas Committee had arranged for a supply of coal to the extent of about 1500 tons, and that this had been done at a saving of £20. They had obtained six different kinds of coal, and they were paying, on an average, 18s. 9d. per ton—a saving of 11d. on their former contracts.

It is now several months since I reported that negotiations were being entered into between the Corporation of Montrose and the Gas Company, with a view to acquire the works in the public interest. At a meeting of the Corporation on Wednesday, Dean of Guild Scott said he thought it would be well, pending these negotiations, that they should do everything in their power to see what was the best and the cheapest light that could be obtained. He accordingly gave notice that at the next meeting of the Council he would move—"That the Treasurer's Committee make arrangements to have the High Street and the public buildings lighted by electricity for a month during autumn, to see what the expense and what the effect of it would be." A gentleman in Montrose, he said, was quite willing to supply the necessary machine gratis, if the Board supplied the coals and attendants. If the authorities of Montrose can get the machine gratis, they may be able to supply the electric light for a less sum than gas.

At a meeting of the Cleaning and Lighting Committee of the Edinburgh Town Council yesterday, the Convener, Mr. Landale, reported that he had visited London, and had inquired into the several systems of electric lighting. The Brush system he considered the most suitable. A three months' trial of it in Edinburgh was estimated to cost £400; and it was mentioned that, if satisfactory, the apparatus could be purchased for about £2400. The machines for generating the electricity are to be placed in the Waverley Market, just in the heart of the district which it is proposed to illuminate—namely, the North Bridge and Princes Street. It is anticipated that all the necessary preliminaries to the introduction of the light will be completed by the last week in August; and that the portion of the city referred to will be lighted up on the occasion of Her Majesty's visit to Edinburgh to review the Volunteers in the Queen's Park. If practicable, the space in front of Holyrood Palace will be lighted by electricity, but the distance must be three-quarters of a mile from the Waverley Market.

With their water scheme as with their gas, the people of Dundee are very unfortunate this year. The accounts of the Commissioners were submitted to a meeting this week by Mr. Ballingal. He pointed out that the revenue had been seriously affected by stagnation of trade, and said the margin of revenue over expenditure shown on the estimate was £201 9s. 9d.; the actual balance at the debit of the revenue account was £745 15s. 4d., which, added to the sum of £1162 6s. 8d., being the amount of previous years' rates held good, but now found to be, and written off this year as irrecoverable, made a deficit of £1908 1s. for the year. The estimated revenue for the year was £38,454 8s. 4d.; the actual revenue had been £38,694 6s. 10d., less irrecoverable rates, £1162 6s. 8d., showing a shortcoming of £1908 1s. But, on the other hand, while the estimated expenditure was £38,252 13s. 7d., including a deficiency of £87 18s. 7d. from last year, the actual expenditure had been £39,440 2s. 2d.—as compared with the estimate, a deficiency of £745 15s. 4d. As was pointed out by the Provost, the prospect is a very unpleasant one for the ratepayers. They have a deficiency of £1908 to provide for, and, in addition to this, ten months of the sinking fund, estimated by the late Treasurer at £3500. Besides, they had £600 of higher taxation on account of deductions in the name of "tenants' profits" being disallowed, and these items together made £5008 of additional revenue which would require to be found this year. This meant, in round numbers, an increase of 5d. on the domestic rate. At the very least, the ratepayers would have to pay 1s. 6d. per £1 on the domestic rate, and from the special rates there would have to be raised something like £2500 more. The Provost bitterly complained that the Commissioners, by a majority of 16 to 9, last year refused to go to Parliament for a Bill to suspend payment of the sinking fund. After a good deal of "bickering," it was remitted to the Finance Committee to prepare estimates for the current year to be submitted to the Commission in July.

In Glasgow it is complained that there is a waste of water because of the consumption of 50 gallons per head per day; in Coatbridge an attempt was recently made to remove the watering of gas-meters from the category of domestic use; and in Arbroath it is maintained that the flushing of water-closets is not a "domestic purpose" for which water may be employed. Some of the members of the Town Council, at a meeting this week, expressed the fear that unless some check were put upon the flushing of closets, and a large waste of water prevented, they would have soon to face a great water scheme. If the flushing of closets is not a domestic use, and if watering of gas-meters is not a domestic use, what is domestic use of water? It would be instructive to have an exact definition. The Provost of Arbroath quelled the fears of his coadjutors by assuring them that there was no fear of a deficiency in the water supply, and he hoped no restriction would be placed upon the public in the use of water indicated.

The fortnightly statement as to the Edinburgh water supply shows that the daily delivery of water was 12,976,000 gallons, being equal to 41·80 gallons per head per day to a population of 310,000.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

The annual meeting of the Kelso Gas Company was held on Wednesday—Mr. Swan, the senior Director, occupying the chair. In addition to transacting the usual routine business, the meeting unanimously adopted certain alterations and amendments in the contract of copartnery, and likewise agreed unanimously to a proposal to give a retiring allowance of

£20 per annum to Mr. Clazy, who, as has formerly been mentioned, is retiring from the office of Manager, after having given the Company 45 years of faithful and devoted service. The usual dividend at the rate of 10 per cent. on the paid-up capital of the Company was sanctioned, and the Directors were authorized to declare the same.

On Friday, the 10th inst., the annual meeting of the Annan Gaslight Company was held—Mr. McLean, Chairman of the Company, presiding. In the Directors' report, which was submitted, a dividend at the rate of 14s. per share was recommended, as also a reduction in the price of gas from 4s. 8d. to 4s. 6d. per 1000 cubic feet. The report was adopted, and the retiring Directors, Messrs. J. Carruthers and F. Chalmers, were re-appointed. It was agreed to give the Manager (Mr. William Ewart) a gratuity of 20 guineas, in consideration of the extra work that had been thrown upon him during the past year, in consequence of the sewerage operations throughout the town interfering in many cases with the Company's main and service pipes.

With reference to the appointment of a Manager to the Penicuik Gas-Works, already noticed in the JOURNAL, it is worthy of mention that the successful candidate, Mr. Arthur G. Quigley, has been Assistant Manager of the Inchgreen Gas-Works, Greenock, under Mr. Samuel Stewart, for about ten years. He had entered the service of the Greenock Corporation Gas Commissioners as Assistant Inspector of Works at the time the Inchgreen works were commenced. There were upwards of 100 applicants, many of them of undoubted ability, for the Penicuik appointment. Mr. Quigley was highly recommended.

At the annual meeting of the Dalbeattie Gas Company, which was held on the 10th inst., a dividend of 5 per cent. was declared, and the price of gas was reduced to 8s. 9d. per 1000 cubic feet. This is the second reduction in the price of the gas at Dalbeattie since the works were enlarged.

One of the most interesting events in connection with lighting affairs during the past week was the formal inspection of the gas-works erected and fitted at Port-Glasgow, for the Clyde Lighthouses Trustees, by Pintsch's Patent Gas Lighting Company, Limited, of London. There were present the Chairman and other members of the Lighthouses Trust, representatives of the Clyde Navigation Trust, the Greenock Harbour Trust, the Port-Glasgow Town Council and Harbour Commissioners, and other gentlemen. After the works had been carefully inspected and described, together with the operations of manufacturing the gas and charging it into the buoys, for use in the River and Firth of Clyde, the company sat down to luncheon, and several gentlemen present made some very interesting remarks upon the system of lighting which the Lighthouses Trustees have adopted for rendering the Clyde safely navigable both by night and in foggy weather. There is every probability of the system undergoing very considerable extension, both at home and abroad.

The annual general meeting of the Dunoon Gaslight Company was held on Saturday, the 11th inst.—Provost Oswald, Chairman of the Company, presiding. The financial statement for the past year was submitted, which showed that the income had been £2493 11s. 11d., and the expenditure £1678 2s. 10d., leaving a net profit of £815 9s. 1d. A dividend of 10 per cent. was declared. Provost Oswald was again appointed Chairman of the Company, and Messrs. W. W. Mackay and James Hunter were re-elected Directors.

Judging by the report which is to be submitted by the Directors to the annual meeting of the Hawick Gaslight Company to be held on the 1st prox., the famous hosiery town is again to the front in connection with the question of cheap gas. As I have only been able to glance at the report, I must in the meantime leave over a detailed notice of it; and at present I would simply mention that the past year's consumption shows an increase of upwards of 4 million cubic feet, and that the price of the gas might have been reduced to 3s., instead of allowing it to remain at 3s. 6½d. per 1000 feet. When the facts are all made known in reference to the gas question at Hawick, it may reasonably be anticipated that they will excite a little professional rivalry in other places.

The actions at the instance of the relatives of the persons killed by the disastrous explosion which took place in Henderson Street, Glasgow, at the opening of the present year, have just been served upon the Lord Provost and Magistrates. They are as follows:—Rebecca Reid claims £1000 for the loss of her father and mother, both of whom were killed; Hugh Reid, for the loss of his wife, £500; Ann Chapman, for the loss of her daughter, £500; Martha McCulloch, for the loss of her husband, £500, besides £250 each claimed on behalf of six children. The Lord Provost and Magistrates are sued as Commissioners acting under the Corporation Gas Act of 1869 and the Glasgow Police Act of 1866, and as Commissioners acting under the Glasgow Corporation Water-Works Act, 1855; and it is stated that for at least three weeks previous to the explosion the occupants of the houses that were wrecked had perceived a strong smell of gas, and had made complaint to the gas officials. One of the tenants, thinking that something was seriously wrong with the pipes, had mentioned the matter to the gas inspector; but in spite of these warnings, no steps were taken by the officials. The accident, it is contended, therefore occurred through the negligence of those for whom the Lord Provost and Magistrates were responsible. In addition to the above actions, a number of others claiming for damage to property have also been raised.

Mr. H. E. Crum-Ewing, Lord-Lieutenant of Dumbartonshire, has intimated to the Dumbarton Water Commissioners that he will make a free gift of a piece of ground on the Strathleven Estate for the purpose of increasing the size of the Blackinn reservoir. The Water Commissioners intend purchasing a piece of ground from Mr. Buchanan, of Auchentorlie, and another from Mrs. Ewing, Strathleven, for the same purposes. The increase in the reservoir will give larger storage accommodation; but besides this, the Commissioners propose to enlarge their works to such an extent as to provide for a very considerable increase in the population, which is likely to take place through an additional shipbuilding yard being opened in the town, and the large extension of Leven shipyard, which is to be carried out by Messrs. William Denny Brothers.

Mr. W. R. Copland, C.E., Glasgow, has been appointed to carry out the new works resolved upon by the Local Authority of Newton-Stewart for obtaining a supply of water from the Coldstream Burn; and formal notice is forthwith to be given to the Public Works Loan Commissioners for a loan of £4000.

The Police Commissioners of the burgh of Kirkintilloch are about to make an important extension of their water supply works.

His Grace the Duke of Argyll has agreed to give a large area of ground on very favourable terms for water supply works for Kilcreggan and Cove, two favourite watering-places on his estate of Rosneath and adjoining lands.

The Glasgow pig iron warrant market was quieter this week, but a good business was done, while a considerable degree of firmness was displayed at the lower quotations. There was not much fluctuation in prices, and at the close yesterday there were buyers at 46s. 6½d. cash, and 46s. 8d. one month, and sellers near.

A somewhat improved feeling has been shown this week in the Glasgow coal trade, partly on account of the shipments having been on a larger scale. Some good contracts have recently been closed for Lanarkshire cannel coal, both for gas-works at home and for shipment abroad.

CRANSTON'S DEEP ROCK BORING MACHINE.—Mr. Cranston, of Newcastle, writes: "In your notice of my deep boring machine in the JOURNAL of the 31st ult., will you please correct an error? The total cost for labour, oil, &c., was only £15 (fifteen pounds) not £105 as stated. I am pleased to inform you that the 6-inch diameter hole bored by my apparatus at the Hartlepool Gas and Water Works has been most satisfactory—inasmuch that an additional supply of pure water has been gained, equal to 25,000 gallons per hour, from a depth of 103 feet."

MESSRS. B. DONKIN & Co. have sent us a copy of a new illustrated catalogue of gas apparatus just issued by them, containing illustrations and descriptions of their manufactures in the way of gas-exhausters, gas-valves, and steam-engines. The two most noticeable novelties contained in the list, and which Messrs. Donkin and Co. have the sole right to manufacture, are (1) the exhauster made under J. Beale's 1877 patent, and a full account of which was given (with illustration) in the JOURNAL for the 1st of March this year; (2) Livesey's patent automatic anti-dip valve. This valve is intended to take the place of the dip-pipe in hydraulic mains; and should answer well, as there is nothing in it to get out of order. The cap opening with a very small pressure of gas, and closing by its own weight, there are no levers or joints to stick and become unworkable. It is the invention of Mr. G. Livesey, and has been in operation for a considerable time; upwards of 600 of them having, it is stated, already been manufactured.

THE BEVERLEY TOWN COUNCIL AND THE WATER COMPANY'S BILL.—At the monthly meeting of the Beverley Town Council on the 18th inst.—the Mayor (Alderman Crosskill) in the chair—the subject of the proposed water-works was under discussion, the Beck Committee having recommended the Council to erect a number of pumps in different parts of the town. Reference was made to the Beverley Water Bill, which, has passed a Select Committee of the House of Lords, and it was pointed out that this Committee had retained to the Corporation the right to erect pumps, and also restricted the Water Company from interfering with the existing water supply. They contended, therefore, that they were doing their duty to the town in increasing the existing supply, and preventing the proposed Company from making a profit out of the ratepayers. Several members of the Council took the opposite view, and opposed the expenditure of corporate money in erecting pumps in private streets. They also commented on what they deemed the waste of public money in opposing the Water Bill. A very angry discussion ensued, in the course of which several members were called to order by the Mayor, who twice threatened to leave the chair. The proposition of the Committee was, however, eventually adopted.

COST OF WATER-WORKS IN THE PRINCIPAL CITIES OF THE UNITED STATES.—The following table shows the cost of works for water supply, the population, and the cost per head of the population, in the several cities of the United States named:—

Cities.	Cost of Water-Works. Dols.	Population.	Cost per Head. Dols.
Detroit	2,750,700	119,000	23.11
Newark	2,671,580	140,000	19.08
Wilmington	912,120	44,000	20.73
Buffalo	3,000,000	164,000	18.29
Cincinnati	6,813,000	260,000	26.20
Milwaukee	2,227,482	115,702	19.25
Columbus	943,513	52,090	18.14
Louisville	3,906,141	156,000	25.04
Cleveland	2,628,319	156,000	16.84
Providence	5,530,347	104,850	52.74
Boston	18,320,000	412,000	44.46
Manchester	800,000	33,000	24.24
Hartford	1,495,519	42,000	35.00
New York	35,820,081	1,041,886	34.38
Philadelphia	18,703,519	817,500	23.00
Chicago	8,842,825	503,304	17.49

MIDDLESBROUGH CORPORATION GAS SUPPLY.—At the meeting of the Middlesbrough Town Council on Wednesday last—the Mayor (Mr. C. Willman) in the chair—the minutes of the Finance Committee, which contained a recommendation to the effect that 10 per cent. per annum on the gross cost of the gas-works be charged against the revenue account of the gas-works accounts, for interest and redemption, so as to leave a balance of profit for reduction in the price of gas, &c., were presented. In moving the adoption of the minutes, Mr. J. F. Wilson said the proposed change would bring about a reduction of 3d. to 4d. per 1000 cubic feet in the price of gas. In addition to an ultimate decrease of 3d. per 1000 feet expected to arise from the profits made, it would enable the Council to pay off the borrowed gas-works liabilities in some ten or twelve years. Mr. A. Hinton seconded the motion. Mr. Archibald moved as an amendment—"That the proposal be referred to the Finance Committee." He advocated in preference an immediate reduction in the price of gas, since he found that the cost of making it was only about 1s. per 1000 feet. He believed a margin of 8 per cent. would have been sufficient to propose for paying off interest and redemption. Mr. Dunning seconded the amendment. Their money was, he said, borrowed at something like 6½ per cent., £26,000 to £30,000 having been paid towards the redemption of the gas-works, and it was now proposed to pay 10 per cent. on the original cost, after the above proportion had been paid off. The amendment was then put and lost, and the minutes were adopted.

FATAL ACCIDENT AT THE GLOUCESTER OLD GAS-WORKS.—A frightful accident occurred at the Gloucester Old Gas-Works, on the morning of Monday last week, by which one man lost his life and another narrowly escaped death. It appears some men in the employ of a firm of contractors were engaged in pulling down the works, and two men, named Newey and Prickett, were stationed at the top of two high columns of a gasholder, taking some girders off the columns by means of pulley blocks. Suddenly, without the least warning, one of the three girders snapped in the centre. Newey was flung upwards, and then fell with the girder into the gasholder-tank beneath, a distance of 75 feet. Two other girders also fell, and were shattered to pieces. Assistance was immediately rendered, and two men descended the tank, in which there was a quantity of dirty water, with a rope; but the poor fellow was quite dead, his body and head being terribly lacerated. A stretcher was procured, and the body brought to the surface and placed in an adjoining shed. The other man, Prickett, who, as stated, was working at the other end of the girder when it snapped, fortunately succeeded in grasping the top of the column, and remained in this position for some minutes. As may be imagined, the utmost excitement prevailed among the men below, and one of them, named George Everson, at once ascended the pillar, without the assistance of rope or ladder, and remained with Prickett at the top, in his precarious position, until ladders were placed against the pillar and firmly bound together, when he tied a rope round the man's waist and lowered him gently down the ladder. It was then found that he had received a cut in the forehead, and his body was bruised and much shaken.

THE WATER SUPPLY OF WHITCHURCH (CHESHIRE).—On Saturday, the 11th inst., a meeting of ratepayers was held in the Town Hall, Whitchurch, to consider the proposed water-works scheme, to which reference was

made a few weeks since in the JOURNAL. There is a strong feeling among the great majority of the ratepayers against the scheme, the general idea being that a plentiful supply of water, of better quality than that proposed to be supplied, could be obtained much nearer the town, and at considerably less cost. The Chairman of the Board (Mr. R. T. Smith), who presided, defended the action of the Board. They had not, he said, adopted the present water scheme without much consideration, and it had been approved of by Mr. Baldwin Latham. The water had been analyzed by Mr. Farrar and Drs. Hassall (London) and Thursfield, and they had given it as their opinion that with the exception of its being rather hard the quality was excellent. There could be no question of the extent of the supply, and the Board were perfectly satisfied with everything that Mr. Wyatt (the Engineer to the Board) had done. Dr. Gwynn complimented the Board and Mr. Wyatt on the ability they had displayed in perfecting the scheme, which he believed to be a good scheme, and one which could, no doubt, be improved upon by a chemical process. He was not, however, convinced that they could not have a better. The Local Government Board Inspector had expressed a wish that an attempt should be made to get water nearer the town, and he hoped this would be done. He would suggest that an engineer of the highest eminence should be engaged to take a survey of the district, and to report thereon to the Board. If this were done it would be more satisfactory to the Board, to the ratepayers, and to Mr. Wyatt. Ultimately it was agreed that an experienced engineer should be engaged as suggested.

EMBEZZLEMENT BY A GAS COMPANY'S COLLECTOR.—Last Friday, at the South Shields Police Court, John Lincoln was brought up charged with having embezzled certain sums of money belonging to his employers, the South Shields Gas Company. Mr. J. M. Moore, Solicitor to the Company, prosecuted, and in opening the case said the total defalcations of the prisoner amounted to £206 10s. 3d. The fraud had been carried on for some time, by a systematic falsifying of the books, and putting them in such a condition that it was difficult and almost impossible for the Company to know the position in which they stood with regard to their debtors. The system the prisoner had pursued was that of appropriating sums collected during one quarter, and taking the money received the next quarter to pay the amount embezzled. From some trifling circumstances the Secretary of the Company was induced to suspect Lincoln, and ask for an explanation. When it was called for he acknowledged having defrauded the Company, and supplied a list of his defalcations. In order to cover his misdeeds, he in succeeding quarters abstracted the properly issued accounts, and substituted accounts of his own making out. Mr. J. H. Penney, Secretary to the Company, said the prisoner had been in their service since January, 1867, and had acknowledged to witness that he had tampered with the accounts, and had withheld some of the moneys belonging to the Company. Mr. Penney then gave evidence respecting three sums—£2 11s., £6 2s., and £8 18s. 6d.—which had been received by the prisoner and not paid over to the Company.

Lincoln's salary was, he said, £120 per annum; and £5 was allowed for expenses. After evidence had been given as to the sums mentioned above, Mr. Moore, having conferred with the Directors of the Company present, said he would not go into other cases, but leave the matter in the hands of the Magistrates. The prisoner, who pleaded guilty, was then sentenced to six months' imprisonment with hard labour.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 2524.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in the manufacture and purification of gas, and in apparatus employed therein." A communication. June 10, 1881.
2528.—DIXON, J., Richmond, Victoria, "The manufacture of an improved gas, and the apparatus and method therein employed." June 10, 1881.
2535.—COCKEY, H., and F. C. Frome, Somerset, "Improvements in gas condensers." June 10, 1881.
2570.—DEMPSTER, J., Elland, Yorks, "Improvements in apparatus for distributing and measuring water for gas scrubbers and similar purposes." June 14, 1881.
2589.—LUX, F., Ludwigshafen-on-the-Rhine, Germany, "Improvements in and relating to the desulphuration of liquids and gases." June 14, 1881.
2624.—SUGG, W. T., Westminster, "Improvements in gas cooking-stoves." June 16, 1881.
2636.—COX, G. J., Maidstone, Kent, "Improvements in gas cooking and heating stoves." June 16, 1881.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

- 5064.—THORP, T., Whitefield, and TASKER, R., Prestwich, Lancs, "An improved apparatus for regulating the flow of gas to burners." Dec. 4, 1880.
5347.—ROBINSON, S., Westbromwich, Stafford, "Improvements in engines to be worked by steam, air, or gas." Dec. 21, 1880.
5366.—ANDERSON, W. F., Great Winchester Street, London, and MANT, G., Stratford, Essex, "Improvements in coke breaking or splitting machines." Dec. 22, 1880.

PATENTS WHICH HAVE BECOME VOID

- BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.
1978.—WEST, J., "Improvements in apparatus used in the manufacture of gas." June 8, 1874.
1938.—DANN, J. T., "Improvements in the construction of apparatus for lighting, extinguishing, and regulating gas-flames." June 8, 1874.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending June 15, 1881.

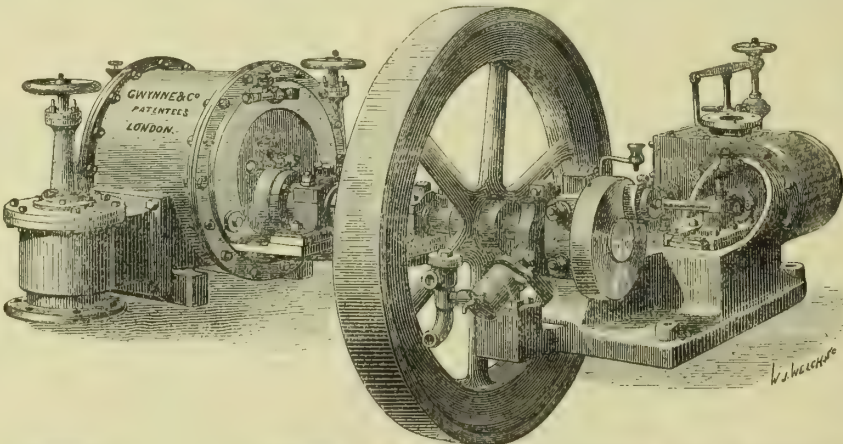
Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	17.4	16.8	17.2	9.5	7.8	8.6	0.3	0.0	0.2	None.	In excess.
	Camden Town	17.4	16.7	17.0	12.3	10.7	11.5	0.2	0.0	0.1	"	"
	Dalston	17.5	16.8	17.1	21.5	10.1	13.2	0.0	0.0	0.0	"	"
	Bow	17.4	16.8	17.1	12.2	9.0	10.4	0.9	0.6	0.8	"	"
	Chelsea	17.5	16.4	16.9	13.2	9.3	11.7	0.2	0.0	0.0	"	"
	Kingsland Road	17.8	17.2	17.5	14.3	10.2	11.9	0.3	0.2	0.3	"	"
South Metropolitan Gas Company . .	Westminster (cannel gas) . .	21.9	21.1	21.4	8.3	6.4	7.4	0.0	0.0	0.0	"	"
Commercial Gas Company	Peckham	16.8	16.5	16.6	11.2	8.2	10.1	0.2	0.0	0.1	"	"
	Old Ford	17.3	16.8	17.1	9.5	7.0	8.0	0.5	0.3	0.4	"	"
	St. George-in-the-East . . .	17.3	16.6	17.1	6.3	4.0	5.1	0.4	0.2	0.3	"	"

(Signed) T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.
Note.—The standard illuminating power for common gas in the Metropolitan is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

Can be made on their Patent principle to pass the gas without any Oscillation or Variation in Pressure.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO. Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.

The Judges' report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is—"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."

GWYNNE & CO.'S PATENT COMBINED EXHAUSTER AND ENGINE.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce machinery of the very highest quality, and most approved design and workmanship. The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

SUPPLEMENT

TO THE

JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XXXVII.

LONDON, JUNE 21, 1881.

No. 945.

BRITISH ASSOCIATION OF GAS MANAGERS. EIGHTEENTH ANNUAL MEETING.

NEVER has there been recorded a better attendance at any of the gatherings of the British Association of Gas Managers than when, in the Masonic Hall at Birmingham, on Tuesday last, Mr. Charles Hunt, President of the Association, rose to open the business of the meeting. The large hall was completely filled, and the President was received with a warmth of welcome which augured well for the success of the subsequent proceedings. A special feature of the opening ceremony, if such it may be called, was the appearance on the platform of Alderman R. Chamberlain, Mayor of Birmingham, who, in a few well-chosen sentences, greeted the members of the Association on behalf of the Corporation. It was a happily conceived way of testifying to the interest naturally taken by the governing body of a place where the gas supply is public property, in the fortunes of an art which has an existence so closely bound up with the life of modern towns; and it was also, as the Mayor himself remarked, a sign of the esteem in which the Corporation hold the persons and services of the two Gas Engineers to the Municipality—Mr. Charles Hunt and Mr. Henry Hack. The Mayor's speech was well received, and after the President had acknowledged the courtesy of the Corporation in a suitable manner, the meeting at once proceeded to business.

The very large number of applicants for enrolment, both as ordinary and extra-ordinary members, whose names were read out by the Secretary (Mr. W. H. Bennett) at this stage of the proceedings, afforded gratifying evidence of the way in which the Association continues to assimilate the personality of the gas world, not only in these kingdoms, but also of the Continent beyond sea which we do not like to speak of as a foreign land. The continued swelling of the numbers of members of the Association, and the highly satisfactory manner in which, in the present instance, they came forward, intent upon business, combined to arouse just one passing doubt as to how, in a very few years, the great gatherings which should then be annually expected, may be housed and accommodated with assembly room in any but our largest towns. This prospective difficulty, which is of rather a pleasant character than otherwise, need not, however, be anticipated. If it ever assumes definite shape, we may rest satisfied that the organization of the society will be fully competent to grapple with it.

The Masonic Hall in New Street, where, as stated, the meeting was inaugurated, is a sufficiently capacious room, and not devoid of some claims to architectural graces; but its acoustic properties are woefully defective. The usually clear voice and distinct enunciation of Mr. Hunt were insufficient to ensure his words being easily heard in all parts of the hall; and such an unfortunate result promised badly for the comfort of speakers and listeners during the after proceedings, which forebodings were only too well borne out, as events proved. Still the greatest attention was paid by all to the President's remarks, and if any of them were lost, it could not be said to be the fault either of the speaker or of his willing hearers.

Opinions may differ respecting the merit of the address;* but it must be generally conceded to bear in almost every paragraph plentiful evidence of what may be called the official personality of the composer. We hear the Gas

Engineer, it is true, but, especially in the earlier part of the address, it is the Gas Engineer to the Corporation of Birmingham, who was hardly perceptible in Westminster last year. The difference is, of course, easily explicable, for now the President's foot is on his "native heath," and his name is—Mr. Charles Hunt, of Birmingham. The President, indeed, mentioned the fact that he is the first representative of a Corporation who has ever occupied the chair at a meeting of the Association, and he certainly lost no time in opening up a subject which is distinctly of importance to Local Authorities having the control of gas undertakings. The commencement, and, in fact, the greater portion of the address is taken up by a strong statement of the policy of Corporations in regard to the much-argued question of prices and profits. Under the circumstances, it is unnecessary to inquire why the President took the side of those who advocate the application of gas profits to relieving rates; it is sufficient to remark that in powerfully espousing their cause, Mr. Hunt displayed a capacity for finding and building up arguments which is worthy of all admiration. The case was stated, as against the views held by ourselves and others, with more fulness and aptness of illustration than ever before; and if we are still unconvinced, it must be owing to the badness of the principle rather than to the weakness of its exposition. Briefly, the President's conclusion appears to be that the matter is one which only concerns the ratepayers of any particular locality. If they choose to allow their representatives to sell gas at cost price, well and good; if, on the contrary, they like to make profits on their gas supply, they are quite justified in doing so. Hence, in matters of Corporation gas policy, "Whatever is, is right." Now this belief, if it had really been rooted in Mr. Hunt's mind, should have led him to decline to discuss the question at all, especially before those whom he elsewhere stated to have no right to any than common individual opinions thereon. We do not hold such a creed, and neither does he, or he would not have wasted five words in this connection. We believe in the existence of a standard of right and wrong whereby even the actions of Local Authorities may be gauged, and we therefore proclaim our difference with the President on this matter, and intend to show how this difference is widened rather than removed by the arguments contained in the address.

In the first place, we hold the principle, nowhere controverted or even mentioned by the President, that it is unjust to make one resident or trader in a town pay more than his due share of the burden of local government. There is no evading this simple proposition; it must either be accepted or the reverse. It is easy enough to becloud the plain issue here stated; but when we want to test the truth of any maxim or practice of social life, we must follow the method of all great thinkers, and strip the problem to its elementary components. In other words, a theorem must be true in simple figures, if it is to be assumed as correct for complex relations; and it must apply universally, or not at all. We are now, of course, speaking with reference to right and wrong in the abstract, and as superior to, and irrespective of considerations of policy, which will be dealt with later. Leaving Birmingham out of the question, are Mr. Hunt's principles, which for the moment may be deemed applicable enough there, equally practicable in every place, of whatsoever size or howsoever situated? Clearly not, and an example is easily to be found. We had occasion, during the latter half of the past

* This appeared as a supplement to last week's JOURNAL.

year, to refer to a small district where the consumers of gas supplied by the Improvement Commissioners objected to being mulcted heavily for the relief of the ratepayers of the whole district, of which the gas-lit portion was but a fraction. The Commissioners themselves felt the wrong, and took steps to obtain the sanction of the superior powers to a rearrangement of their affairs, with the object of rectifying the injustice complained of. Here was a typical case, differing in no respect from many others, save in the fortunate circumstance that the inherent injustice of a procedure which might, and does pass unnoticed when gas is cheap, and gas supply and local board districts are more nearly contemporaneous, became highly magnified. We cannot see any reason why what was wrong in Lytham, is right in Birmingham or Manchester. And if it is urged that "circumstances alter cases," we might retort that this is the same argument used by Protectionists against Free Traders, for American and German adherents to the Tariff always maintain that the principle of open trading which holds good in England would not apply in their case, whereas our own Free Traders as stoutly contend for the universality of the principle, even when confronted with such apparently unfortunate facts as the ruin of the British sugar trade. In Lytham, as elsewhere, the credit of the ratepayers was pledged for the purpose of obtaining capital from the gas undertaking; and this is always a strong point with those who think with Mr. Hunt; yet it was not allowed to interfere with the ultimate settlement of the matter.

And now—having fairly launched out upon the sea of considerations other than those of plain duty, upon which those who shut their eyes to that guide-star are "driven 'devious, tempest-tossed'"—what is the meaning of this ratepayers' guarantee, and how is it to be regarded? No sane man will assert that when Local Authorities purchase gas undertakings with money advanced by the Public Works Loan Commissioners, or borrowed from the public on the security of all the property of the borrowers, there is anything of the nature of a speculation in the business, or the faintest apprehension which can be measured by the sensitive touch of the Stock Exchange, that the principal and interest will not be borne wholly by the property for which the obligation is incurred. Then, as the consumers, in their capacity of ratepayers, voluntarily saddle themselves with the payment of the principal sunk in the concern, as well as the interest, with the natural expectation of obtaining a cheap supply of gas in spite of this unwonted double burden, what should induce them to undertake all this, with the further obligation of helping to pay rates for other people? Take another example. If gas consumers aid rates, a ratepayer may escape his rightful burdens by just so much as he retrenches his gas account—he may even be relieved in the rating of his private gas-works, if he owns any, by so much of the profit on the public establishment as other people may be induced to contribute. Where is the wisdom, to say nothing of justice, in a policy that can render such a state of things possible? If there is any reason why public expenses should not be borne by all classes of the community, we should like to know what it is. The President did not commit himself to the doctrine that Local Authorities should manage gas undertakings on strict commercial principles; this concession of the fundamental difference between public and private trading being needed, to avoid the risk of some ill-conditioned critic observing that the practice favoured in Birmingham has no limit. We are therefore told that the public good must enter into the considerations affecting the amount of profit to be made. Bringing forward our last illustration again from this fresh point of view, how is the public good served by relieving the rich manufacturing ratepayer out of the gas profits? Supposing that he employs a number of poor gas consumers, the expenses of supplying whom with gas are proportionately heavy, every one of these contributes besides in some measure to the rating of the millowner, while he himself need not even go through the form of paying out of one hand and receiving into the other.

There are many other considerations intimately connected with this subject, some of which may be very briefly mentioned here to show the labyrinth of side issues which spring up to confuse when one tries to find any other way out of the difficulty than by returning to the straight path. If gas is the best and cheapest agent for lighting up the poor man's cottage, as the President confesses it to be, and if the peculiar mission of Corporation gas undertakings is to conduct, with a view to the benefit of the public, what the Gas Companies regard as a purely commercial speculation, what greater good can be done than spreading the advantages of the cheapest and best light among the poor? We do not by any means advocate the instant appropriation, under all circumstances,

of surplus profit from Corporation gas undertakings to the mere reduction of the price. We regard this course as the means—not the sole, but obviously the most powerful means—of extending the consumption of gas for trade and domestic purposes, and above all among the poor. But more than this is required to place a good and cheap gas in every workman's cottage. A day labourer, although possibly a respectable man who pays his way, is compelled to buy his means of lighting, like his provisions, in small quantities, and, in order to save time, at the nearest shop. Trading Companies cannot afford to go so far out of their way to meet the requirements of such customers as can a benevolent Corporation; and we are convinced that an infinite amount of benefit in this direction would be done with an expenditure of profits that could go a very little way in the purchase of property for making new streets or other similar works, the chief advantage of which would naturally be experienced by posterity. Such enterprises in the way of popularizing gas must be seriously hindered in any place where a handsome profit is also expected from the business. Profit must not be looked for if the consumption is subdivided among thousands of poor houses when the gross rental is but little in excess of the cost of distribution, collection, and the inevitable loss. Is there not also a risk that the benevolent, because unremunerative, portion of the operations of an undertaking may be regarded with disfavour, since they must necessarily interfere not only with the usual subvention, but also with possible reductions in the price of gas to the better-paying consumers? We know that this is frequently the case, and that in many localities where the gas supply is in the hands of the public authorities, there are frequent complaints of the unwillingness of the department to undertake unremunerative business, although it might be for the special benefit of the poor. When no profit is looked for, there can be no objection to one class of consumption more than another, and increased cost of distribution, necessitated by the service of poor districts, need not be so jealously watched; for if gas is to be universally introduced into the homes of labouring men, it must never be forgotten that the ordinary methods of collection, &c., competent to conduct a more remunerative trade must be greatly altered, at a considerably increased expense.

We might further argue, on the ground of local administrative economy, that it is bad policy to give the spending departments of a Corporation a fixed allowance which does not come immediately out of the ratepayers' pockets. Such departments are always prone to increase their expenditure, and require to work under a strong and ready check. If any one denies this, we will go further and maintain that whatever amounts may be extracted from the gas consumers of any town where the practice is followed, the rates have very rarely been lower than in other places where the authorities have had to raise their revenues by direct rating. As a general rule, the ready income from gas has proved a dangerous incentive to extravagance on the part of Improvement Committees and others who have learnt to rely upon it, and consequently no commensurate good has been secured by the over-taxation of the consumers. If examples are required, we will cite Manchester and Salford as amply illustrating our meaning. The President draws a parallel from the Government service, and holds up the Post Office as a model of a profitable undertaking, something analogous to the working of a ratepaying gas undertaking, and in all respects challenges our admiration for the method of raising revenue at present directed by Mr. Fawcett. Now, we are not sure that this choice of a pattern is a happy one, especially at the present time, when reports are rife of insubordination and discontent among an important section of Post Office *employés*. It is generally believed that the revenue of the Post Office is simply an evidence of modern commercial progress; it was not started as a great profit-making concern, and the later development of this side of it has not been so unattended with general complaint as Mr. Hunt supposes. If he considers the postal service is perfection, a great many people do not share his respect for it, and would like to see the administration improved, and the condition of the *employés* ameliorated. It is not putting it too strongly to say that the obstruction to the introduction of cheaper rates for telegrams, the oppression and semi-starvation of the postal servants, and the slowness of the administration to admit general reforms, are directly traceable to the growth of the modern habit of looking to the Post Office for a substantial and increasing revenue.

Finally, we will close this part of our comment on the address by referring to the President's challenge of proof that the practice of Corporations acting as traders is illegal. We might as fairly reply that the reverse cannot be more conclusively proved, and that the truth must be found by

regarding the question as a perfectly open one, to be decided on the general principles of justice. Besides, in the present connection, it is not so much the absolute right of corporate bodies to carry on a profitable trade which is in dispute, for it is evident that to their conducting some kinds of trading operations—such, for example, as selling at a profit the produce of a sewage farm—there can be no possible objection. The real point taken by the legal authorities is altogether missed by Mr. Hunt; for, as it appears to us, the objection is solely to that class of Corporation trading which is devoted to making profits out of one section of ratepayers for the benefit of others, whereby some few individuals must be made to pay more than their fair share of local taxation. We fail to find any warrant in the spirit or the letter of the legislation under which Local Authorities draw their revenues for any such unequal distribution of rating. Such Authorities are endowed with ample powers of raising money for purposes of improvement, sanitation, and otherwise, and we cannot believe that Parliament, in entrusting with gas undertakings Corporations having these powers simply meant them to serve as means for raising additional revenue for general purposes from a part of the population. Circumstances cannot alter the truth—they can only conceal it. If a Local Authority sells gas at a fair rate; if the limits of the gas supply and the local board district are conterminous; if every ratepayer is a gas consumer, and there is also perfect parity between his rating and his consumption of gas; if every care is taken to maintain the quality of the supply, and to extend the use of gas among the poor—then, and only then, may the matter be considered as broad as it is long. But vary any of these conditions, and the equality disappears. Much more then, since scarcely one of them is to be found existing in practice, is it unjust—to say nothing of impolitic—to require one inhabitant of a town to pay on behalf of another, equally well able to afford it, for public advantages which are shared by both alike.

The President was particularly happy in his references to the discussion of the relative cost and value of high and low yields of gas from coal, which was recently initiated in our columns by Mr. George Livesey. Reduced to its elements, the difficulty of such a problem disappears, for it is then seen that it solves itself, or rather that it lacks the necessary factors of a question which can be answered by regular mathematical proof. The coal to be used forms the most important element in the case, and this, with other conditions, depend so very largely upon circumstances, that any successful solution must necessarily be of strictly local application. No general answer could be given when the conditions would vary in every instance; and the matter must therefore be left in a great measure to individual judgment. It is something, however, as Mr. Hunt says, to know that the necessity for complete independence in such matters should have been impressed so clearly, as we believe was done by the correspondence in question, on all who read it. There can be no doubt that the attainment of a high yield of gas per ton of coal carbonized is a good thing to strive for; and that, all things being equal, the more coal that can be saved in the retort-house the better for the gas manufacturer. It is, however, just this general equality which is so difficult to appreciate, in the face of many conflicting opinions. If we could have the advantage of watching the working, over a period of some years, of several carbonizing establishments using similar coal, and obtaining equal values for residuals on a strict basis of proof quality, and of which some works produced a high yield of gas per weight unit of coal, while others gave less, in different proportions, we should even then have only proved the standard which is best suited for this particular coal under rigid conditions. The necessity for the exercise of the higher qualities of commercial management under the pressure of other circumstances would, fortunately, still remain. We are satisfied with this conclusion, because we do not desire, even if it were possible, to see gas making reduced to a rule-of-three question, however much we may despise the still more objectionable rule-of-thumb. It must now be conceded by many who until lately were not of that way of thinking, that a high yield of gas is not always the indication of good management; rather should the more delicate and obscure result of a high total value at a low cost of production be sought for, although the slightest approach to laxity in excellence of carbonization must still be vigilantly guarded against. The more sensible doctrine would be at once and unnecessarily prejudiced if it were to be imagined that low yields of gas meant the production of bad heats, and possibly leaky retorts, and careless work. The low rate of production thus caused is a very different thing from that advocated by Mr. Livesey, which is

really an outcome of the highest efficiency of apparatus, and smartness of management. While dealing with this subject, it must be stated, for the edification of those who may unduly admire the proceedings of Herr Hasse, of Dresden, that his high production per mouthpiece, which enabled him to dispense with so much new plant, by getting from his retorts twice as much gas as he had originally anticipated, is rendered easier by the low quality of the gas which is consumed in the German towns, as compared with that commonly supplied here. The President looks forward to the assistance of high heats in furthering the work of purification, with a spirit which, arguing from the present state of our knowledge, must be considered rather sanguine.

The reference to the unsatisfactory performances of gas-stoves for heating apartments, as compared with the success of appliances for the use of gaseous fuel for cooking, is most appropriate. There can be no doubt that a great reward awaits the man who can render available in a pleasant form the at present objectionable heat developed by gas, as commonly burnt for lighting rooms devoid of ventilation. We get the heating effect now, it is true, but spoiled by the presence of combustion products, which, when attempted to be drawn off by a chimney, take away the heat with them.

With reference to the aspiration of the President for some means of manufacturing gas in bulk, and for gas purification in closed vessels—his remarks on which together form the most suggestive portions of the address—it is impossible not to sympathize. At the same time, while confessing to the reasonable nature of his regrets that at such an establishment as Beckton there should be visible nothing beyond the multiplication of apparatus used in gas manufacture in the most insignificant works, it does not necessarily follow that anything else would be better. If a large coke or steel works is constituted of different details than a small factory of the same description, the largest spinning-mill is also nothing more than a multiplication of the small spindles which are to be found in the smallest; and yet it is not necessarily imperfect on this account. It has to be proved which comparison applies the more closely to gas manufacture as carried on at Beckton or elsewhere. In reply to this objection, Mr. Hunt might aptly remark that cotton or woollen manufactures are not handled in bulk, like coal and iron. We admit the distinction, and acknowledge the great advantages that might be obtained by a course of treatment of coal, for the extraction of gas and other products, which should be as continuous and free from petty subdivision as is the subsequent management of the gas on the present system. It may be said that it is now usual to make gas by retail; but from its entry into the hydraulic main it is treated wholesale until its final distribution to the consumers. The subject is of much interest, and the suggestion thus made may bear fruit in due time.

In touching upon the proposal of Dr. Wallace for dividing the gaseous distillate from coal into two parts, of which the first should be used for lighting and the last for heating, the President nearly approached the subject opened up by Mr. W. D. Scott-Moncrieff, whose suggestion to take off only about one-third of the usual yield of gas from common coal, and leave the remainder in the coke, aroused some interest during the past winter. It is, however, evident that material alterations must take place in the conditions of existence of gas undertakings before proposals of this kind can receive any serious attention. Whatever may eventually be the case, we cannot disguise from ourselves the fact that the use of gas for purposes other than lighting is, although extending, still so insignificant that, at its present rate of increase, many years must pass before the value of the trade will bear the charge of extensive structural alterations for its accommodation. It is nevertheless most important that this branch of trade should be fostered in every possible way, and with this end in view we are disinclined to favour the waste of surplus revenue in expensive cannels, or other costly means of maintaining an unnaturally high illuminating power for any particular locality. It would be absurd to decry the many advantages of an extremely brilliant gas; but while this may be a natural product for Glasgow or Aberdeen, sixteen-candle gas is good enough for all practical purposes, and should suffice for places where a higher power could only be secured at a disproportionate cost. If the selling price be kept down by every fair means, common illuminating gas will gradually win its way into favour as a general agent for all the purposes of a heating gas, without the necessity of serious alteration of the method of manufacture. We had thought to have done with the arguments which filled our earlier paragraphs; but in this connection it may be permissible to ask how the President is able to reconcile his later declaration that "every penny per

"1000 cubic feet taken off its price increases its chances of permanent employment in this direction, and removes it to a less measurable distance from competition with carbonic oxide," with his former adherence to a policy of weighting gas with charges with which it has no direct concern? Let us ask, further, as the ratepayers' security is so often talked of, how the interests of ratepayers embarked in gas supply may be better served—whether by taking every penny per 1000 cubic feet off the cost, and so aiding in establishing coal gas safely beyond the reach of competition by electric lighting or carbonic oxide gas heating; or by restricting the sale of common gas by so much as it is taxed for laying out parks or making new streets, until, being confined in use to those purposes which cannot, under present circumstances, be otherwise served, the same competing agents may perhaps arise, and find it with small support which they cannot remove. We advocate the popularizing of the use of gas as a consequence of the policy so admired by the President, in what we must consider his better moments, of taking every penny off the price—in the case of Companies, by the operation of the sliding scale for obtaining cheap capital; and in that of Corporations, by the principle of devoting gas profits to extending the service and lowering the rates at which it can be distributed to all classes of consumers. Every one must admit the desirability of this great result, and we must be content to bear the accusation of obstinacy, if incurred in consequence of our present assertion of unshaken faith in the absolute soundness of our own principles of action to obtain the required development.

The presidential address concludes with a very short but eloquent appeal on behalf of the Benevolent Fund of the Association, which appears not to have received so much support as its work requires and deserves. Not to enter into an unnecessary amplification of the President's appeal, it may simply be pointed out that whatever differences of opinion may have at one time existed with regard to the utility and desirability of the movement, now it has been in actual operation, and has acquired claims on the part of those for whose benefit it was intended, the necessity of supporting it cannot be questioned. It is one thing to establish an organization of this kind, and quite another to maintain and extend it. The former may be fair matter for debate, but not so the latter, unless it can be shown that the institution has so far failed in its work that its continuance is not to be desired. This cannot surely be urged in the present instance. Every one must feel, after Mr. Hunt's announcement, that supporting such a useful and unostentatious organization is an imperative duty for all who may be concerned in its welfare. They must feel it—and in the right place, which is the pocket; and thus, with its last words devoted to beneficent objects, the presidential address came to an end.

After the President's address had been delivered, there was only time for the reading and discussion of a short paper before the hour for adjournment; Mr. R. P. Spice's communication, on the subject of the St. John purifying apparatus as in use at Rochdale, being the one chosen. We shall reserve particular comment on the papers till another occasion, when they are published in the regular course, desiring only to remark here that the eagerness of the meeting for work was early manifested in the sharpness of the discussion upon Mr. Spice's remarks.

In the afternoon there was a general muster of members and their friends for the tour of inspection of the Corporation Gas-Works. Eleven large omnibuses were chartered for this service, and were packed to their utmost limits, and as the procession started from the Council Chamber the principal streets of the town were passed through before Saltley was reached. Here every preparation had been made by Mr. Hack and his assistants for conducting the large party of visitors round the establishment, the completeness of all the arrangements of which was much admired. Mr. Hack's corrugated annular condensers attracted considerable attention, as did the handsome exhausting plant, consisting of some very large machinery of the treble-cylinder reciprocating order, and including also a large-size steam-jet exhauster. Machinery, indeed, may be said to have been the leading feature in these works, as structural boldness was the principal characteristic of the Windsor Street station, afterwards visited. Before leaving the subject of Mr. Hack's works, it should, however, be remarked that the gas generator class of retort furnaces are on trial here, several experimental examples thereof being shown in different states. Observations on this circumstance tend to confirm our previously formed belief that when the generator system is

established in this country it will not be as the result of the importation in its entirety of any particular continental model of construction, patented or otherwise. Mr. Hack and Mr. Hunt, like many other Englishmen, are busily engaged in investigating the principles of the system, but mainly with a view to overcoming, in ways of their own, its acknowledged difficulties. They will not object to learn from the methods of others who have earlier engaged in the search for the best build of furnace; but daily proof is given of the strong spirit of independence in which our own engineers are reviewing the works of the German pioneers in this direction. This is also very fortunate for the ultimate general adoption of the idea, for unless our countrymen have lost the practical sense for which their predecessors have been famed, the result of their investigations cannot fail of at least equalling, and perhaps surpassing, their original patterns.

Proceeding to Windsor Street, the interest of the visitors was naturally mainly concentrated on the new side of the works, although there was much to see in the older parts of the station. Mr. Hunt's magnificent new retort-house, divided down the centre by a canal dock, of course awakened the astonishment of the unaccustomed spectators, whose respect for the vastness of the structure must have been deepened by the information given by the designer that the work would be proportionately cheap. Economy and flimsiness are certainly not synonymous terms with Mr. Hunt, whatever others may believe. The twin tanks, which are to surpass in dimensions anything yet attempted, next came under review. These works are yet in the stage of excavation, their full importance being perhaps less easy to appreciate by the eye now, than when the whole gaping voids, with their clean-faced walls, shall be fully exposed. Still, to a practised eye, the maze of timbering through which one has to peer to obtain a glimpse of the excavation proceeding far down in the depths, and the busy spectacle of steam-pumps and hoists in full operation at various spots on the area of the works, afford sufficient evidence of the magnitude of the operations in progress. The lightness of Mr. Hunt's iron houses for purifiers and meters, and their elegance, were generally remarked; and also—as, indeed, at Saltley—the skilful use made of hydraulic power throughout the establishment. Before quitting the yard, mention should be made of a show of Herr F. Siemens's great regenerative gas-burners, one of which was suspended in the open space near the new retort-house, and the other in regular use over the entrance to the offices; both being in full and successful action. It is hoped that Mr. Hunt will speedily have some information to impart respecting the performance of these burners, from tests made by himself.

Dr. Siemens engrossed the whole evening sitting with his interesting and somewhat controversial paper, and showed for the first time how the regenerative idea, so successfully applied by his brother to large lamps, can be adapted to gas-burners of average capacity. The reception accorded to the great practical philosopher was as personally flattering and as independently critical as he could have desired, which is saying much.

Mr. G. E. Stevenson's paper, in the subject of which Dr. Siemens is naturally much interested, had to be held over till the following morning, instead of being taken, as arranged, after Dr. Siemens's own communication. As we may not have another opportunity of remarking on the subject, we may state here our satisfaction at the substitution of an interesting and debatable paper from a man whose name would suffice to draw a goodly audience, for a formal lecture, which, as in past years, might be interesting, but which, also from experience, might merely have been a tame *réchauffé* of a few elementary text-books on some well-worn science.

Next morning's papers were somewhat heavy, and an early retreat was made for the purpose of visiting Messrs. Tangye's works at Handsworth. The history of this establishment, and of the commercial and engineering progress from small beginnings which it represents, is one of the remarkable episodes in the contemporary industrial record of the country. Even supposing that some of Messrs. Tangye's men had made themselves presentable for the occasion, the good appearance of the *personnel* of the establishment, no less than the fine class of tools and appliances in use therein, made a most favourable impression on the visitors, and confirmed the report which all had heard respecting the admirable organization and discipline of the works. We lack space to describe in full detail the engines and machinery, finished off in the manner appertaining to the firm, which were specially displayed on this occasion, and can only mention, in passing, the powerful pump, the quick whipping-hoist, and the excava-

tor's crane shown together in full operation—all of which deserved more attention than time permitted.

The Mayor's reception at the Town Hall, in conjunction with the *conversazione*, given by the Gas Committee, which took place on Wednesday evening, was a very brilliant affair. The hall was prettily decorated, and the amusement of the guests was provided for by the collection of a great number of highly interesting objects, more or less connected with gas lighting, displayed on tables on the floor of the hall itself, in the galleries, and in the adjacent corridors. Among other exhibits were a fine assortment of books on gas manufacture and cognate industries, gathered apparently from the four corners of the earth; and models of retort-stoking machinery, from the almost obsolete patterns of only ten or twelve years ago to Ross's latest. Photometers from the leading makers afforded much scope for wonderment to many unsophisticated visitors, who made the lives of their better-informed friends burdensome by demanding instruction in the niceties of gas valuation, and such abstruse matters. Collections of coal-tar dyes in bottles with cunningly arranged lights behind them, cast a kaleidoscopic radiance from a conspicuous place opposite the organ; and everything that would light up or go by gas was at one time or another started with the brilliant staple of the Birmingham Gas Department. Messrs. Tangye Bros. showed a new gas-engine, simple and apparently effective, from which they expect great things; but, in short, it would fill our space were we to so much as indicate the nature of a tithe of the many beautiful and useful articles sent freely by well-known manufacturers and others, and arranged so effectively under the superintendence of Mr. Edwin Smith and Mr. Hunt, with a view to show the width of range of gas and its congeners and derivatives.

The following day was well occupied, first with reading and discussing—not, it must be owned, as fully as might have been wished—three very capital papers; and then, after a recess for luncheon, came the great business of the meeting so far as the life of the Society itself was concerned. A pleasing incident must now be recorded. Immediately after the re-assembling of the meeting, the representatives of the donors and managers of the Birmingham Medal Fund presented the Association, through the President, with the medal and fund which have been formed to reward original discoverers in the domain of gas lighting. Mr. R. O. Paterson and Mr. E. Smith, on the part of the donors, and Mr. R. H. Jones and Mr. E. Goddard, on behalf of the recipients of the munificent gift, aided the President in rendering the brief ceremony as unobtrusively impressive as it could well be made. It is not to be supposed that the actual medal was handed over; provision has been made for it, and as soon as the day's proceedings were over the founding of the dies was proceeded with. The medal will be awarded at intervals of not less than two years, to any person in the world whom the Institute, who now own the fund, by the action of their Council and members, may find most worthy to receive it. Let us, without incurring the charge of selfishness, hope that the first receiver of this honourable and valuable distinction may be our own countryman! But if the gift should be destined to leave us—and we are confident nothing but pure and high merit will weigh with those who may have to dispense it—may we accept the lesson, and determine to keep it at home for ever after. Something in reference to the improvement of the work of the Association was done on the opening day, when the appointment of a Committee of Research was agreed to. This is a step which has been advocated in the JOURNAL so frequently and so recently, that we shall not now dwell upon its advisability, which must be patent to all. The discussion of the proposals of the Committee for a reconstitution of the society as an Institution with a new name and code of rules, was looked forward to as likely to be somewhat lively; and the expectation was abundantly fulfilled. First of all, in opening the subject, the President, perhaps rather unadvisedly, gave notice of some verbal alterations which the Committee proposed to make in the rules as printed and distributed previously to the meeting; and this prepared a way for such a flood of vague dissatisfaction with the entire scheme, poured out from all parts of the hall, that the strongest efforts of the most stalwart members of the Committee were required to stem the rising tide, and save the rules and themselves. Much time was wasted in discussing the new title, with the result of carrying an amendment to the proposal of the Committee, and so The Gas Institute was eventually adopted as the new name, after great display of dictionary reading on the part of some of the members present. To us it appears a perfectly needless alteration, and its chief import at the time was undoubtedly the consequent giving way of the Committee. The malcontents of the meeting perhaps thought the Committee would

be equally pliable in the matter of the rules, and so a vast quantity of aimless fault-finding was allowed to escape, diluting and prejudicing the value of the few really thoughtful objections which were at the same time expressed. The effect of so much condemnation was unfortunate; the Committee "put their foot down," if we may so express the fact, and, by turning the question into a matter of confidence in themselves, carried the day, with an important qualification. This partial success from without was due to the sensible remarks of Mr. Denny Lane, who may be said to have supported the rules while desiring that members should have a further opportunity for expressing their views thereon to the Council. We, like many more, are not quite satisfied with the rules in their present shape; and trust the Council—as the governing body must now be called—will see that they do not go far enough in several directions. But we are equally certain that no good would have been effected by referring the constitution of the Institute for another year either to the Council or to a mixed commission. By the present arrangement, what amounts to a Committee of the whole body of members is secured, and nothing can be deemed finally settled until this Committee has had a year's existence. The debate of Thursday last, fiery as it was, will have served a useful effect if it directs the attention of members to the new constitution as something still in process of formation, and for which they are individually and collectively responsible. The sincerity of any member's professions of solicitude for the welfare of the new-born Institute will now be gauged by his readiness to undertake the slight toil of laying his views in writing before the Council. The executive authorities have a right to expect to be strengthened in their work by the support and criticism of independent members, especially since the loudly-echoed cry for more time for consideration was raised at the late meeting. There may be further reforms still contemplated by a few members of the Council, which cannot be carried into effect without exterior support. A course settled upon by the majority of the old Committee may be reconsidered, if opposed to the deliberate opinion of the majority of the members. There is yet time for much alteration—as there is certainly room for improvement—if the general body of members do their duty as conscientiously and well as the Revision Committee have already done theirs; and any man who does not state his views before the appointed time next year will not have the slightest ground for complaint if he is then bidden to hold his peace.

We have now little further space at disposal for comments respecting the dinner, and the excursion to Enville on the following day. The former was well attended, even crowded; and the latter, despite several showers during the day, was a great success. Nothing could surpass the anxious labour of the Stewards, and all concerned in the arrangements, to make the affair most complete; while the demeanour of the official hosts, and of the Chairman, Mr. G. King Harrison, was certainly perfection. The last day of the gathering was, therefore, of its kind, a fitting climax to those which had gone before; and materially helped to confirm the impression, which every visitor must have carried away with him, that while the British Association of Gas Managers had consummated its end at Birmingham, in a manner that could hardly have been foreseen by its early friends, The Gas Institute had definitely started on its career under the most favourable conditions that its strongest adherents could have desired.

REPORT OF PROCEEDINGS.

The Eighteenth Annual General Meeting of the Association commenced on Tuesday, the 14th inst., at the Masonic Hall, New Street, Birmingham, under the presidency of Mr. CHARLES HUNT, M.I.C.E. The handsome and commodious hall, which had been placed at the disposal of the members, was well filled by probably the largest meeting which has been held since the foundation of the Association.

Previously to the commencement of the regular business, the PRESIDENT announced, amidst considerable applause, that the Mayor of Birmingham (Alderman Richard Chamberlain) desired to address a few words to the meeting.

The MAYOR said: Mr. President and Gentlemen,—The few words that I wish to say are those of welcome to gentlemen like yourselves, engaged in a work in which the Corporation of Birmingham have naturally so deep an interest. We must remember, however, that we are in the very infancy of our undertaking, for when persons talk of electric lighting being in its infancy, we have to consider that gas lighting is just in the same position; and owing to the restrictions which were

placed by Parliament—wisely, as was supposed at the time; foolishly, as we now know—upon the dividends to be paid to gas shareholders, the incentive to invention, improvement, and economy, has also been restricted in like manner; and it is only now, when the gas managers in some districts are aware that by economizing in their manufacture they can also extend their dividends, that there has been anything like this incentive. The same thing, of course, takes place when large corporations undertake the management of gas-works for the benefit of the ratepayers. It is only in this way, gradually, as I say, that the proper incentive is applied to stimulate invention and economy in all directions. This being the case, there is a greater reason than ever for gas managers to meet together to preserve an *entente cordiale*, and in every way to assist one another in the important work in which they are engaged. And thus, when you come to Birmingham—connected with gas lighting almost from the very beginning; because, as most of you are aware, it was at Boulton and Watt's factory that the second instance of gas lighting took place—it would be discourteous at least, and certainly would not represent the feeling of the inhabitants, if I did not, as Mayor of the town, bid you a hearty welcome, and express the pleasure we feel at seeing you here together. I have to congratulate the Association that it is not satisfied with merely discussing what has been done, and what is being done, but that the members wish to devote themselves to developing to the utmost the possibilities of the future; that for this purpose they have succeeded in substantially endowing a medal for research; and that when you meet again next year you will, I hope, have to announce to whom this medal is to be given. I am very glad, too, to learn that the Committee intend to do their utmost to encourage research in all directions; for my own opinion—which is not worth much, because you all know more about gas making than I do—is that we have hardly begun yet to make gas. I believe the possibilities of the future are almost infinite; that we shall find out, in no very long time, that the processes of manufacture can be greatly simplified; that the residuals will be turned out—not as at present, in such a form that the chemist has to deal with them afterwards—in the form in which they are commercially required; and that by these means we shall not only reduce the cost of making gas, but increase the price of the residuals. Then, again, for the chemist there are also indefinite possibilities. We do not yet know what may not be produced from these extremely valuable residuals. Only the other day we learned that indigo is actually being produced from coal tar. The price is at present too high for a commercial development, but this is a matter which will have to be, and no doubt will be settled. I look forward to the time when, in fact, we shall almost be able to give away the gas, if not pay people to consume it. Then, on the other hand, there are also indefinite possibilities with regard to improvements in the use of gas. We know how much gentlemen like Mr. Sugg, Mr. Bray, Mr. Goddard, and others, have done in improving the burners we use; but very much more yet remains to be done in this direction, and I hope we shall soon see a good deal more done in the way of carrying off the products of combustion—the main objection to gas burning. We in Birmingham, and I believe people of many other towns, have done a great deal to encourage the use of gas for the purpose of cooking, for which it is so admirably adapted, and also in gas-engines, which in many cases are very convenient and economical. With all these matters you are more familiar than I am; but I could hardly bid a meeting of gas managers welcome without alluding to the great field for research that lies open before them. The greatest encouragement to research of this kind is the feeling that your work will be recognized, and gratefully recognized, not only by your fellow-labourers, but also by the public at large. For myself, speaking for the public as Mayor of this town, I feel that we are greatly indebted to the gas managers for their labour. We in particular are indebted to our extremely able Managers—your President and Mr. Hack—for the admirable manner in which they conduct our works; and we are very glad to show the feeling we have towards them by bidding you a hearty welcome. It is unfortunate for me that I have a great deal on my hands, and that I have to leave immediately to attend an important committee meeting; but I hope you will fully understand that it is only from necessity I shall be absent during the delivery of the President's address, which I am quite sure will be not only interesting but instructive. I hope you will all find your visit to Birmingham a pleasant one; and that the result of your deliberations will be to do something to advance the matter which we all of us have so greatly at heart.

The PRESIDENT, in the name of the Association, thanked the

Mayor for his kindly words of welcome, and for the good wishes he had expressed for the success of the meeting. He said he was encouraged to hope that this meeting, which promised to be one of the largest the Association had ever held, would also suffer nothing by comparison with its predecessors in point of interest and usefulness. Those present were fully aware of the onerous duties which devolved upon the Mayor, and this made them more deeply sensible of his kindness in coming amongst them. They looked forward with much pleasure to the reception by the Mayor on the following evening, and to his presence at the annual dinner on Thursday.

The minutes of the previous meeting, and the statement of accounts, were then taken as read.

The SECRETARY (Mr. W. H. Bennett) next read the following report of the Committee:—

"Your Committee present the following report upon the condition and progress of the Association.

"The total number of members of all classes upon the roll of the Association, on June 1 last, was 675. During the year just ended the number of members who have withdrawn has been 6. During the same period information has been received of the deaths of 8 members. These are as under:—

Bell, T.	Gas-Works, Selby.
Bowen, H.	Do., Cardiff.
Brown, W.	Victoria Foundry, Manchester.
Evans, F. J.	Claypods, Brentford.
McCrae, B. M.	Gas-Works, Dundee.
Muriel, G.	Do., Bahia.
Roberts, W. T.	Gas Office, Altrincham.
Throsby, W. P.	Gas-Works, Lincoln.

"Your Committee have had under consideration during the year several important matters affecting the usefulness and position of the Association.

"The suggestion made at the last annual meeting by the Acting-President (Mr. Charles Hunt), for the collection and publication by the Association of extracts relating to gas from home and foreign journals, was referred to a Committee of members who were willing to assist in the work of translating and extracting. It was not, however, found practicable to carry it into effect, owing merely to the want of efficient machinery for sufficiently rapid publication. The Committee are informed that the proprietors of the JOURNAL OF GAS LIGHTING purpose taking up the suggestion.

"Proposals having from time to time been made for the formation of a class of Associates, and an increasing difficulty having arisen as to admission of applicants for membership under the existing rules, these latter were, upon the eve of the last general meeting, referred to a Sub-Committee, with instructions to report to the Committee upon any revision of them which they might deem desirable. This Sub-Committee—which consisted of the President, E. Goddard, G. Livesey, C. Woodall, W. J. Warner, G. W. Stevenson, T. Newbigging, and W. Carr—considered the subject long and anxiously, and ultimately presented a report to your Committee, which, with a few amendments, was unanimously adopted. That report, in the nature of a revised Code of Rules, has since been printed and circulated amongst the members, and a resolution for its adoption will be submitted to the meeting. The Committee confidently and unanimously recommend the proposals therein contained, as forming, in their judgment, the basis of a satisfactory settlement of many questions that have long been agitated.

"A growing desire having been manifested for the formation of an Investigation and Research Committee, under the control of the General Committee of the Association, it has been decided to submit the following resolutions giving effect to this desire:—

- "1. That it is desirable the organization of the Association should be employed for the purpose of aiding investigation into doubtful or difficult questions relating to gas manufacture or science.
- "2. That the Committee are hereby requested to prepare and circulate, before the close of the current year, a series of questions to be answered from the experience of members, or to lay down the method of investigation in regard to any such matter as they may determine, and to report the result of their inquiries to the next general meeting.
- "3. The members of the Association here present pledge themselves to aid the proposed labours of the Committee to the utmost of their ability."

The PRESIDENT moved that the report just read be printed and circulated with the Transactions.

This proposal was carried unanimously.

The PRESIDENT then formally moved the three resolutions in the report with regard to investigation and research.

Mr. CORBET WOODALL seconded the motion, which was at once carried unanimously.

ELECTION OF MEMBERS.

The following gentlemen were, during the meeting, unanimously elected ordinary and extra-ordinary members of the Association respectively:—

ORDINARY MEMBERS.

Anderson, P. G.	Santiago, Chili.
Bark, S.	Godalming.
Bell, W. H.	Selby.
Betley, R.	Poulton-le-Fylde.
Braithwaite, J.	Bridgenorth.
Browning, R. A.	Neath.
Bullock, J.	Chester.
Campbell, C.	Sheffield.
Chew, J.	Blackpool.
Chubb, F.	Ironbridge.
Cocks, J.	Manchester.
Coles, H. R.	Halesowen.
Collett, T.	Dudley.
Darwin, F. H.	Ventnor.
Davis, J.	Bath.
Easson, J.	Wolverhampton.
Elliott, C.	Leyland.
Greenough, M. S.	Boston, U.S.A.
Hack, H.	Saltley.
Hallam, E.	Lincoln.
Hopper, J. H.	Glastonbury.
Hoyle, R.	York.
Ineson, J. S.	Ripon.
Linton, F. T. C.	Leath.
Meiklejohn, C.	North Berwick.
Mitchell, A.	Bury St. Edmunds.
Mitton, J. L.	Knowle.
McGregor, W. G.	Ringwood.
McKenzie, J.	Wilmslow.
Oldfield, W.	Purston.
Parry, J.	Cardiff.
Pedder, G.	Birchington.
Pitts, J. W.	Gomersal.
Pouchain, C.	Rome.
Roberts, H.	Widnes.
Silcox, J. H.	Pembroke Dock.
Simpson, J.	Alresford.
Smith, E.	Birmingham.
Smith, J.	Bangor.
Smith, J. H.	Sutton-in-Ashfield.
Stevenson, E. H.	Westminster.
Stewart, S.	Greenock.
Swallow, W.	Carnforth.
Taplay, H.	Stoke-upon-Trent.
Temblett, S.	Whitchurch.
Terrace, D.	Maryhill, Glasgow.
Tew, W. T.	Warwick.
Thomas, P.	Andover.
Ward, J.	Brierley Hill.
Watson, P.	Stirling.
Weeks, O. J.	Cambridge.
Wells, W. J.	Stamford.
West, R.	Lichfield.
Wharton, H. E.	Basford, Nottingham.
Wilcock, J.	Shipley.
Yeates, T.	Bracebridge.

EXTRA-ORDINARY MEMBERS.

Adkins, W.	Birmingham.
Blocksage, J.	Dukinfield.
Burrows, H. F.	London.
Chuter, J. P.	Epsom.
Coates, J.	London.
Craik, G. W.	Barnsley.
Dawson, G.	Thorncliffe, near Sheffield.
Dempster, A.	Elland.
Donkin, B., jun.	London.
Drake, J. A.	Halifax.
Lennard, F.	London.
Marsden, J. T.	Lancaster.
Milne, J. L.	Edinburgh.
Nichols, J. H.	Newton-le-Willows.
Wells, C., jun.	Sutton, near Hull.
Wolstenholme, J.	Manchester.
Wood, A. P.	Beeston, Notts.

PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered his address, which we were enabled by his courtesy to publish as a supplement to last week's JOURNAL. At its close he was received with cheers, again and again renewed.

AWARD OF PREMIUMS, ETC.

The PRESIDENT next announced that the awards of the medal and premiums for papers read at last year's meeting were as follows:—

The medal to Mr. G. Barker, for his paper on the Construction of Gasholders.

The first premium of £10 to Mr. Frank Livesey, for his paper on Retort Furnaces.

The second premium of £7 to Mr. G. E. Stevenson, for his paper on Regenerative Furnaces.

The third premium of £3 to Mr. F. W. Hartley, for his paper on the Standards for Estimating Illuminating Power.

APPOINTMENT OF SCRUTINEERS.

Mr. T. L. Sheppard (Farnworth) and Mr. S. P. Leather (Burnley) were appointed Scrutineers of the ballot-papers for the election of Officers.

PAPERS READ.

The reading of papers was then proceeded with. These were taken in the following order; and we shall, as in former years, print them and the discussions to which they gave rise in succeeding numbers of the JOURNAL:—

Tuesday Morning.—"The Treatment of Gas in Condensation by St. John's Apparatus." By Mr. R. P. SPICE, of London. *Tuesday Evening.*—"Gas Supply, both for Heating and Illuminating Purposes." By Dr. C. W. SIEMENS, of London.

Wednesday Morning.—(1) "The Advantages of the Regenerative System of Heating." By Mr. G. E. STEVENSON, of Peterborough. (2) "The Calorific Power of Coal Gas." By Mr. F. W. HARTLEY, of London. (3) "The Heating Power of Coal Gas." By Dr. J. ADAMS, of Glasgow. [This last paper was, in the absence of the Author, read by Mr. G. E. Wright.]

Thursday Morning.—(1) "The Economics of Gas Management." By Mr. H. WOODALL, of Leeds. (2) "The Incidence of Commercial Charges in the Selling Prices of Gas." By Mr. W. J. WARNER, of South Shields. (3) "Anti-Dips." By Mr. C. GANDON, of Sydenham. (4) "Stoppages in Ascension-Pipes." By Mr. D. F. GODDARD, of Ipswich.

THE BIRMINGHAM MEDAL.

The President took the chair at 2.15 p.m. on Thursday afternoon, and called upon Mr. R. O. Paterson (Cheltenham) to make a statement with regard to the Birmingham Medal.

Mr. PATERSON said in his capacity as President of the Midland Association of Gas Managers, and Chairman of the Birmingham Medal Committee, he had to ask the Association to accept a medal which had been subscribed for in order to encourage original research. In giving a brief account of the starting of the scheme, it was only right that he should accord all the credit for the original suggestion to the President, Mr. Hunt, for it was he who first formed the idea and laid it before the Midland Association and its friends. The scheme was very heartily approved of by those to whom he addressed his first circular, and steps were speedily taken to bring it to a successful issue. The result was that they now asked the British Association of Gas Managers to accept from them, as a token of their wishes for the prosperity of the gas interest, this medal, which they desired should be called the Birmingham Medal. The Hon. Treasurer would shortly state what the amount of the subscriptions was, but he (Mr. Paterson) might say the medal would be a handsome work of art, and of considerable value in itself. The object had been to make the medal somewhat characteristic of their profession, and on one side it bore the face of William Murdoch. On the other side they had placed an allegorical design, embracing four small medallion portraits. These were of Clegg, Malam, Perkin, and Bunsen. Their desire, in asking the British Association to accept this tribute of their regard, was that the Association might be able to inspire and create a greater amount of original research in connection with the science of gas making than had existed before. They felt that the medal would be an object to be prized and to be worked for, and though its intrinsic value would be considerable, this would be slight compared with the honour it would confer on its recipients. The rules which had been drawn up to regulate the bestowal of the medal were as follows:—

"1. The object of the medal is to encourage the extension

of the uses of coal gas. It is to be bestowed for 'Originality in connection with the manufacture and application of gas;' such qualification to be interpreted in its widest possible sense. It shall be awarded at the discretion of the Council, but at intervals of not less than two years, and may be awarded to persons of any nation.

"2. The meeting of the Council at which the medal is awarded shall be attended by an actual majority of such Council, of whom not fewer than three-fourths shall agree in the award.

"3. The Council shall, not less than one calendar month prior to the meeting at which the award is to be made, issue a circular notice to that effect to the members of the Institute. The notice shall set forth the object of the medal, give (after the first award shall have been made) the names of persons who have already received it, and invite members to send in the names of such persons as they may think fit for the consideration of the Council.

"4. The principal sum set apart for the endowment of the medal shall continue to be invested in the names of the Trustees for the time being of The Gas Institute, the said Trustees to have power, with the consent of the Council, to change the investment from time to time, and a separate account of such trust shall appear annually with the balance-sheet of the Institute, showing the nature of the investment, and the manner in which the interest money from time to time accruing has been disposed of.

"5. The Council shall from time to time frame such regulations as they may deem necessary for the disposal of any surplus funds, or for the determination of the medal award, in accordance with the spirit of the intentions of the donors.

"6. A copy of these regulations, together with such as may hereafter be provided, shall appear annually as an appendix to the rules of the Institute."

He had now, he said, simply to hand to the President these rules and the dies for the use of the Association.

Mr. EDWIN SMITH said that having had the honour of being Treasurer to the Medal Committee, he would lay before the meeting a short statement of what had been done. They had received in subscriptions £383 14s. 6d., of which £103 had been received from the owners of gas property in Birmingham and the immediate neighbourhood, £113 from gas managers in the same district, and £168 from manufacturers and others who were largely, if not solely dependent on the gas industry. In addition to this they had received £4 0s. 6d. for interest, making the total amount of the fund £387 15s. They had spent £4 15s. in collecting, printing, &c., and had paid £35 for the dies, and they had kept £25 for the first medal, which they should have the pleasure shortly of handing over to the Trustees. This would be the annual value of the medal. The total expenditure had thus been £64 15s., leaving £323 to be offered to the Trustees for the endowment fund. He was very sorry that they were not able to lay a copy of the medal on the table, but as they understood a proposal was about to be made to change the name of the Association, they did not think it wise to have the name inserted in the die until this point was decided. He had now only to express a hope that the medal would be found useful in very many ways. In the first place, he hoped it would be a permanent memorial of Mr. Hunt's presidency; and, as a Birmingham man by adoption, having spent the best part of his life in the town, he hoped it would be a creditable example of Birmingham workmanship, and at the same time be a memento of what he thought might be considered a pleasant and successful meeting of the Association. He hoped, too, that it would further the interests of the Association, beyond even the hopes of its promoters; and, above all, would promote the intentions of the founders by stimulating research, especially amongst the younger members of the Association. He had much pleasure in asking the acceptance by the Trustees of the balance of £323.

Mr. R. HESKETH JONES (Dover) said he had the pleasant duty of moving a vote of thanks to the founders of this handsome medal. Although his words would be few and quite inadequate to express the gratitude they felt for this act of generosity, he was sure the motion would be heartily accepted when put from the chair. For the last five or six years the work of the parent society had been slightly discounted by the provincial Associations, and there had been a growing feeling that something more comprehensive should be undertaken by the British Association—that, instead of the attention of its members being, as it were, concentrated on the three or four days of the annual assembly, they should be engaged in researches and comparisons which should be

gathered up in a practical manner, to the advancement of the science of gas making and the varied and extended uses of gas. The Midland Association, assisted by the Corporation of Birmingham with a donation of £50, followed by the owners of surrounding gas-works, and individuals connected with them, had raised a sum to found the Birmingham Gold Medal, which they were now asked to accept. It did not need any advocacy on his part to ask them to accept this gift, or to express their high appreciation of the good intentions of the donors. Personally he looked forward to this medal being put into the hands of a Research and Investigation Committee, to be awarded for special and extraordinary researches into the production and use of gas. That there were still many unsolved problems, was apparent from what took place on Tuesday evening. When they heard of the great differences in the value of gas of different qualities, and when there were also so many different qualities of raw material from which gas was made, it was evident that a separate investigation into them was needed before they could grasp Dr. Siemens's idea of separating the gases as they passed from the retorts, and distributing them in two sets of mains for the separate uses of lighting and heating. The meeting this year had proved the necessity for a new departure. They must not simply be content with meeting each other for two or three days, but be prepared to do battle for the furtherance of the interests of the calling in which they were engaged. He would move—"That the best thanks of the British Association of Gas Managers are hereby given to the donors and founders of the Birmingham Medal, and that the regulations attached to the gift be accepted."

Mr. GODDARD, sen., said he had much pleasure in seconding the resolution. The medal, handsome and valuable as it was, would tend, he hoped, to stimulate the younger members in those researches which were so necessary to be made.

The resolution was then put and carried unanimously.

The PRESIDENT (addressing Mr. Paterson) said it was with great pleasure that he had to convey through him to the donors the thanks of the Association for the medal. From the circumstance already alluded to of his connection with the matter, it might be thought that he was placed in a position of some little embarrassment; having, on behalf of the Association, to receive the medal and endowment; but, in truth, it seemed to him that his position was distinctly advantageous. He could most thoroughly appreciate and heartily endorse the remarks of Mr. Jones and Mr. Goddard in regard to this vote of thanks, and at the same time he knew that he spoke in the names of the subscribers, when he said they felt the appreciation of the Association to be their greatest possible reward. The best thanks they could offer to the subscribers would be to enter vigorously upon the course of investigation to which they were invited, not to allow the medal to remain unawarded for lack of merit, and above all to discharge the trust reposed in them with the greatest care and fidelity.

THE NEW RULES.

The PRESIDENT said he had next to bring forward a matter of very considerable importance—the proposed revision of the rules. A copy of the rules as signed by the Committee had been sent to all the members, and he had no doubt had been carefully studied. They would all admit that the proposed changes were characterized by considerable moderation, while at the same time they showed a careful regard for the interests of existing members. It had been said that these alterations had been made partly from a fear of competition by District Associations; but he need hardly point to the incident which had just occurred to show that, so far from there being any rivalry, either contemplated or actual, on the part of the District Associations, they were really a source of strength to the British Association, and had shown in a substantial manner how they could assist it. The proposals before the members were simply the result of the expansion of the Association. They were all aware that when the Association was first established, about seventeen years ago, the number of members did not exceed 70; but they now numbered, inclusive of the elections during the meeting, about 750. All would agree that it reflected no small credit upon the original framers of these rules that, having been originally devised for so small an institution, they had, with very trifling amendments, sufficed up to the present. At the same time it was not to be expected but that there should occasionally arise certain conditions not contemplated by the founders, and it had been a source of embarrassment to the Committee that a large number of intending members could not find admission under the existing rules. It had been a considerable grievance for some time past that, whereas managers of very small works,

making one or two million cubic feet a year, could readily be admitted, officials of very much larger works, who, although they were not the managers or engineers, yet occupied very responsible positions, could not be admitted. The rule had occasionally been relaxed; but, notwithstanding what had taken place from time to time in this direction, there had been a considerable amount of dissatisfaction evinced. Now this matter was so seriously considered by the Committee, that on the eve of the last general meeting the entire question of the revision of the rules, as affecting the constitution of the Association, was referred to a Sub-Committee, as they had heard from the report. They had also heard who were the members of this Committee, and he need not say that they represented almost every section of the Association. The Committee comprised gentlemen upon whose judgment and regard for the interests of the Association every reliance could be placed, and he need not say also that they brought to their work a determination to submit such a set of rules as they could advocate and defend on every possible point. The conclusions they ultimately came to were referred to the General Committee, when the judgments of the Sub-Committee were carefully considered. The rules which had been circulated were substantially the recommendations of the Sub-Committee, and they involved one or two material changes. The first was an alteration of the name of the Association. He knew that great objection was sometimes raised to a change of name, but in their case it seemed to be absolutely unavoidable. If they were to admit a class of associates, as had been advocated for a considerable time, they could not well retain the name of "Association"—they could not have associates of an association; but whatever opinion might be held upon this, he felt sure that the general sentiment would confirm the judgment of the Committee on this matter. Coupled with these recommendations of the change of name and of the introduction of a class of associates, was another—viz., that henceforth there should be no elections under the class of extra-ordinary members, but that gentlemen who sought admission, and who would at present be entitled to admission as extra-ordinary members, would have the privilege of admission under the class of associates. Although the Committee had very carefully considered the rules clause by clause, still some few verbal amendments had been since suggested, which they proposed to adopt; and these he would indicate. [The President then went through the rules, pointing out the suggested amendments, and concluded by moving that the rules as printed, subject to these slight amendments, be adopted.]

Mr. GODDARD, sen., said that, having been connected with the Association from its commencement, and having had something to do with the formation of the rules by which it had been governed, and also having been on the Committee which had had the revision of those rules under its consideration, he rose to second the motion. The rules had received the very careful attention of the Committee from time to time. They had had communications from various parts of the constituency, and every objection which could be raised, either to the alteration of the name or to any of the rules, had had the greatest consideration from the Committee.

Mr. DENNY LANE (Cork) said he had no doubt the rules were framed on principles which would tend to the advancement of the society, and if the members were to critically examine them one by one they would probably come to a conclusion when the period of time arrived called the Greek Kalends. He quite agreed with the first word of the title, and also with the second, but he thought there might be an amendment made in the third. It was called a gas "Institution." It seemed to him that there were two other societies which had preceded them, of much longer duration and of greater dignity, and he did not see why the term used in those cases should not be adopted in this, and that they should call it "The Gas Institute," and not "The Gas Institution," after the model of The Institute of Civil Engineers and The Institute of Mechanical Engineers.

The PRESIDENT said the two societies referred to were both named "Institution," and not "Institute."

Mr. R. MORTON (London) said, having been a member of the British Association of Gas Managers from its origin, and having thought the class of associates ought to be introduced for various reasons on which he would not then enter, he believed the whole body would support the proposition made by the Committee. But the very same difficulty which Mr. Lane had mentioned had also struck him; though it was much easier to find fault with the name than to suggest a better. The reason Mr. Lane had given for altering it to "The Gas Institute" appeared not to be a sound one; still he thought the change would be a good one. The proposed

name had the recommendation that it was shorter than the present, and if they substituted the word "Institute" for "Institution" it would be going a little farther in the same direction.

Mr. C. GANDON (Sydenham) said, seeing these proposed rules had received so much consideration from the Committee, it behoved any ordinary member of the Association to be very cautious in raising objections, and, therefore, he hoped he should not be considered as objecting if he made a remark or two on them. Looking at the name, he was scarcely able to understand the meaning of it—it seemed to mean either too much or too little, and he hardly knew which. He should like to suggest that one word was left out, and that was "British," which he should like to see retained. Another thing which struck him was that the proposed sum of 20 guineas as the composition for the annual subscription was far higher, in proportion to the subscriptions paid, than was usual in similar institutions. For instance, in The Institution of Civil Engineers, where the subscription was four guineas per annum, a man could compound for 15 guineas.

Mr. J. W. GLOVER, as an honorary member, wished to make one or two observations. They must all sympathize with the object the Committee had in view in widening the basis of the Association, and extending its usefulness. He felt that the alteration of the name was a somewhat serious matter. He must say that the word "Institute" was the first he thought of suggesting, instead of "Institution," his idea being that the word "Institution" was a wider word than need be used. In the supplement to the "Imperial Dictionary" he found that an Institute meant a scientific body—a society established according to certain laws and regulations for the furtherance of a particular object, as a philosophical institute, a literary institute, a mechanical institute, an educational institute, and so on; therefore, not only for the sake of euphony, and because it was shorter, but also because it was a little more explicit, he thought the word "Institute" had certain advantages. Going back to the word "gas," it appeared a little indefinite. They omitted the word "managers" altogether, and had simply "The Gas Institution." Would it be equally satisfactory to have another institution called a water institution, or an electricity institution? It did not seem to him to be definite enough. Again, the word "British" had a certain advantage, as he thought it would be well to keep as nearly as possible to the old title. If, therefore, they could adopt some such title as the "British Gas Managers' Institute," he thought it would be better. He was perfectly well aware that the title "Gas Managers," had been said to be too small; but, looking at the objects set forth in Rule 1—viz., "the advancement of gas engineering, manufacture, and finance, and to facilitate the exchange of information amongst its members"—he did not see anything outside the management of gas undertakings. If he were an active member he should probably conclude with a resolution; but as an extra-ordinary member of course he should not do so. He simply gave expression to his views, because if such a radical change were to be made it was well it should be done with unanimity, and have the concurrence of the large majority of the members. With regard to abolishing in future the extra-ordinary members, he was not sure that this was altogether wise. They had at the present meeting a very considerable influx of extra-ordinary members, and he found that the society had benefited to the extent of about £80 from the entrance fees paid by this class of members. It seemed to him a desirable thing if extra-ordinary members wished to join the society—and no doubt they expected to derive some benefit from joining—that they should pay an entrance fee. With regard to the rules, it did not appear to him that they were so compact and distinct as they ought to be; they seemed a little patchy and fragmentary in certain places. For instance, with regard to the money, he found that, according to Rule 12, the Secretary was to receive the money, the Finance Committee were to assist in paying it away; and, according to Rule 15, three Trustees were to invest all the property of the Institution. This property must mean the money, because, although in Rule 25 it was stated that all papers read by members were to become the property of the Institution, it could hardly apply to them. Rule 15 also said that the property should be invested in the names of the Trustees, except such as should be in the hands of the Council; but as the Secretary had to receive all the money, the Council could not have any of it. Therefore, it seemed to him that a little revision was required in the wording of the rules. Then in Rule 3 it was stated that members should be engineers, and so on, except in special cases, in which the Council might recommend, and the general meeting deem it necessary that this rule should be relaxed. He thought it

would be much better, except in special cases, in which the general meeting, on the recommendation of the Council, deemed it necessary, that the rule should be relaxed. Then Rule 7 said the Secretary should be *ex officio* a member of the Council, which he thought was unnecessary. All these might be verbal alterations, but the same thing ran through them all, and therefore he thought the best course the meeting could pursue would be to accept the principle, if possible, in some general resolution, and refer back the rules for re-consideration, because he did not think they were quite so perfect as they ought to be for an Association of this character.

Mr. C. E. JONES (Chesterfield) said he had hoped, when he received the circular from the Secretary, to find the Committee had proceeded on a legal basis in altering the constitution of a society which had existed and done useful work for eighteen years, and he looked through the rules with the view of discovering if any legal opinion had been sought upon them, or if advantage was to be taken of the opportunity to place the society under the Act of Parliament for encouraging literary and scientific institutions; but he was sorry to find this was not the case. The changes about to be made were of such an important character that they could not be decided by voting on the rules *en masse*; they should be considered *seriatim*. He hoped the Committee would yet think it advisable to place the Association under the protection of the Literary and Scientific Societies' Act—an Act which was specially passed to do away with the necessity of applying for Charters, as some older societies had done, and which would place them on a proper and legal basis, give them a common seal, and various other advantages which they did not at present possess, and could not possess under the present rules. The word "Institution" had been commented upon, and the word "Institute" appeared to be out of favour with the members of the Committee, who had already spoken with considerable affection for the word "Institution." Now, there were many societies equal in importance, if not superior to their own, which adopted the word "Institute," and to his mind the word "Institution" was by no means the happiest that could be selected. Any combination of persons at the present day called themselves an institution—

The PRESIDENT, interposing, said none of the Committee had spoken with any particular affection for the word "Institution." So far as the present Committee were concerned, they were quite in the hands of the members whether it should be "Institute" or "Institution."

Mr. JONES said he was delighted to hear that the word was not insisted upon, and he hoped the meeting would eventually arrive at a decision by which the title would be modified. He had also hoped that the suggestion made at former meetings of the society would have been considered by the Committee who undertook the task of revising the rules. He had urged the point before, and he thought an attempt should have been made to combine the professions of gas engineer and water engineer. [Several MEMBERS: No, no.] Well, if such a thing were not possible, they must still remain a gas association. But what kind of gas was it?—coal gas, hydrogen gas, or what? His friend Mr. Gandon had suggested British gas; but he (Mr. Jones) thought something rather more definite than British gas was needed. Then it was said that associates should be persons holding a responsible position in gas-works. What was a responsible position? The term was a very vague one. He considered his engine driver held a responsible position. Then again it was proposed to admit the pupils of gas engineers, and this was, no doubt, a very wise arrangement; but the Committee did not say whether these gentlemen should be under or over 21 years of age. With regard to the admission of secretaries, he contended that the Association was a scientific body, and they should give preference to men of science. Were secretaries men of science? He thought not. Again, he had a strong objection to an Institute numbering 700 members being governed by so small a body. He thought they should have more than three Vice-Presidents, and that the office of Vice-President should be given to men who were real workers, and who had at heart the permanent good of the profession. He would also suggest that the Presidents of District Associations be incorporated with the General Council, and form *ex officio* members of it. They would then bring to bear on the discussion of the affairs of the society an amount of intelligence and experience from the provinces which would be altogether extraneous from routine and official control, and would be a lasting and permanent good. The total number of the Council should be largely increased, and he thought one councillor to 200 members would be by no means too large a number. With regard to Rule 13, he

would suggest that the report be printed and distributed to the members before the annual meeting. Rule 18 said the Auditors should be members or associates of the Institution, but he could not see any necessity whatever for this. He would rather they should not be members. Again, he thought the papers should be printed and distributed before the meeting. The discussions of the society were most valuable, and if they sometimes ran rather wide of the point it was from want of better information. If the members had the papers before them, and could read them previous to coming to the meeting, the discussions would be more valuable. Rule 26 provided that the Council should take such steps as seemed desirable to secure correct reports of the proceedings of the society. He quite agreed with this, and he had a strong opinion that the Association should have a Publishing Committee as well as a Paper-Examining Committee, who should be editors of the Transactions. He next objected to the Secretary being an *ex officio* member of the Council, which he considered placed the Secretary in a false position altogether. His position was a neutral one; but if he had a right to vote it was not so. He knew of no instance where the Secretary of a similar association was a member of the Council; they might as well make the secretaries of gas companies and managers of corporations *ex officio* members of their boards. As to the extra-ordinary members, he was not at all of the opinion of a speaker who had preceded him, that these gentlemen joined the society in order to obtain some benefit from it, if he meant a substantial benefit. Of course if he meant mental benefit they could get as much of this as they liked from attending the meetings. Again, there was in the rules no power of expulsion. When once a man became a member he was a member for life, provided he paid his subscription; but this seemed to him (Mr. Jones) to be a somewhat mercenary consideration. He thought they should have the power of expulsion, and there should also be some power of enforcing payment. If they adopted the Literary and Scientific Societies' Act, both these things could be provided for; they would have a common seal, they could sue and be sued, and there were other considerable advantages in being organized under this Act. He should like to know whether any legal gentleman had been consulted with regard to the new rules, for he thought the Committee were proceeding rather hastily in the matter. There was no necessity for an important and radical change being hastily made in the name and character of the Association, which had already existed for eighteen years; they could very well afford to wait another year to consider this matter with all the calmness which its importance deserved. He would therefore move as an amendment, which he hoped would commend itself to the members present—

"That a joint Committee be appointed, consisting of six members nominated by this meeting and six members nominated by the Committee of Management, who shall meet and confer together to devise the best means of extending the usefulness of this Institution, determine what changes are required in the rules of the Association to attain this result, and further to promote its scientific character; and that such Committee report in writing to the next general meeting."

Mr. C. EASTWOOD (Batley) seconded the amendment. He said there were many questions in connection with the changes of rules to which he should have liked to advert, some of which Mr. Jones had touched upon; but there were several others which it would take too long now to debate. He, however, strongly objected to secretaries, book-keepers, or accountants being members of the Association. These gentlemen were not persons of scientific attainments, but rather men whose business abilities would be as well exercised in a merchant's office as in a gas office, behind a draper's counter as behind a gas ledger. He also was prepared to allow all those who were at present members of the Association so to continue, and the remarks he had made were not made with the slightest feeling of disrespect to any of those gentlemen whom they had now the honour of associating with them. Some of these gentlemen were men of high attainments, whom he personally respected; but the meeting were looking forward to making a new departure in the Association, and he was thinking of the future and not of the past. During the infancy of the Association they were glad to receive such gentlemen amongst them; but he thought they had now arrived at such strength that they should rather dictate their own terms as to who should be admitted. Another point was this: He rather doubted the wisdom of the meeting electing the members of the Council; they had a universal electoral district. The names were placed before the entire body for every one to vote upon without anything like a representation of districts. It would be well if there were

some means by which certain districts in England, Ireland, and Scotland should be represented fairly, and they would then perhaps save the little heartburnings which sometimes arose from the idea that the management of the Association was confined within too narrow limits.

Mr. J. HEPWORTH (Carlisle) said he rose simply to make a suggestion to the Committee, that as there did not seem to be any very immediate hurry, they should accept the suggestion that the matter be postponed. He could not support the amendment of Mr. Jones, because he thought there was no reason whatever for the meeting to supplement the Committee; but he should very heartily support the Committee in withdrawing the matter for the present, and taking it into further consideration.

The PRESIDENT asked on what ground.

Mr. HEPWORTH said from what had been already stated, it appeared that the rules as drawn up were capable of some verbal amendment at any rate, and certainly the point which Mr. Jones had introduced as to the Literary and Scientific Societies' Act was new to him (Mr. Hepworth). If what Mr. Jones had said was correct, it would be well for the Council to take the matter into consideration.

Mr. G. LIVESSEY said the President had very wisely confined himself to a bare statement of the facts, without entering into any argument whatever, and no member of the Committee had spoken upon the new rules. He was afraid, from the course the discussion had taken, that there was a slight danger of a spirit of antagonism being raised between the members generally and the Committee.

Mr. JONES rose to order, and asked if it was competent for one of the Committee to charge a member with raising a spirit of antagonism because he disagreed with the general policy.

Mr. LIVESSEY said he made no charge whatever against Mr. Jones. He thought the discussion had assumed that the Committee were wedded to these amended rules—that they had brought them forward, and wanted to force them down the throats of the members. Now, they did not want anything of the kind. The Committee had been driven into consideration of the rules by the repeated representations of members, during a series of years, urging upon them the necessity of altering and revising. All the points which had been brought before the Committee, at various times, had been thoroughly considered; the Committee had had a number of meetings, and had spent whole days in discussion and conference. The Sub-Committee went through the rules two or three times, and then the General Committee deliberated upon them, and they had endeavoured honestly and faithfully to carry out the views expressed by the members. He did not think a single one of the objections was really of any material moment. Some of the suggestions Mr. Jones had made he should be glad to adopt; for instance, the one in reference to circulating the report before the annual meeting. With regard to the name, the Committee were not wedded to it; all they wanted was to take counsel with the members, and to do that which was best for the society. The Committee had given their best attention to the matter, and could do no more. They could not accept the amendment, because, having done all they could, it would be waste of time and money to go all over the work again. He should be very glad to see the thing settled that afternoon, and he believed this might be done. The greater part of these questions could be settled at once by votes, and it would be a pity to let the matter drag on for another year, as he was reminded that the die for the Birmingham Medal still wanted the name, and if they could not settle the name to-day this munificent gift must stand in abeyance. It would not look very generous to have to say, "Keep your medal for twelve months, because we cannot settle on the name to be put upon it." It was suggested that the word "British" should be introduced; but there were some objections to this, because there were gas managers connected with them who were not in British possessions. This was the first institution of the kind, and therefore they were entitled to take the general name. He would therefore propose that a vote be taken as to whether the title should be "The Gas Institute" or "The Gas Institution."

Mr. W. HARDIE (Newcastle) agreed with the suggestion of Mr. Hepworth, that the matter might as well stand over for another year. He thought it would not be fair to the Committee or themselves to accept the rules to-day. They contained a great many changes, and amongst them the creation of a new class of associates. With all deference to the President, he thought it was a most extraordinary reason to give for the change, that because there were a great many managers of small works who were eligible to be members, there were

others—who, he (Mr. Hardie) supposed, were sub-managers—who could not be made members because they were not eligible. If this alteration were to pass the case would stand thus: A great many men would only be eligible to be associates who, in fact, were fit to be members. He was in favour of doing away altogether with these class distinctions, of which he had seen too many—members, honorary members, and associates. He should have to move another amendment—that they thank the Committee for their labours, receive the report, and agree to take it into consideration at the next general meeting.

Mr. W. PARLBY (Sheffield) seconded this amendment.

Mr. JONES said if the Committee would withdraw the report, or postpone its consideration until next year, he would withdraw his amendment.

The PRESIDENT said, as Mr. Livesey had already explained, it was impossible to accept Mr. Jones's amendment, for the reason that the Committee had already given so much time and attention to the matter that if it were remitted to them half-a-dozen times they could only arrive at the same conclusion as they had now done. They were aware that there were verbal amendments which might from time to time be made; but these would not touch the principle. The first question to settle appeared to be the name, and he would therefore take a vote upon this at once.

A vote was then taken, when the majority decided in favour of the name being "The Gas Institute."

Mr. DENNY LANE said he thought perhaps it might meet the views of the Committee that the principle of the changes should be adopted to-day, and that the Committee would have an opportunity of considering, between this and the next meeting, any alteration which they might wish to make in the form of the rules. Although he believed the Committee were of all men most competent to decide what was most conducive to the interests of the society, they might still receive from the members suggestions which might not have occurred to themselves. He would leave the matter entirely in their hands. He would not think of importing any foreign element; but would suggest that it should be further considered, not with the view that they had not considered every view put before them, but because there might have been some suggestion made to them which might deserve their attention. He was particularly struck with Mr. Jones's suggestion with regard to placing the society in the same position as a registered body. With regard to secretaries not being admitted in future, he should be very sorry to enter by a side door when the front door was closed in the face of his colleagues. If it would meet with the approval of the Committee, he would move—"That the principles embodied in the rules now submitted be considered by the meeting, and that the consideration of any details be left to the next meeting, and that any amendments to be made should be proposed and submitted to the Council at least one month before the next meeting."

Mr. W. CARR (Halifax) said that he should like to see Mr. Jones's amendment submitted to the meeting and voted upon, because it really amounted to a vote of want of confidence in the Council. With regard to the rules as now presented, he might say, as a member of the Committee, and also a member of the Sub-Committee which had had to do with the revision, that there had not been a single suggestion made that day which had not been made in the Committee, and considered and discussed several times over. The principal suggestion made by Mr. Jones with regard to placing the society under Act of Parliament was brought forward and very carefully weighed; but the Committee considered that what they should gain by placing themselves under the Act named would not counterbalance the disadvantages which might accrue in other ways. They had gone through every single detail from beginning to end in the most careful manner. He at first was most anxious to make some very radical changes, and he must say, in fairness to his colleagues, that they considered all the suggestions he had made, and met his arguments very fairly. The result had been the preparation of a set of rules which he believed would be best suited to the interests of the Institute. They were not, by any means, unanimous, to begin with. They had members who had no wish to go forward too fast, just as there were members present who did not wish to go forward indiscreetly, and there were others who proposed radical changes just as Mr. Jones had been proposing some very extraordinary changes to-day; but he (Mr. Carr) was bound to say that they did not conclude, as Mr. Jones did, by suggesting that there was no need for any change at all. There was one further alteration he should like to see made before he left the Committee, as he had contended for it very long and

earnestly, and had induced the other members of the Committee to adopt it. It was with regard to the election of committeemen. He should like to see the whole of the rules passed pretty much as they were, for if the meeting put the matter off and discussed the rules next year, they would be just where they were now, and he would undertake to say the thing would then be met with an amendment that it should be adjourned for another twelve months. They need not think that any verbal inaccuracies would become permanent, because if passed to-day they could be altered at any subsequent meeting by giving notice. If Mr. Jones felt competent to do so, he might select half-a-dozen gentlemen and draw a revised code of rules, and submit them at any annual meeting, and if they commended themselves to the wisdom of the society, no doubt they would be accepted. But the rules as they had been submitted were as good a code as the present Council could possibly draw up. With regard to some of the things not provided for, such as the age of associates and what was meant by holding a responsible position, the Committee did not pretend to do everything, and it would be quite impossible to define everything of this sort in a code of rules. The Association had a Council elected to transact the business, and he presumed this Council would be competent to exercise some discretion in such matters. He was bound to say, in fairness to his colleagues, that they did show an interest in the Association—sometimes almost too great a one—for they took it in hand in a parental manner sometimes, and tried to provide against any possible contingency; but, in the future, extended representation might be obtained, if necessary, without necessarily having the Presidents of provincial Associations *ex officio* members of the Council, which he should object to *in toto*. It would simply resolve itself into sending delegates from certain districts. They were a complete body, and could always meet together—could vote even without meeting together; and why they should have delegates sent from districts he could not understand. He hoped a vote would be taken as to whether the rules should be passed or not.

The PRESIDENT then put Mr. Jones's amendment, and it was negatived almost unanimously.

Mr. JONES said he must ask the President to take his protest that he did not consider the amendment was properly put.

The PRESIDENT said he was not aware of any informality. Mr. Lane had made a suggestion, which was in perfect accord with the spirit and intentions of the Committee. They were perfectly prepared from time to time to consider any suggestions which might be made; but if a vote were now taken on the general body of the rules, it did not preclude the Committee from considering proposals laid before them, and which they might, if they thought fit, present to the next meeting. This seemed to him to be the natural course—to accept the rules as they were, or otherwise the Association would be without a constitution for twelve months. They must have rules to work upon, but the Committee would carefully consider any proposals made to them during the course of the year.

Mr. G. HELPS (Bath) asked Mr. Lane if the President had correctly stated his views upon the rules.

Mr. LANE said after the explanation Mr. Carr had given, it was evident that it was competent for members, before the next meeting, to propose any amendments they thought fit to the rules. The impression he wished to convey was that the rules should be now accepted; but that if any suggestions were made by members, either now or during the course of the year, they would be considered by the Committee. The explanation of Mr. Carr had shown that the rules were not like the laws of the Medes and Persians, but that they had the elasticity of form which was necessary in every growing institution.

Mr. HARDIE asked the President to put his amendment, thanking the Committee for their labours, and agreeing to consider the matter at the next general meeting.

Mr. IRONS (Gosport) asked if the President would give the members an assurance that any proposition sent in would be fully considered.

The PRESIDENT said certainly, both now and at all times.

Mr. FRITH (Runcorn), as one of the oldest members of the Association, said he should not like this pleasant meeting at Birmingham to be marred by any resolution adverse to the Committee. The Committee were appointed by the members, and if they were not satisfied with them it was their own fault. After the very laborious work performed by the Committee in going through the rules, it was only right that the members should accept what they offered with the best possible grace.

Mr. G. LIVESSEY asked Mr. Hardie to withdraw his amend-

ment. The Committee would give a pledge that any suggestion which members might submit in writing should be fully considered before the next meeting, and anything which the Committee thought could be adopted with advantage should then be submitted as an amendment to the present rules.

Mr. HARDIE said he quite accepted the undertaking, and would withdraw his amendment.

The PRESIDENT then put the resolution, that the rules as proposed should now be adopted, with the pledge given by Mr. Livesey; and the motion was carried with only two dissentients.

PLACE OF NEXT MEETING.

The PRESIDENT said they had next to determine the place of their meeting in 1882. It had been the custom to hold the alternate meetings in London, and he presumed it would be the wish of the meeting to follow the same practice next year; meeting in London on the second Tuesday in June.

This was unanimously agreed to.

MEMBERS IN ARREAR.

The SECRETARY read the list of members in arrear, in pursuance of Rule 37.

ELECTION OF OFFICERS.

The SECRETARY also read the report of the Scrutineers, showing that the following gentlemen had been selected as Office-bearers for the ensuing year:—

President.—G. W. Stevenson, Esq., of London.

Vice-Presidents.—Messrs. R. O. Paterson (Cheltenham), R. Harris (London), and R. H. Jones (Dover).

Committee (to replace those going out of office by rotation).—Messrs. C. Gandon (Sydenham), D. F. Goddard (Ipswich), and G. E. Stevenson (Peterborough).

Finance Committee.—Messrs. G. Livesey, C. Woodall, and J. Eldridge.

Auditors.—Messrs. Alfred Hersee and Alfred Lass.

Secretary.—Mr. W. H. Bennett.

VOTES OF THANKS.

Mr. DENNY LANE moved a cordial vote of thanks to the Corporation of Birmingham for the magnificent reception of the members of the Association at the *conversazione* at the Town Hall, and for the opportunities afforded for visiting the gas-works belonging to the Corporation. He had, he said, enjoyed the munificent hospitality of the Municipality of Birmingham on a former occasion, when he visited the town as a member of the British Association, and the same princely hospitality had been shown on the present occasion. There were certain places, such as Athens and Rome, which had classical associations with literature and the science of government; but there were others which had associations with the practical application of the sciences of which the Greeks only dreamed, and foremost amongst these places stood Birmingham. Water gas, or steam, and oil gas had almost their sole development in this town, and therefore they might be said to stand on almost classic ground in connection with their particular occupation. The previous day he saw the old Soho Works, in which the first steam-engine of modern construction was ever made. The three great forces of the present day were steam, gas, and electricity, and with regard to two at least of these Birmingham occupied the foremost position. The resolution was also interesting because it proposed a vote of thanks to a Corporation. Now, he was an enemy to centralization; he believed that all the great progress of the human race had originated in countries composed of small States, such as the Greek and Italian States, and, therefore, the more these municipalities were extended the better it would be for the country, because he thought it might relieve the Imperial Parliament of many of the duties that it was now unable to perform. Their thanks were also due to the members of the Reception Committee—especially to Mr. Edwin Smith, the Secretary, to their President, and to Mr. Hack, the Engineer of the Saltley Gas-Works.

Mr. MORTON, in seconding the motion, said nothing struck him more, in the speech delivered by the Mayor from the platform on Tuesday, than the expression of the happy relations which existed between the Corporation and the officials of the gas-works.

The motion was carried unanimously.

The PRESIDENT then proposed that a cordial vote of thanks be given to the contributors of papers. He said he felt sure that none of the interest which usually attached to the communications read at these meetings had been lost. Want of time had prevented the reading of some of the papers presented, but the discussion upon those which had been taken had fully sustained the character of the proceedings.

Mr. HEPPWORTH seconded the motion, and it was carried unanimously.

Mr. ALFRED PENNY moved a vote of thanks to the Committee for the way in which they had conducted the affairs of the Association during the past year, which he said he was quite sure would be passed unanimously.

Mr. C. E. JONES said he had much pleasure in seconding the resolution. He believed the Committee had worked thoroughly for the benefit of the Association, and in what he had said he had been actuated by precisely the same principle. There was no antagonism between himself and any member of the Committee; he only wished to promote the honour and dignity of The Gas Institute.

The motion was carried unanimously.

Mr. CARR proposed a vote of thanks to the Scrutineers, who, he remarked, had a good deal of hard work to do, and whose duties were perhaps the most thankless of all.

Mr. PARLBY seconded the motion, which was unanimously agreed to.

Mr. COX moved a vote of thanks to the Auditors for their valuable services.

Mr. TREWHITT seconded the motion, and it was carried unanimously.

The PRESIDENT then proposed a vote of thanks to Mr. Walter King for his services in connection with the report of the Transactions of the Association.

This was seconded, and carried unanimously.

Mr. G. LIVESEY said it was his pleasing duty now to move a hearty vote of thanks to the President. He did not like to say much in praise of a man to his face, nor was it necessary. They were greatly indebted to Mr. Hunt for the services he had rendered to the Association. He came to their aid upon year, when they were in a position of difficulty, and helped them out of it admirably. He felt it was rather hard upon Mr. Hunt to call for an address two years in succession, but he had shown himself fully equal to the task. He (Mr. Livesey) had listened to his remarks with great pleasure, especially when he noticed the courage with which the President addressed himself to a most important and interesting question, but one upon which he could not but feel that possibly some might not agree with him. The meeting at Birmingham would be one of the most memorable in the annals of the Institute, marked as it was by the munificent act of the members connected with the district, which would give a stimulus to the members, and be beneficial in every possible way. The innovation, which had been introduced without any vote being taken upon it, had, he thought, met with their entire approval. It had been a great improvement to break up the days, as they had done, by visiting the large works of which the President had had charge. He must say he was filled with admiration at the boldness of conception and the admirable manner in which these works were conducted. Everything was carried out on the most economical scale, without sacrificing anything of efficiency or strength. He had much pleasure in proposing that the hearty thanks of the meeting be given to Mr. Hunt for all that he had done.

Mr. MORTON seconded the motion, which was carried by acclamation.

The PRESIDENT, in reply, said of all the tasks which he had had presented to him, that with which he now found himself face to face was the most difficult, for he could not find words to express his appreciation of the kind manner in which Mr. Livesey had referred to him, and of the very hearty way in which the resolution had been received. He was much pleased that his conduct in the chair and throughout the year had met with their approval, and he could only say that it had afforded him very great gratification to find that all the arrangements for the comfort and the success of the meeting had been so well appreciated.

The PRESIDENT then proposed a cordial vote of thanks to the Secretary, remarking that no one but the President and the Committee knew the arduous labours which devolved upon the Secretary of an association like this, more especially when it was progressing so fast, and so many changes had been proposed. The duties of the past year had been more than usually arduous, but Mr. Bennett had carried them out with all his wonted energy and perseverance.

The motion having been seconded and carried unanimously,

Mr. BENNETT briefly responded, and the business of the meeting closed.

EXCURSIONS, ETC., IN CONNECTION WITH THE MEETING.

On Tuesday afternoon a large body of members and friends proceeded by conveyances to the Saltley Gas-Works, where they were met by the Engineer, Mr. Henry Hack, who courteously conducted the visitors round the great establishment under his charge. At various points on the tour of inspection

plans of the apparatus in use were exhibited, and greatly aided in the forming of a just appreciation of the dimensions and other particulars of the plant seen. We have so recently given a plan and various details of this and the Windsor Street works, to which a move was afterwards made, as to render unnecessary further reference to the arrangement of either works. At Windsor Street—where the party were, of course, under the guidance of Mr. Hunt—the greatest interest was evinced in the prodigious retort-house and gasholder-tanks in course of construction, the dimensions, &c., of which were shown on the plan accompanying the number of the JOURNAL for the 31st ult. One of Herr F. Siemens's regenerative burners of large power was in operation; but, in the bright sunshine prevailing at the time, it was not possible to judge of its effectiveness. It is, however, we understand, giving great satisfaction.

On Wednesday, the firm of Messrs. Tangye Bros. provided a special train to convey the members and friends to Handsworth; and a very interesting afternoon was spent in an inspection of the varied manufacturing operations carried on at the Cornwall Works.

At eight o'clock in the evening of the same day there was a *conversazione* at the Town Hall, preceded by a reception of the invited guests by the Mayor (Alderman R. Chamberlain) and the Mayoress. The place was brilliantly lighted, and was most tastefully decorated with flowers and foliage plants in great profusion; while the numerous exhibits—too numerous, in fact, to particularize—of manufacturing operations, apparatus, scientific experiments, models, and illustrations of the process of gas manufacture, afforded an opportunity, eagerly taken advantage of by the majority of those present, of passing the pleasant and profitable three hours to which the entertainment was limited. An efficient orchestral band, under the guidance of Mr. A. W. Gilmer, performed a choice selection of music, at times assisted on the great organ by Mr. Stimpson. Refreshments were served in the Committee Room from nine till eleven o'clock; so that, in every respect, the comfort and entertainment of the visitors were most completely provided for. Much praise is due to Mr. Edwin Smith (the Secretary of the Gas Department) and Mr. Hunt, who carried out the details of the matter, under the control of a Reception Committee, appointed by the Gas Committee, consisting of Councillors Pattison (Chairman), Baker, Hart, and Marris.

The annual dinner of the Association took place at the Great Western Hotel on Thursday evening. Mr. Charles Hunt presided, and was supported by Mr. R. Harris, and Mr. R. O. Paterson; the Stewards being these two gentlemen and Messrs. W. H. Bennett, W. Carr, J. Hepworth, R. H. Jones, T. Newbigging, W. North, W. Sugg, J. Tindall, J. West, and H. Woodall. A selection of vocal and instrumental music was performed at the close of dinner, interspersed with the toasts. After the national toasts of "The Queen" and "The Prince and Princess of Wales and the Members of the Royal Family" had been proposed in felicitous terms by the Chairman, and as heartily received, Mr. Hunt gave the toast of "The Army, Navy, and Auxiliary Forces," which was responded to by Quartermaster Garnett, of Ryde. Mr. E. Goddard, sen., next proposed "The Mayor and Corporation of Birmingham," the response to which (in the regretted absence of the Mayor), fell to Mr. Marris, the Chairman of the Gas Committee; and he, in concluding, proposed "Success to the new Gas Institute." This having been acknowledged by Mr. Hunt, Major G. Warren Dresser, of New York, gave the toast of "The Past-Presidents," the reply to which was entrusted to Mr. R. P. Spice. Mr. West then proposed, and Messrs. Harris and Valon responded to the toast of "The Vice-Presidents and Committee;" and the last toast drunk was that of "The Provincial Associations," responded to by Mr. R. O. Paterson. Time would not permit of the remaining toasts on the list being gone through. They included "The President-Elect," to have been proposed by Mr. C. Gandon, and responded to by Mr. G. W. Stevenson; "The Secretary," proposed by the Chairman, and responded to by Mr. W. H. Bennett; and "The Press," proposed by Mr. Carr.

On Friday, at the invitation of a Committee of manufacturers and others in the district, a very large party was conveyed by special train to Stourbridge, and thence in four-horse drags to Enville, one of the seats of the Right Hon. the Earl of Stamford and Warrington, where, after an inspection of the ancient church of St. Mary, a short time was spent in going through the extensive and highly ornamental grounds surrounding Enville Hall. This proved a pleasant prelude to the luncheon which was subsequently served in a double marquee erected on the cricket-ground attached to the estate.

The arrangements, which were greatly appreciated, were carried out by a Committee consisting of Mr. George King Harrison (Chairman), Mr. Herbert Spencer (Secretary), and Messrs. H. Bewlay, W. Corbett, J. W. Thomas, and W. Westwood. The first-named gentleman presided at the luncheon; and at its close proposed the toasts of "The Queen," and "The Army, Navy, and Volunteers;" to which latter Colonel Cochran responded. He then gave the toast of "The President and Members of The Gas Institute," in a very humorous speech, replied to by Mr. Hunt. Mr. Denny Lane undertook the response to the toast of "Literature, Science, and Art," and quite charmed the audience with the excellent manner in which he dealt with the subject. The toast of "Our American Cousins" was characteristically responded to by Major Dresser; and, in acknowledgment of repeated calls, Mr. M. S. Greenough, of Boston, U.S.A., added a few words. Several other toasts followed, and on the party breaking up for the return journey, much satisfaction was expressed at the excellent provision made for the day's entertainment. Slight showers fell at intervals; but not to such an extent as to seriously mar the enjoyment of the last day of this most successful meeting of the Association.

THE FINANCES OF THE NOTTINGHAM CORPORATION.

APPROPRIATION OF GAS PROFITS.

At the Meeting of the Nottingham Town Council on Monday, the 13th inst.—the Mayor (Alderman Gripper) in the chair—the report of the Finance Committee was presented. It showed that in the course of last year the various committees had considerably exceeded their estimated expenditure; nevertheless it was proposed to lower the general district rate for the ensuing year from 3s. 9d. to 3s. 6½d. in the pound—a reduction of 2½d.—and as there would, it was understood, be a considerable profit on the gas undertaking, it was suggested that £10,000 thereof should be appropriated in relief of expenditure. The Council having gone into committee to consider the report, a lengthy discussion took place on the various items; and one Councillor having protested against the payment, out of the rates, of £3940 towards the Natural History Museum,

Mr. BREWSTER said the only source from which money could be taken for the purpose would be the gas profits. He asked the Council to bear this in mind. What he contended was that in the present state of the gas undertaking the Council had no right to take money from it for any other purpose than the building up of a reserve-fund. Looking at the manner in which the electric light was marching upon them, he said it was incumbent upon the Council to store up against the necessary depreciation of their gas property, and thus to recoup the loss that might ensue. They must remember that they had gone into the market as borrowers; they had borrowed on the strength of their properties, and they must be careful how they dealt with these properties.

Mr. BAYLEY remarked that the Council had no statement of profit and loss account then before them with regard to the gas undertaking, from which they were taking this £10,000. Would it not, he said, be better to have the gas accounts audited up to the same time as they had the other accounts of the town, so that they might have all before them together? He thought it would be better to have a report from the Gas Committee, authorizing or advising them to take the amount proposed.

Mr. JACOBY wished to ask the Chairman of the Gas Committee if, in his opinion, the gas undertaking as a commercial concern, could afford to give away £10,000.

Alderman THACKERAY (Chairman of the Gas Committee) said most decidedly not. The Gas Committee had never been consulted on this matter. He quite agreed with what had been said by Mr. Brewster, that with the electric light making such rapid progress, the Council would have to be exceedingly careful what they did with their surplus funds from the gas undertaking. He thought the safest course for the Corporation would be to keep the price of their gas as low as they possibly could. The course recommended by the Finance Committee was unjust and a delusion. It was done simply to make it appear to the ratepayers that they were spending less money than they really were. If they could put their hands into the pockets of other people, the Finance Committee appeared perfectly content to do so. The accounts of the Gas Committee would be made up at the end of the month, and they would, he hoped, show a creditable balance. Of course the Committee had made all arrangements for the coming year, and they would know what their profits would be at the present price of gas. He himself—and he trusted the Committee would support him—would prefer that in the coming year they should make a reduction in the price of gas, and that they should set aside a certain sum for a depreciation or reserve fund. He thought it was most unjust to the consumers of gas to appropriate £10,000 for another purpose, and it would have the effect of taxing the consumers of gas beyond other ratepayers. He said the proposal was unjust in principle, and not only this, but a delusion upon the ratepayers. The Finance Committee made it appear, by putting forward figures, that the district rate would only amount to 3s. 6½d., when in fact they were spending 4s. He was quite satisfied, from Sir William Thomson's report upon the electric light, that it was making and would continue to make great progress. It was now possible to store electricity, and large consumers of gas might say, "There is no reason why we should not have this new light." They wanted now to light the Market Place by the electric light, and if it was found to be so much superior to gas it would soon come into general use. He was sorry the Finance Committee had reckoned upon £10,000 from the gas undertaking when there might not be this sum to hand over.

Mr. CROPPER said this was either the fourth or fifth time he had heard Alderman Thackeray oppose any appropriation of the gas profits. About four years ago, when the electric scare had not come upon them, he had denounced the proposal in quite as strong language as he had done on the present occasion. He (Mr. Cropper) rose for the purpose of saying that he probably had a more practical experience with the electric light, as applied to the particular trade of Nottingham, than any other member of the Council, inasmuch as his firm had been fitting up a large factory of lace machines, and applied the most recent and best known system of lighting by electricity. The Council, as owners of the gas undertaking, would probably not be displeased to hear that the experiment had been a complete failure for such machines. The nature of the light rendered it impossible for the workmen to see the threads, and while the factory to which he alluded was brilliantly illuminated, the workmen had to put the threads through by means of a candle which they held in their hands. There was another point as regarded the future of the gas industry. It was

making as rapid strides for the displacement of steam as electricity was making for the displacement of gas for illuminating purposes. There must be a great and remunerative future for gas makers, if for motive power alone. Where there was one gas-engine ten years ago there were a thousand to-day; and where, five years ago, there was one firm of engineers applying themselves to gas engineering there were now twenty. He did not hesitate to say, and he said it with practical experience as a maker and patentee of gas-engines, that the younger members who were present at that meeting would live to see the steam-engine entirely displaced by gas. Looking at this, he did not think they need get up any scare about the safety of their gas investment. He had not expressed any opinion about the appropriation of the gas profits for the purpose of reducing the rates. Were he to do so, he should say it would be better to put before the ratepayers a correct statement of their expenditure, and not an apparent one.

Mr. WILKINSON contended, with regard to the observations of Mr. Cropper, that as gas was superseding steam, so the electric light would supersede gas. It could not but be admitted that electricity was making vast strides, and he thought the Council ought to have a great reserve fund in hand for the gas undertaking.

Mr. S. ROBINSON drew attention to that part of the Finance Committee's report which stated that the rate this year had been reduced 2½d. in the pound lower than that of last year, and that the rate of last year was 2½d. lower than that of the previous year. This, he said, was all a delusion, as the Council were taking the money from the gas undertaking. He did not think the ratepayers ought to be deceived in this way, for if the Council should not be able to obtain money from the Gas Committee in the future, they would have to raise the rates again, which would bring upon them the name of an extravagant, instead of an economical Council.

Mr. SYLVESTER said it was a sort of legerdemain way of raising the rates, which he did not consider to be straightforward.

The report was eventually adopted.

NOTTINGHAM CORPORATION WATER SUPPLY.

At the Meeting of the Nottingham Town Council on Monday last week—the Mayor (Alderman Gripper) in the chair—the Water Committee presented a report accompanied by the annual statement of accounts of the Water Department for the year ending March 25. They stated there was a balance on revenue account of £3463 2s. 6½d. in favour of the Committee; and that this balance remained at the disposal of the Council for the purposes mentioned in the 7th sub-section of the 65th section of the Nottingham Improvement Act, 1879. They recommended it should be carried to the credit of the revenue account for the next year. This profit had not been made strictly on the year's trading, but had resulted to a large extent, they state, from the operations of the Committee in purchasing the share capital offered by auction by the late Company before the transfer to the Corporation had been completed. The Committee calculate that the actual net profit on the year's trading proper amounts to the sum of only £321 14s. 0½d. As compared with last year, there has been an increase in revenue of £3455 2s. 6d., and the working expenditure has decreased by £797 18s. 3½d.

The accounts show that the total capital employed in the concern, and on which interest will shortly have to be paid, is £481,516—viz., £264,200 of annuities of £50 each, bearing interest (after Lady-day next year) at the rate of £3 10s.; and £98,406 of £19 5s. each, with interest (as from the same date) at the rate of £1 7s.; besides which there are loans of £115,810 at 4 per cent., and £3100 at 3½ per cent. To the first-named amount are added the following items:—Balance brought forward, March 25, 1880—being money in hands of the late Company at date of parliamentary transfer, £8388 9s. 7½d.; plumbing materials, &c., sold during the year ending March 25, 1881, £652 15s. 6d.; balance carried down £13,139 6s. 8d. The grand total of £503,696 11s. 9½d. is thus disposed of under the head of payments on capital account:—

Purchase of general works, to Lady-day, 1880, as under:—		
6013 £50 shares	£300,650	0 0
5159 £19 5s. shares	99,310	15 0
Loans	32,040	0 0
Lamp expenses before transfer	798	18 4
Stamp duties re transfer	3,531	3 11
Additional purchase-money to late Company	30,000	0 0
Premium paid on 698 £50 shares and 10 £19 5s. shares, purchased before transfer	25,976	5 0
Premium paid on 31 £50 shares and 37 £19 5s. shares, purchased since transfer	1,691	7 6
Mains, hydrants, &c.	2,215	13 0
Do., excavating, laying, &c.	2,610	16 0
Services, taps, &c.	1,658	1 8
Do., excavating, laying, &c.	1,356	18 6½
New meters	636	16 2
Horses, harness, and carts	283	14 6
Works	339	19 5
Reservoirs	250	2 7
Sundries	336	0 2
	£503,696	11 9½

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(Continued from p. 1023.)

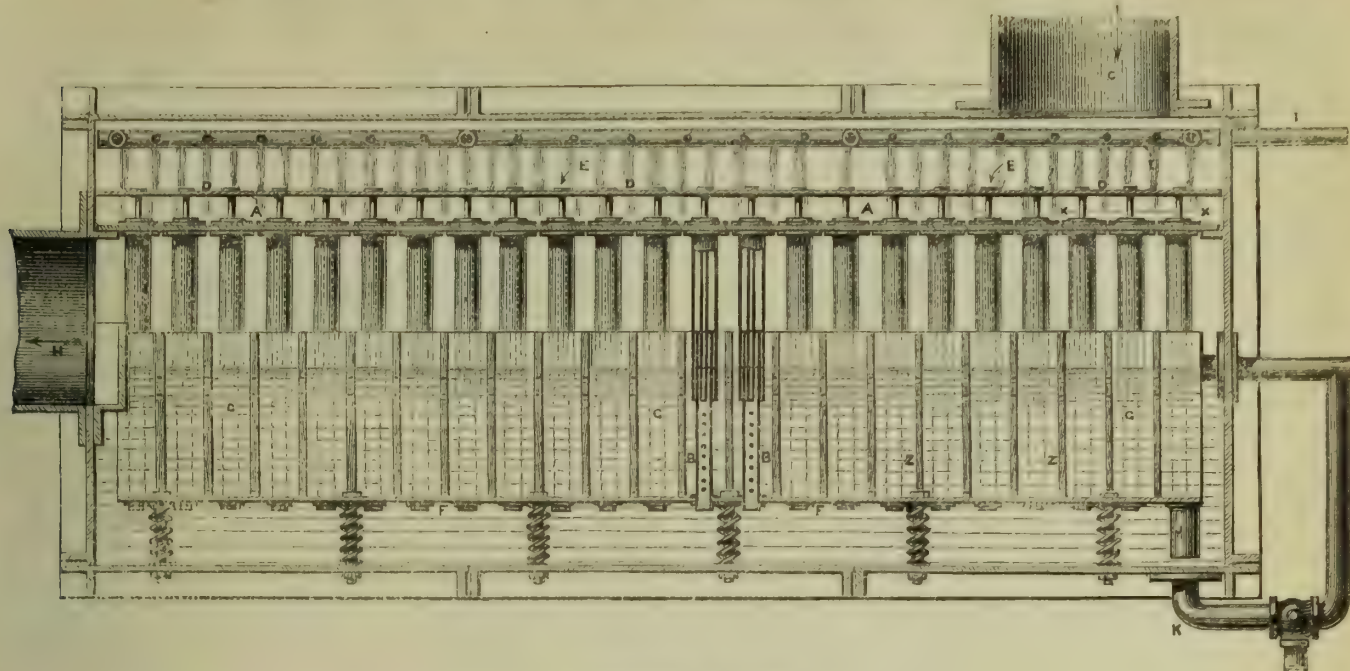
Mr. D. M. NELSON (Glasgow) made some few remarks, which he has since, at request of the Association, embodied in the following paper:—

FORD'S PATENT MULTITUBULAR WASHER WITH CONCENTRIC TUBES.

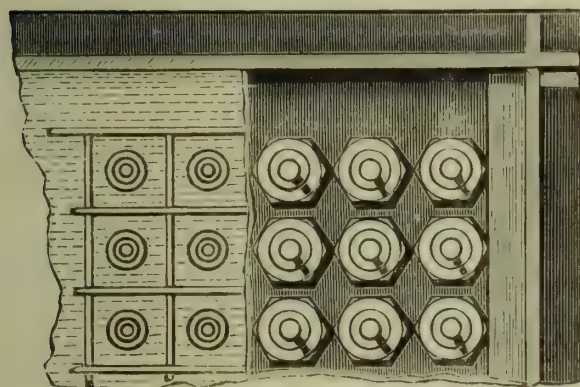
At the request of your President a few days ago, I looked around for something likely to interest this meeting, and found in the recently patented gas-washer of Mr. Andrew Ford, of Stockton-on-Tees, an apparatus which I felt would do so, and although I am not in a position at present to do much more than simply describe its construction and usefulness approximately, I trust on another occasion to prepare a paper giving exact data of its practical and commercial value. The apparatus will, I think, commend itself to your consideration as being very likely to perform the work required of it, and in these days, when producers of coal gas are put more on their mettle through the threatened extinction of their production as an illuminant by the employment of electricity, every appliance in the direction of improving the quality and of reducing the cost of gas production will have the effect of continuing to electricity the title it has held during the past 50 years as being "the light of the future;" always excepting, of course, the instances where trouble is accepted as a pleasure, light and shade as agreeable variety, inconstancy a "light" diversion, and the vital question of cost in money value ignored.

An essential feature in all apparatus designed to improve upon systems or methods hitherto in use is that such apparatus shall be capable of fulfilling conditions and of performing duties surpassing those machines already in possession of the field. Failing in these respects, the multiplication of machinery is a delusion and a snare, serving no useful purpose, but, on the contrary, sacrificing money, energy, and reputation.

The ingenious mechanic who can produce an apparatus that will perform the duty required of it in less time, more efficiently, with less absorption of energy, or in any other way more economically and better than

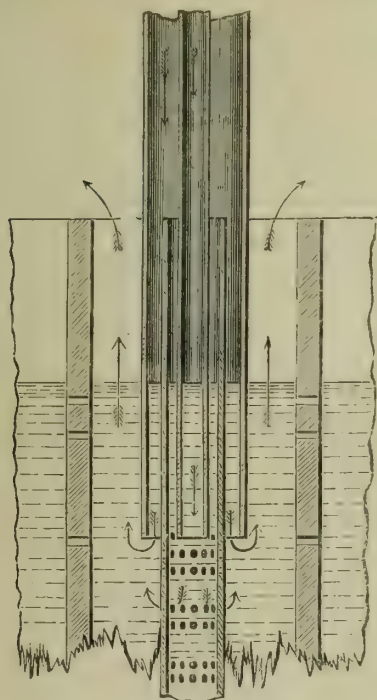


LONGITUDINAL SECTION.



SECTION AT Z Z.

SECTION AT X X.



ENLARGED SECTION OF TUBES.

other apparatus designed for a like purpose, occupies a position parallel with the oft-quoted benefactor of mankind who makes two blades of grass grow where only one grew before. Recognizing the force of this belief, it may be expected that I have some assurance in bringing under the notice of this Association and the gas profession generally an apparatus possessing in some degree qualities entitling it to your attentive consideration, for it is the invention of one who, although not a gas manager at present, has, from a life-long knowledge of gas manufacture, and being a skilled mechanic, a claim upon your attention to the extent at least of fairly judging his gas-washer upon its merits.

The apparatus, with the assistance of the accompanying engravings, may be explained as follows:—It belongs to that class of gas purifying machinery known as "washers" used in the purification of coal or other gases for illuminating and other purposes, and has for its object their construction in such a manner as to make them more efficient and con-

venient for the removal of ammonia, the sulphur compounds, and other impurities with which coal gas is charged after leaving the retorts.

The invention consists in the construction of a box or chamber, closed at the top, and of a size proportionate to the quantity of gas to be purified, forming the outer shell of the machine; also another box, of which the vertical sides are parallel to, or concentric with the vertical sides of the outer shell, and extend above to the horizontal partition, A, which stretches completely across the box. Its shape may be square, circular, or rectangular. If square or rectangular, it is provided with vertical and horizontal partitions, B, so as to divide the chamber into two, three, or more divisions or compartments. In the lower part of the vertical partitions, a number of holes or perforations are made. An inlet, C, for gas in the top part of the box or chamber is formed; but the inlet or outlet for the gas can be made on any side of the apparatus.

If the gas enters from the top (as per diagram), the chamber is divided by a horizontal and vertical plates or partitions, D, fastened to its sides, and made gas-tight. This horizontal plate has a number of holes in it, and in each of the holes is fixed a pipe, E, open at both ends, and descending some distance into the lower compartment, but does not reach the bottom. Beneath the division or plate just described there is another horizontal but loose plate. This plate has also an equal number of holes, into each of which a pipe, open at both ends, is fixed. These pipes may be either larger or smaller in diameter than the other pipes specified. If smaller, it rises within the corresponding descending pipe, and is concentric thereto; if larger, as shown at G, it rises without. The lower plate, having a number of these pipes attached, is capable of being raised or lowered by suitable screws, or may be arranged so as to float in the liquid with which the vessel is charged. These horizontal plates (which can be either loose or fixed) may be multiplied in number, and placed in tiers under each other, each being furnished with pipes or tubes of suitable diameter to leave concentric spaces between them and the corresponding pipes or tubes through which the gas is destined to travel. In the other compartment of the chamber first mentioned there is also a horizontal partition, fixed or loose, having a number of holes or perforations therein, and above this plate or partition is formed the outlet, H, for the gas.

When the washer is made circular in form, the partitions may be arranged similarly, or the division chamber may be made annular.

The number of chambers or vessels will vary according to the work they are designed to accomplish, and each is charged with water or other form of liquid compound, the height of which is capable of being adjusted by means of one or more overflow-pipes; or it may be done by an automatic arrangement, acted upon by the pressure of the gas within the vessels. These vessels, too, may be so contrived as to receive an oscillating or rotary motion by means of any suitable power.

The action of the apparatus is as follows:—The vessels being charged with suitable liquid, gas is admitted into the inlet-chamber of the first series. The gas passes down each concentric space between the pipes, and escaping from the bottom of each inlet-pipe, rises through the liquid, and passes through the holes in the top of the vertical plate. Into each of these holes is fixed a bent pipe, which descends into the liquid again, but does not reach the bottom, and rises up to the outlet chamber from whence it (the gas) is conveyed by the outlet-pipe to the next vessel in the series, or to other apparatus.

It will be observed that the space for the escape of gas from between each of the pipes may be increased or reduced within certain limits at pleasure by raising or lowering the horizontal plates, F, or the same spaces may be practically closed entirely, when the gas would be compelled to pass down the interior of the smaller pipes and through the liquid as already described. By these means much of the impurities contained in gas may be removed. In the drawings, I shows the water inlet; J, the tar outlet; and K, the means provided for emptying the vessel.

The apparatus may be made of cast or wrought iron, or a combination of these and other materials. For the small space this washer occupies, and the large amount of work it performs, I am of opinion that the apparatus will bear very favourable comparison with any other of the numerous machines intended for the work of removing impurities from coal gas.

Discussion.

Mr. STEWART (Greenock): By this plate with these inverted dip-pipes you can raise or lower, and so regulate, the pressure that practically there is no "seal" at all?

Mr. NELSON: That is so; for the "seal," as shown, can be raised or lowered at will.

Mr. STEWART: Is there one of these in actual working?

Mr. NELSON: Yes.

Mr. STEWART: What is the size of the apparatus? Is it an annular one?

Mr. NELSON: It is similar in construction to that shown by the diagram, measures 8 feet in diameter, 3 ft. 9 in. deep inside, and 4 feet outside height.

Mr. STEWART: I should have the fear that in endeavouring to get through the "washing" connection there must be a considerable depth—1½ in. or 2 in.—of luting, and there will always be this pressure in working. Then there is another point which I do not exactly understand. The water runs down in a shower, and falls outside the pipes into the lower box.

Mr. NELSON: The water falls down the inner as well as the outer surface of the pipes, and having any number of diameters, the gas, in its travel, is exposed to an extraordinary area of wetted surface, by its contact with the water trickling down the sides of the pipes.

Mr. WYLLIE (Johnstone): How does this washer keep the liquor of uniform density?

Mr. NELSON: The "flush" water or other liquid compound introduced is regulated so that when combined with the impurities of the gas (which add to its volume) the liquid drawn off may be obtained of any given strength, and in proportion to the quantity of gas you are making or the quality of coal being carbonized.

Mr. WYLLIE: That is a uniform density, and you keep it constantly.

Mr. NELSON: Yes; because the overflow may be maintained at the proportionate ratio of the flush water flowing in.

Mr. WYLLIE: I think this will be a good thing.

Mr. NELSON: I have seen it working in the North of England, and I can say that it seemed to require no attention from anybody. The bubbling noise gave proof of the active work that was going on inside.

Mr. M'GILCHRIST (Dumbarton): Perhaps you would inform us whether scrubbers are used in connection with this washer for the purification of the gas, or does the apparatus do all the work itself?

Mr. NELSON: In the works to which I have made reference, this machine is put in to supplement the scrubbing power. The make of gas last year was 170 million cubic feet per annum. The apparatus has been added, instead of erecting a tower scrubber, and my impression is that it does more work than a tower scrubber 20 feet in height would do.

Mr. M'GILCHRIST: I am afraid that this washer in its present state would be unfit to remove the whole of the ammonia from the gas. We know that in the case of several scrubbers which have been brought before the public it requires different strengths of liquor completely to remove the ammonia, and so far as I can gather from this drawing, the gas only passes once through the liquor, and then it is taken off. Now, one liquor is not sufficient to remove the impurities—a series of liquors are required.

Mr. NELSON: I said it could be used in conjunction with other scrubbers, and with liquor of any given strength; but even the duplication of this apparatus itself will perform all the work of the kind you name. Suppose you start the apparatus with pure water, the pure water will absorb certain chemical compounds for which half-strength liquor has little or no affinity. This gas passing on to a second washer containing, say half-strength or strong liquor, will there deposit the other compounds which the pure water or weak liquor in the first washer had no power to hold. Now my theory is that by this simple means a most effective system of gas purification may be secured; and considering also that no driving power is required beyond the pressure of the gas acting upon it as in the ordinary hydraulic main, with which you are all familiar, the cost of working it is practically nothing, besides you have no expense for pumping up the liquor over and over again, as in the ordinary tower scrubbers. I may further remark that this washer could be made as a combined wet and dry purifier with moveable cover as in ordinary purifiers, and could also be made in a variety of ways to be as effective.

Mr. CARLOW (President) concluded the discussion with some complimentary remarks upon Mr. Nelson having come forward at his request and at the last moment to supply in some measure the want of other papers.

(To be continued.)

THE SMETHWICK LOCAL BOARD GAS UNDERTAKING.

At the Meeting of the Smethwick Local Board on Monday, the 13th inst.—Mr. A. KEEN in the chair.

The CLERK reported that the award in connection with the gas undertaking was made on the 20th of May, the sum ordered to be paid to the Birmingham Corporation by the Smethwick Local Board, being, as already stated in the JOURNAL, £53,324. The costs of the Arbitrators and Umpire amounted, he said, to £188 17s. 6d., which were divided between the Corporation and the Board.

It was resolved that a cheque should be drawn for £94 8s. 9d., the portion of the costs to be paid by the Board.

The CHAIRMAN then presented a report on the subject, detailing the proceedings taken by the Board since the Corporation of Birmingham introduced into Parliament a Bill to enable them to purchase two gas undertakings—one known as the Birmingham Gaslight and Coke Company, and the other as the Birmingham and Staffordshire Gaslight Company. He stated that the late Birmingham Gaslight Company lighted part of Birmingham alone, and the Staffordshire Gaslight Company lighted Birmingham and several outlying districts; but it was only the Birmingham and Staffordshire Company with which he had to deal. When the Bill was introduced, Smethwick, West Bromwich, Oldbury, and Tipton opposed it for the purpose of obtaining clauses enabling them to purchase the gas undertakings within their respective districts. The result of the opposition was that the outlying districts obtained powers to purchase the portions of the undertaking within their districts, provided they, in the session of 1876 or 1877, brought in Bills to enable them to do so. The Corporation Act contained a clause to the effect that, if the outlying districts did purchase, the amount of purchase-money to be paid by each district should, failing agreement upon the amount, be settled by arbitration. The outlying districts could not agree with the Corporation as to the amount of purchase-money, and the result was that the matter was referred to arbitration, Mr. F. J. Bramwell being the Arbitrator for the four outlying districts, Mr. T. Hawksley acting for the Birmingham Corporation, and Sir Henry Hunt being the Umpire. The Act obtained by the Corporation also provided that the Arbitrators should in one arbitration decide the principle upon which the valuations of the gas undertaking in each district should be made. In the session of 1876, each of the outlying districts obtained an Act enabling them to purchase their portion of the gas undertaking, and the Smethwick Gas Act and each of the other Acts contained clauses to the effect that the outlying districts should each complete their purchases at the expiration of two years from the 1st day of January or the 1st day of July, whichever should first happen after the publication of the award. The arbitration really commenced on Oct. 16, 1877, although the Arbitrators had previously formally met on March 17, 1877. The Corporation had the right to choose which arbitration should be first taken, and they accordingly took West Bromwich. After continuing for many days, the West Bromwich case closed, and the award was made on Aug. 16, 1878, and by virtue of it West Bromwich had to pay £70,750. The Birmingham Corporation were very much dissatisfied with the principle set forth in the West Bromwich award, and took steps to upset it, because it was this principle that was to govern the other arbitrations. They appealed to the Queen's Bench Division of the High Court of Justice, and also to the Lords Justices, but the award was ultimately

upheld. During the time these proceedings were pending, the Smethwick Board were advised by their Clerk—and he (the Chairman) believed the other outlying authorities had similar advice, and the Arbitrators and Umpire were of the same opinion—that the other arbitrations could not be proceeded with. It was evident that if the principle in the West Bromwich award had been upset, then any other proceedings that might have been taken in the awards between the Corporation and the other outlying districts would have been abortive, as these proceedings would have been conducted, and a decision arrived at, on the principle set forth in the West Bromwich award. It was, therefore, necessary to have a final judicial decision upon the principle enunciated by the Umpire in the West Bromwich award before proceeding to incur further expense in deciding the other arbitrations. He had gone into this matter fully, as he had heard the question asked, "How is it that West Bromwich have completed their works, whilst Smethwick and the other outlying districts have not yet commenced to make gas?" The answer was simply this: West Bromwich was fortunate enough to be chosen by the Corporation as the first outlying district whose case should be arbitrated upon (and this he believed was done because the West Bromwich case was the largest concern, and the works were situated there). The award was made on Aug. 16, 1878, and the two years within which they could complete their purchase began to run, and still continued running whilst the legal proceedings were pending; whereas the Smethwick arbitration, and those of the other outlying districts, could not be held until after the legal proceedings had ended, and consequently their two years could not commence to run until the 1st of January or the 1st of July, whichever should first happen after their award was made. Thus it was that West Bromwich had been able to commence to make gas so long before either of the other districts. When the Board began to erect their gas-works they, of course, did not anticipate the arbitrations would be so lengthy, or that the Birmingham Corporation would consider it their duty to dispute the award of the Arbitrators (when the purchasers were neighbouring local authorities) in two courts of law. The Board, however, had the great advantage, by commencing at the time they did, of contracting for everything on the best possible terms, and of not being compelled to construct their works in a hurried manner, which, he was told, was of great importance in building gas-works, and he believed their works would be found equal to any in the kingdom. The Smethwick award was, as they were aware, made on the 20th of May last, and the sum they had to pay as the purchase-money was that reported by the clerk—viz., £53,324. By arrangement with the Birmingham Corporation the award was to have the same effect as though it had been made before the 1st of July, 1880, so that the Board could take to the undertaking on the 1st of July, 1882, unless they were able to arrange with the Corporation to take to it in September next. He thought that they might congratulate themselves upon the result of the arbitration, and the ratepayers might rest assured that the acquisition of the gas undertaking would prove a benefit to the consumers. Nobody could dispute that Smethwick was the most prosperous of any of the outlying districts. In support of this he had only to quote these figures:—The increase per cent. in the gas sold during the 6½ years commencing Dec. 31, 1873, and ending June 30, 1880, was in West Bromwich 33·5 per cent.; Oldbury, 23·9 per cent.; Tipton, 14 per cent.; and Smethwick, 43 per cent. The consumption in Smethwick between Dec. 31, 1873, and June 30, 1880, increased to the extent of 25,546,400 cubic feet. He thought these figures justified him in saying that, taking into account the increase which had already occurred in Smethwick, and the probable prospective increase in Smethwick over some of the other districts, the result of the arbitration might be considered favourable to the locality. The estimate he had made was that the total cost of the gas undertaking would be less than £110,000. In making this estimate he had included the costs of opposition to the Corporation Gas Bill in 1875; the costs of promotion of the Smethwick Act, enabling the Board to purchase; the expenses relating to the gas arbitration, comprising those of counsel, solicitor, engineers, and other witnesses; also the erection of works, expenses of clerk of the works, costs of raising the loans to enable the Board to build the works and pay the Corporation; and, lastly, the amount necessary to pay the Corporation under the award. Before concluding, he desired to make a remark with reference to some complaints he had heard with regard to an increase in the rates. The Board had up to the present time had to borrow £50,000, to enable them to erect the gas-works, and for other purposes connected with the gas undertaking. Of course they had had to pay interest upon the money borrowed, and as the works were not yet in operation, and they had not derived any revenue from the supply of gas, they had been obliged to pay the interest either out of the money borrowed or out of the rates. They would have paid it out of the capital, but their Auditor had decided that they could not legally do so. Under the circumstances, they had to pay it out of the rates, but he hoped that this was only temporary, and that the amount so paid would be credited to the rates, and thus they would be lessened at a future date. It must also be remembered that when the gas-works were in operation the surplus revenue arising from the sale of the gas would be carried to the credit of the district fund, or applied to such purposes for the benefit of the district as the Board might prescribe.

The report was received and ordered to be entered on the minutes.

SMOKE ABATEMENT.—During the meeting of the British Association of Gas Managers at Birmingham last week, Mr. William R. E. Coles, the Honorary Secretary of the Smoke Abatement Committee of the National Health and Kyrle Societies, was allowed to address the members in reference to the projected Exhibition of Smoke Preventing Appliances to be held in London next October and November. We have since received a communication on the subject from the Superintendent (Mr. G. R. Redgrave, A. Inst. C.E.) in the course of which he says: "Various patents have recently been taken out for improvements in the lighting and heating art, as it is very desirable to alter the present old and barbarous state of things, which causes so much waste and discomfort. The exhibition is under the presidency of His Royal Highness Prince Leopold, Duke of Albany, K.G., and the Duke of Westminster, K.G.; while the work has been confided to an influential Committee. The arcades of the Royal Horticultural Society, and some of the adjoining galleries belonging to the Royal Commissioners for the Exhibition of 1851, have been lent for the purposes of the exhibition. Many prizes in money and medals will be awarded to the inventors of the best appliances for preventing smoke from boiler furnaces, domestic grates, and ranges; and for improved fuels for household and manufacturers' use. A large number of applications for space have been received in advance of the particulars of the exhibition, and no applications can be entertained after the 30th inst. During the exhibition trials of apparatus will be made and reported upon, and popular lectures will be delivered by various scientific authorities. The Superintendent (Works Office, South Kensington Museum) will reply to inquiries from persons who may wish to send inventions to the exhibition. A whole section having been devoted to the application of gas to heating purposes, a large number of exhibitors is expected."

London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 21, 1881.

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion.

Undisplayed Advertisements—Situations Vacant or Wanted; Apparatus Wanted or for Sale; Contracts; Tenders; Public Notices, &c.—cost 3s. for the first six lines (about 42 words) or less; and 6d. for each additional line.

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TO CORRESPONDENTS.

ASTRA.—There is not one.

J. T. S.—Next week, after the publication of the paper.

W. S.—On their value to the supplier. There is thus no maximum rate; the figure depending solely on the consumption.

F. M. H.—Thanks for forwarding report. Our own representative was, however, present; and his account appears elsewhere to-day.

W. F. C.—Letter, &c., to hand. We may notice something of it next week.

ERRATUM.—In our report last week of the discussion that took place at Birmingham in reference to the change in the constitution of the British Association of Gas Managers, Mr. Gandon was made to say that the life subscription of a member of the Institution of Civil Engineers was fifteen guineas. This was a misprint for fifty guineas.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 28, 1881.

THE PROCEEDINGS OF THE BRITISH ASSOCIATION OF GAS MANAGERS AT BIRMINGHAM.

In the Supplement to the present number of the JOURNAL we give the first instalment of papers read and discussed at the Birmingham meeting of the British Association of Gas Managers, beginning with Mr. R. P. Spice's communication on the working of the St. John condensing apparatus at Rochdale. The meeting had just previously agreed to the appointment of a technical Committee for the authoritative investigation of doubtful points in the manufacture of gas, among which the functions and performance of various kinds of apparatus would naturally be included. The necessity for this step was unquestioned; but if there had been any present who might have felt disposed to doubt the reality of the work which such a Committee would be called upon to do, the first paper submitted to the meeting must have convinced

them. It is without any disrespect to Mr. Spice that we may here express the opinion that, with an investigating Committee in the background, such a paper as his would never have been brought forward. It was clear and very much to the purpose—from Mr. Spice's point of view—but in other respects it fell far short of what the Association had a right to expect from the author. Mr. Spice is not an unknown man who might be sharply reproved and ultimately silenced if found to indulge in strange and unscientific language, and therefore he should exercise the more caution in making statements which are intended to be taken as facts. On the present occasion, he did not—as it may be thought he would have done—lay bare the inner principles and conditions of working of an apparatus of which less was known than surmised; but, without referring even to an illustrative diagram, he gave the barest possible verbal outline of the construction of the apparatus, and immediately afterwards plunged into the statistics of the working of the entire establishment in which one of the appliances is fixed, and brought forward a mass of figures to prove the astounding proposition that a gross economy of nearly £6000 per annum is realized at Rochdale, solely by the use of a St. John condenser. We all know that figures handled in a proper manner may be made to prove anything—at least, on the surface; but it was too much to expect an assemblage of practical gas managers to follow Mr. Spice in his interpretation of facts and figures which are undoubtedly true in themselves. It may be taken for granted, as was admitted by Mr. T. O. Paterson, who watched the apparatus working on its first introduction to Rochdale, that it is successful in improving the gas passed through it in contact with warm light tar; but it is by no means certain that it effects this end more completely than simpler means which can be arranged at a much smaller cost. Mr. Spice's figures were numerous enough to prove many things in regard to the management of the Rochdale Gas-Works besides the success of the St. John apparatus; but when, as sought by the author, they were tied down to serve the purposes of his paper and nothing more, they were singularly inconclusive. Many speakers in the course of the discussion exposed some of the weak points in Mr. Spice's arguments, and it is quite unnecessary for us to go over them again. The best description of the principle of the apparatus was that suggested by Mr. Gandon, who asked if it were not strikingly similar in action to an Aitken and Young analyzer; while the most damaging criticism on Mr. Spice's manner of stating his case was that emanating from Mr. Carr. In his reply, Mr. Spice displayed his well-known power of fence, and spoke with a happy daring which dazzled his hearers; but whether he succeeded in refuting the objections that had been raised is a question which can best be answered by individual opinion after diligent perusal of our report.

Dr. Siemens's paper was regarded with a curiously divided feeling by many of those who attended the evening meeting. There was, of course, the prevailing impression of respectful consideration, due to the reader's eminence, and of admiration for the manner—as illustrated in his gas and coke fire and his new regenerative burner—in which his genius continues to manifest itself in fresh fields; but accompanying and underlying these was the impression that Dr. Siemens had strayed out of his latitude in opening up the principles of economic gas supply to the general public. He seemed to regard as sacred the opinions held by himself in 1863 with reference to the distribution in Birmingham of a special supply of heating gas, and to consider it was necessary to maintain them at the present day. That his opinions should have remained unchanged for eighteen years speaks well for Dr. Siemens's constancy, although not necessarily for his sagacity. Following a celebrated saying, it may be remarked that many things have been changed since then, and the prospect of a new gas superseding the common article has certainly not altered for the better. Dr. Siemens, however, did not bring forward, in the light of a plea for the establishment of a new industry, the advisability of the manufacture of a special gas for fuel; but suggested that lighting and heating gas should be made from the same coal and in the same retorts. The beginning and ending of every charge is best suited, in his opinion, to the production of heating gas, while the lighting gas would be taken from the middle two-thirds of the duration of the charge. In this way Dr. Siemens, following the results of experiments conducted by M. Ellissen, of Paris, anticipates that from common coal a gas of at least eighteen candles illuminating power can be obtained, with a further separate portion of gas of about nine-candle power, to be sold for heating purposes only. He

considered that a higher price than is now obtainable for average gas would be readily paid by the public for the first quality gas, thus enabling the heating gas to be supplied at a profit through a separate system of mains and services. The fallacy of this assumption scarcely needs detailed exposure. Setting aside the more obvious difficulties of manufacturing and selling gas by candle power, it will be seen that, unless a perfect balance exists between the ratios of gas consumption for heating and lighting, the whole system fails. This we regard as the gravest fault of the idea, for it cannot be overcome. There is, moreover, a sad economical blunder concealed in the idea of selling a portion of the same lulk, whether of gas or anything else, dearer in order that another portion may be sold cheaper than the mean value of the whole. To take a simple illustration, it is cheaper to buy beef in the carcase than to pay a high value for the prime cuts and a lesser rate for the coarser joints, with the butcher's profit on the cutting-up included. So is it better to sell all the gas from a charge of coal, taken at a fair average quality, at the cheapest possible rate, and through one channel for distribution, leaving the consumer to use it for lighting or heating as he pleases, instead of breaking up the gas production into two classes. As might have been expected, the best debated portion of Dr. Siemens's paper was that in which he ventilated his theory of duplicate gas supply, though the most original and characteristic part of it was that which dealt with the improved gas-burner shown—we believe for the first time—on the table. If anything like Dr. Siemens's rough results can be obtained in the usual way with burners of this design, a new impetus will be given to invention in the direction of utilizing the latent light-giving power of gas. To this search it would be in vain to fix an even approximate limit. We know, with some approach to certainty, how much heating power gas may be said to possess, although we may never be able to avail ourselves of it to the fullest extent; but the property of affording light is infinitely more difficult to value, and its hidden laws may yet have many and great surprises in store for us. The capital made by the President out of the inventions of the brothers Siemens, when stoutly upholding his own faith in the future of coal gas as against electric light, was in the happiest manner, and was rendered available for qualifying many of Dr. Siemens's statements by his own actions. We do not care to follow Dr. Siemens in his predictions of the ultimate disuse of gas as an illuminating agent, but we cannot express the smallest objection to his prophesying whatever he pleases, so long as he and his brother of Dresden will only continue to invent good gas-burners.

With respect to Mr. G. E. Stevenson's paper on regenerative retort heating, we must confess to a feeling of disappointment. The author was before the same audience last year with a very similar story; and comparison of the two papers, while proving the greater care bestowed on the later example, fails to indicate much advance in point of practice. The present paper was ill-adapted for reading, though of decided value as a contribution to the literature of the subject. Still, even from this point of view, it was late. Mr. Stevenson told his hearers that he had purposely confined himself to theory, in order that results, when independently given, might be readily appreciated at their true value, and referred to the proper causes. This is very excellent in its season, but, as Mr. Chew remarked, there is plenty of information of this character to be found. There is not an ordinarily intelligent gas manager in the kingdom who has not a pretty fair notion of the principles of the regenerative gas furnace; and what is now wanted is not more formulæ of the proportions of carbonic oxide, hydrogen, and nitrogen in an ideal furnace gas, but plain, simple observations and instructions from those who can speak from every-day experience of generator firing in this country. These Mr. Stevenson did not give, and it is to be regretted that he should have so widely misconstrued the undoubted curiosity that exists regarding the generator system, as to give a series of calculations and a drawing of a setting which is not erected, instead of the hard facts for which his hearers were waiting. Mr. Greenough, who had just returned from a tour of inspection through the German works, and Dr. Siemens himself, touched upon some of the points upon which practical men, about to embark in generator construction, demand every available scrap of information; and, on the whole, it may be conceded that some progress was made in the popular elucidation of a subject which is of the most pressing importance. Indeed, although we have been compelled to take exception to much of the matter of the three papers here dealt with, it must be agreed that they all gave rise to most interesting

and profitable discussion, and were therefore of considerable use. We shall return to the consideration of the other papers and discussions next week.

THE GAS AGITATION IN NORWICH.

It is a curious study to observe the evolutions of the self-constituted gas reformers of Norwich. Recently, when the charge for the public lighting was popularly supposed to be excessive, the Secretary to the Gas Company somewhat astonished the cavillers by announcing that the cost to the town of the gas consumed in the public lamps was not more than 2s. 6d. per thousand cubic feet on the existing contract. The local economists, however, soon recovered themselves, and, by way of taking the Company at their word, proposed that the public lighting contract should be renewed on the meter system, at the rate stated by the Company. The latter have since agreed to these terms, possibly with a desire for a quiet life in the town; and it therefore appears probable that the street lamps will henceforth be lighted on the basis of actual consumption, calculated on the above rating, until permanent arrangements for metering and regulating, in accordance with the wishes of the Council, can be concluded. The Company, as we have previously remarked, have treated the demands of the Local Authorities with the most deferential consideration, and have yielded, in reason, upon every disputed point in respect of which the Council have been able to make up their minds what to ask for. It will, of course, be understood that, in spite of all this, the local gas agitators are not happy, although there are not wanting signs to show that the agitation is almost played out. The policy of attempting by concessions, not merely just, but even excessive, to pacify noisy discontent, has been tried by many Gas Companies before this, and with indifferent success. We shall be curious to see how matters go on in Norwich, but our present opinion is, that if rigid justice will not serve to allay agitation, generosity will be wasted, and will only serve to feed the fire. There is even now an indication of the spirit in which reductions in the cost of the public light may possibly be regarded by those whose interest lies in being dissatisfied. It was remarked at the meeting of the Council, when the Gas Company's offer was accepted, that the private consumers would not long be content to pay a large additional percentage over the price charged to the public body. This prophecy may or may not be true in reference to the special circumstances, but it appears to indicate pretty accurately the popular feeling with regard to favours extended to public, as compared with private consumption, by Gas Companies who think by so doing to stop local clamour.

THE GAS SUPPLY OF GLASGOW.

THE gas undertaking of the Glasgow Corporation has during the past year continued to expand, although with a steady rather than large process of extension; still a consumption which increased during the year by 26 million cubic feet is manifestly of full vitality. The gas is of the highest character, generally considerably exceeding twenty-five candles illuminating power, and consequently goes farther in general use than the moderately brilliant product of most southern works. A surplus profit of £13,782 for the year has encouraged the Gas Committee in making another reduction in the price of gas from the 31st ult., and the rate now stands at 3s. 8d. per thousand cubic feet, with every probability, we should say, of an early diminution. The manufacturing stations did not require extension during the past year, and are said to be equal to all probable demands upon them for some considerable time. The works are in good order, and it is known that Mr. W. Foulis, the Gas Engineer to the Corporation, is continually introducing improvements in the plant and apparatus in use. There is yet a wide field in Glasgow for the extended consumption of gas, and the sound policy of the Committee will go far towards popularizing it, and extending the range of utility of their excellent product.

FIELD'S ANALYSIS FOR 1880.

THE useful "Analysis of Metropolitan Gas Companies' Accounts" annually issued by Mr. Field has this year assumed another and more extended form. From 1869, when Mr. Field first took up the enterprise of compiling a synoptical statement of the working of the then existing thirteen Metropolitan Gas Companies, the number of separate entries has steadily decreased, until for the past year only four representatives of the original organizations remain. The "survival of the fittest" has been demonstrated to the uttermost during the past eleven years in this connection, and it became correspondingly plain that Mr. Field's work was growing ominously compact, although its interest

remained as great as ever. Hence he has wisely considered the practice of the Registrar-General, who takes cognizance, in his returns relating to the Metropolis, of that Greater London beyond the old municipal limits wherein the large majority of those who swarm in the streets of the town by day, retire to live their real social existence. Mr. Field has therefore included in his purview the suburban Gas Companies, which lie all round the central region to which his previous labours have been confined, and the doings of fourteen outlying undertakings ranging from Barnet to the Crystal Palace, and from Richmond to Lea Bridge, are now brought together for comparison among themselves and with the more properly so-called Metropolitan establishments. Referring to the latter, we find that the total amount of capital sunk in the gas supply of London is £13,025,954, or an average of £6 17s. 3d. per ton of coal carbonized. Much is occasionally heard in regard to the heavy capital expenditure of the London Companies; but it is now shown by Mr. Field's figures that the outlying districts are far more heavily burdened in this respect, the £1,829,760 of capital employed by the Suburban Gas Companies being equivalent to an average of £7 9s. 4d. to the ton of coal carbonized. The lightest charge for capital of all the eighteen Companies cited by Mr. Field is the Wandsworth, with £4 18s. 10d. per ton, and next comes the South Metropolitan, with £5 0s. 10d. per ton; while the heaviest proportion is that of the Barnet Company, which is estimated for gas as equal to £18 14s. 6d. per ton, so that in comparison with many of the smaller outside Companies, even The Gaslight and Coke Company is lightly burdened. Great differences exist in the proportions of unaccounted-for gas; but the West Ham Company are credited with the smallest loss, of only 1.77 per cent on their make, while the Colney Hatch are taxed with a waste of 13.45 per cent. We must naturally expect to find greater differences between the results recorded by the outlying Companies than with the more level conditions of the four Metropolitan Companies; these latter, in fact, run together with striking uniformity. The South Metropolitan Company, as usual, paid about a shilling per ton less for coal than their neighbours, and their manufacturing and distributing charges were also the lowest. The total working expenses of this Company per thousand cubic feet of gas sold, including coals, but less residuals, were 19.27d., being below any other Metropolitan or Suburban Company, calculated on this basis; the highest expense being incurred by the Lea Bridge Company, amounting to 37.55d. per thousand cubic feet. There is indeed scarcely an end to the instructive commentary which might be made on this excellent and exhaustive compilation; and we must therefore restrain ourselves, and commend the book to the study of such of our readers as may be interested in the matters with which it deals.

Water and Sanitary Affairs.

SIR WILLIAM HARCOURT is enlarging his programme to an extent which indicates considerable faith in the opportunities the future is to afford him. The Home Secretary is ready to reform London, and to create a new Billingsgate. He hopes the House of Commons will before long have time to address itself to the former question; and as for the latter, he has given a plain invitation to the Metropolitan Board to provide a fish market for the population outside the City. If they will undertake the task he says he will help them, and he doubts not but that Parliament will support any well-considered scheme that may be thus devised. We suppose Sir William has not forgotten the juvenile offenders, and the Metropolitan Water Supply. If municipal reform is so near at hand, it would seem absurd to create a temporary Commission to take charge of the property of the Water Companies. If the reform of the municipal government of London is yet remote, the water question may require independent treatment. But if the municipal question comes to the front, the water supply must await the issue. *The Times*, in a recent leader, inclined to the idea of separate authorities for different functions, after the Fortescue model. Confessedly the method would be "a makeshift;" but we are told that "under a separate system of control for lighting, for water, for street paving, and street architecture, and for all the other prime necessities of urban life, the danger and mischief of blundering and jobbery would, at all events, be distributed." If the risks are to be "distributed," of course there is an end to that concentration and unity of which so much has been said. If London is to witness "the committal of different functions

"to different bodies conterminous with the area within which the functions have to be exerted," the Metropolitan Water Companies may as well be allowed to continue in existence, especially as the outer limits of their districts cannot be made "conterminous" with the lines which will limit the other authorities. Moreover, if "blundering and jobbery" are still to be feared, the public may perceive that the Water Companies are not likely to blunder over the business with which they have been familiar for so long a time, neither is it probable that their shareholders will submit to any perceptible jobbery. Sir William Harcourt may lead the House up to a very pretty scheme of Metropolitan municipal government, but no sooner is the problem put before our legislators in a tangible form than certain convictions are pretty sure to arise which will sober some of the present enthusiasm.

Lieut.-Col. Bolton's report for the past month contains, among other analyses of the London Water Supply, those furnished to the Metropolitan Vestries by Professor Wanklyn and Mr. W. J. Cooper. These eminent chemists state that when they commenced their analyses in the latter part of 1880, the result showed "that the condition of the London Water Supply was excellent." They now say: "Our analyses, made since that time, have fully confirmed that favourable report, and show that the water has even improved in quality." Finally these gentlemen declare their belief that "the London Water Supply is one of the best in the world."

The half-yearly report presented at the recent meeting of the Chelsea Water-Works Company afforded the usual evidence of progress in the Metropolitan Water Supply. The revenue was more than a thousand pounds above the amount received in the corresponding period last year, and the quantity of water pumped up from Surbiton to the Putney Heath reservoirs showed an increase of 36 million gallons. Among the drawbacks of the period were the severe frost of January last, and the disturbance of roadways for the extension of wood paving. The frost was a temporary trouble, but the wood paving disturbance threatens to be a chronic ailment. The Lower Thames Valley main sewerage scheme involved the Company in law costs, but these—as also the expenses connected with the Purchase Bill of last session—have been provided for out of the contingency fund. The report mentions an "unusual number of houses returned as empty." The Governor, Mr. John Deedes, in his address to the meeting, stated that last Michaelmas there were as many as 2226 empty houses in the Company's district. These are said to be mostly new houses, by which we should understand that the district was temporarily over-built. But as the inhabitants of London are multiplying at a rate which has caused the Registrar-General much surprise, we may expect to see the population soon in possession of these empty houses, thus aiding the revenue of the Chelsea Company. For the present the Shareholders may be congratulated on a dividend at the rate of six and a half per cent. per annum on the ordinary stock, and they may look for yet better days to come.

Is a workhouse a dwelling-house? The Liskeard Water-Works Company and the Judge of the Liskeard County Court think it is not. The Board of Guardians of the Liskeard Union think otherwise, and the Lord Chief Justice, with Baron Pollock and Justice Manisty, agree with the Guardians, as will be seen in our "Legal Intelligence." In the eyes of the Lord Chief Justice, "paupers in a workhouse, 'under one head, and dining together,' are 'one family as much as a nobleman and his servants.'" We hardly think the paupers would acquiesce in the notion or realize the comparison. The main question at issue was whether the water supply was required for public or domestic purposes. The Company contended for the former view of the case, while the Guardians pleaded the latter. If a workhouse were not a dwelling-house, the Lord Chief Justice wished to know what it was. The learned Counsel for the Company suggested that it was rather like a prison, and was then told that even a prison was a "prison-house." It was contended for the Company that the maintenance of paupers was a public matter, and that therefore the water supply for a workhouse was required for public purposes. But the Lord Chief Justice considered that "in the prosecution of all public purposes there may be domestic uses—'there may be things for domestic use, and,' said his lordship, 'this is one.'" Baron Pollock suggested the analogy of a private school with boarding scholars. It is useless, and may even seem absurd, to challenge the wisdom of such a tribunal, but we confess to a difficulty in looking upon a workhouse as a private dwelling-house, and in viewing the

indoor poor as constituting a family circle. The judgment thus given would apparently decide that a barracks was a dwelling-house, and a thousand soldiers one family. A private boarding-school, it seems to us, is a very different thing from a public workhouse. Baron Pollock said he was glad they were able to decide that a workhouse was a dwelling-house, "because," said the Baron, "it is "manifest that the intention of the Act is to require the "supply of water for all purposes—domestic on the one hand, "public on the other; and if by any ingenuity it was found "there was some supply not provided for, the consequences "would be extremely inconvenient." We cannot see there was any danger of such a deprivation in the Liskeard case. The Company were willing to provide the water on the terms of a public supply, but the Guardians sought to obtain it on the basis of domestic use. The difference is a pecuniary one, and the Guardians will have the benefit of the present decision, the Company receiving £12 per annum instead of £40.

The destruction of town refuse continues to make progress. Bradford, which has made trial of this method, has resolved to extend the works. The system adopted is that of Mr. Fryer, and it is stated that the annual cost is just about a fraction more than tenpence per head of the population. The destructors, in their enlarged form, will serve one-third of the borough, or about 80,000 inhabitants. When the subject was under discussion in the Town Council, one member of the body calculated that the total cost of the undertaking would be something like £37,000, and declared that the expense connected with this "magnificent scheme "of destruction struck him almost with terror." In reply, it was stated that the gentleman's calculations were wrong, and were probably influenced by the fact that he had an interest in an opposition destructor, which was really far more expensive. It appears that three different parties connected with Bradford have each invented a "destructor." In fact, this kind of invention seems likely to be in great demand, the difficulty of disposing of town refuse being a source of serious trouble to the Local Authorities.

THE CASTOR OIL GAS-WORKS AT JEYPORE.

AN interesting report by Major S. S. Jacob, on the Jeypore Oil Gas-Works, has just reached us. This establishment was founded by the late Maharajah of Jeypore, who appears to have shared with other native princes of India the desire for the material advantages of European civilization. The apparatus in use was supplied by a German named Hirzel, of Leipzig, who is said to have a patent for this kind of gas-works; although it is difficult to see how such a simple arrangement could form the subject of a valid patent. From the memorandum on the working of the establishment prepared by the present Manager (Mr. S. J. Tellery), whose administration is highly commended by Major Jacob, we gather that the gas is principally produced from castor oil, with the addition, when the castor seed is not available, of poppy, til, or rape seed. According to Mr. Tellery's own records, he produces from one maund of castor oil (82 lbs.) about 750 cubic feet of 26½-candle gas; or 1000 cubic feet of 18½-candle gas; or 1250 cubic feet of 9-candle gas. With other oils the same quantity of material worked to make gas of equal qualities will produce 610 cubic feet, 762 cubic feet, and 914 cubic feet of the respective grades of illuminating power. According to these results, taking the current prices of oils delivered into the works—castor oil being Rs.11 12a. (22s. 4d.), and the other oils Rs.10 (19s. 10d.) per maund—the castor oil gas is Rs.0 10a. 4p. (1s. 3d.) per 1000 cubic feet cheaper than other oil gas.

The works are double in all respects, duplicate sets of retorts, purifiers, &c., and gasholders being erected, for which arrangement no reason is given. It appears that the works were originally intended to make oil and water gas, in the method of producing which the manufacturer's patent probably consisted. For this purpose each set comprised a bench of six retorts in one arch, of which three were used for making oil gas, and the remaining three for decomposing water. This process did not work well, and the first proceeding of the present Manager was to demolish the old settings, and fix each retort separate, so as to be enabled to work one or more, according to requirements. At present two horizontal retorts are used, which are kept at work during about 218 hours per month, and produce something like 98,720 feet of gas in this time. Worked in this way, the cost of manufacture (exclusive of the cost of oil) is as follows:—

	Rs.	s.	d.
Wear and tear	1	3	2½
Fuel	2	11	7
Labour	0	5	3½
Purification	0	0	4½

Total cost per 1000 cubic feet. = Rs. 4 4 4½, or 8s. 6d.

This high charge for manufacturing expenses is, of course, due to the fact of so little gas being required; if the consumption should increase to about 260,000 cubic feet per month, which could be supplied without increased cost for establishment charges, the working expenses per 1000 cubic feet would be reduced to Rs.2 9a. 5½p. (5s. 1d.)

The works consist of the round retorts before mentioned, which

are now constructed of wrought iron, 8 ft. long and 12 in. to 15 in. diameter. This is the only part of the apparatus which causes expense for renewals. The retorts, not being in constant work, have to be heated for six or eight hours before they attain the proper heat for decomposing the oil. The oil is supplied through a syphon, and great care has to be observed to adjust the supply to the capacity of the retort. If too much is run in, the oil merely distils without gasifying; and if too little, the olefant gas evolved is subsequently decomposed into marsh gas. The gas passes into an ordinary hydraulic main, and thence into a cooling chamber, whence it is conducted to dry scrubbers filled with coke. Having parted with all its tar and ammoniacal liquor, the gas is passed through the purifiers, which contain a curious mixture or series of purifying materials consisting of dry lime, sulphate of iron and copper, sheep's wool saturated with naphtha, and sawdust. [This looks very much as if the purifiers also have to perform the duty of carburetters, perhaps to correct any mishap arising from overheated retorts, but there is no particular mention of this necessity.] The gas is then passed into the holders, each of which contains 15,240 cubic feet.

The gas is chiefly consumed in the public offices and streets; there are, however, a few private consumers, who are charged by meter at the average cost price, Rs.18 1a. 8p. (35s. 10d.) per 1000 cubic feet, and appear well satisfied with the supply. Most of the burners in use consume only 1½ cubic feet of gas per hour, which, with this rate of consumption, is equal to from 17 to 18 candles; the gas is therefore of high brilliancy. The street main from the works is 5 inches in diameter, which is considered ample for supplying 1500 lights. One house in Jeypore has 118 lights supplied through an inch service-pipe. The loss by leakage is estimated at about 13 per cent. The supply of premises temporarily, or when situated at a distance, is provided by compressing gas at the works to about three atmospheres by means of a pump driven by one bullock. The compressed gas is then delivered in a wrought-iron receiver to the point of consumption, where it is either transferred into fixed receivers and burnt by the aid of suitable regulators, or is delivered into small portable or service gasholders, and burnt in the usual way. A *ghat*, or landing-stage, two miles distant is thus supplied with 400 cubic feet of gas every day, which is consumed by 30 jets, each burning 1½ cubic feet per hour for nine hours. There have not been any accidents from the distribution of gas in the portable reservoirs, or otherwise. As railway carriages are also supplied with compressed gas, it is evident that the introduction of this branch of service has widely extended the utility of the establishment.

Another peculiarity of the Jeypore undertaking is the necessity that exists for the Manager to unite the attributes of a farmer to his other acquirements, for the purpose of securing a constant and cheap supply of raw material for gas-making. Last year Mr. Tellery personally superintended the sowing of 300 acres with the castor plant (*Ricinus vulgaris*), and the establishment includes a hydraulic oil-pressing apparatus. The process of extracting the oil for carbonizing is as follows:—First, the castor seed is passed through the crusher, when the shells only are broken off. The shells are then picked out by hand, and the seed is again introduced into the crusher, where it is ground to a paste. It is then passed into the heating pan, and after being well heated it is packed into horsehair bags and filled up hot into the press immediately. After about 20 minutes' pressing, the exuding oil being meanwhile collected, the cake is removed and ground over again. It is subsequently heated and pressed a second time, until about 33 or 40 per cent. of oil is obtained from the seed. The labour of preparing and pressing the castor seed costs Rs.1 1a. 8p. (2s) per maund of oil. The cost of extracting other seed oil is about the same, with the exception of the cost of removing the shells. For generating gas the oil is used as it comes from the press. Formerly, at other places, when the oil-bearing seeds were carbonized for gas without previous treatment in this way, the product was overloaded with carbonic acid from the woody part of the seeds, and correspondingly heavy cost for purification was incurred, which by Mr. Tellery's process is entirely avoided.

When the establishment was first started the cost of manufacturing gas was Rs.23 2a. 5½p. (45s. 10d.) per 1000 cubic feet; but from the time when the present Manager obtained full powers of working independently the cost has been reduced, over an average of six months' working, to Rs.18 1a. 8p. (35s. 10d.) per 1000 cubic feet. There will be considerable saving if the Manager succeeds in his castor plantation, and he is confident that during the next twelve months the cost will be brought down to Rs.13 or Rs.14 (25s. 9d. to 27s. 9d.). The illuminating power of the gas, as we have said, is such that a burner consuming 1½ cubic feet per hour is equal to 17 or 18 candles, and about 800 cubic feet of purified gas are usually produced from a maund of oil. As a further means of economy, it is proposed to erect an apparatus to burn the tar, which is rather a drug, for the preparation of lamp-black. This is expected to bring in a better profit than the present system of selling the tar at an almost nominal price. It is unnecessary to state further details to show the manifold duties which fall on Mr. Tellery, of the castor oil gas-works, Jeypore, who in that far-distant state is so worthily displaying the fertility of resource and steadfastness of purpose which in other fields might, though of less real beneficence, attract more celebrity to their possessor. The general advantages of gas lighting are never more clearly shown than when, as in the present instance, the methods practised in more favoured localities have to be copied as closely as possible under difficulties which, even if overcome by the gas manufacturers, necessitate the imposition of high rates for the product. The Jeypore establishment has now apparently become a settled industry, and although some serious blunders, if nothing

more, marred the early promise of the concern, all these bad influences have disappeared, and the order and economy which now characterize the administration and working reflect the highest credit on all concerned.

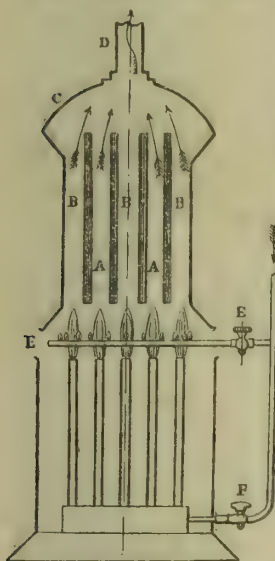
Notes.

A NEW POWERFUL GAS-BURNER.

A new high-power burner has been introduced by MM. Marini and Gœlzer, which is well spoken of by a portion of the French scientific press. The principle of the construction of the burner is simply in the direction and distribution of the air currents to obtain steadiness, whiteness, and brilliancy of flame. Glass chimneys being unsuitable for shielding the flame in burners of great power, in the present example an internal guide is employed. The burner is circular, consisting of a single line of 250 holes; and, having passed a suitable regulator, the gas is supplied to the interior of the burner by four tubes. In the centre of the apparatus a flash-light is kept burning. The air supply to the main burner is thus arranged: First, an external deflector of crystal causes the outer air to strike against the flame immediately above the holes of the burner; then the internal air current is directed against the ring of flame at a slightly higher point, by means of an inverted cone of copper. Besides this double air supply, which is ordinarily secured in a burner supplied with a glass chimney, there is a further and peculiar arrangement for more completely oxidizing the flame, consisting of an internal cylinder of porcelain pierced with holes and covered with a projecting lid. This cylinder is upheld by a crystal tube, which is carried down to the base of the burner. The consumption of gas by this apparatus is from 40 to 70 cubic feet per hour, according to size; and the burner is ordinarily fixed in a large round lantern, hermetically closed. By a consumption of nearly 50 cubic feet per hour, with a porcelain inner column, an illuminating power of about 160 candles is obtained; with an inner cylinder of glass the duty performed is rather less. The flame produced is said to be round, compact, steady, and long; the strongest wind only agitating it momentarily, without causing it to smoke. Smaller burners are made on the same principles, with a corresponding loss of effect.

A NEW GAS HEATING-STOVE.

A so-called "thermo-radiator" for gas has been invented by M.



Teissonière, and is described in a communication presented to the Société Technique by M. Amiel, and published in their Transactions, from which the annexed diagram is also taken. The arrangement is very simple, and depends on the principle of warming induced currents of air. The stove is cylindrical in shape, and contains two sets of gas-burners, one over the other. The lower sets are Bunsen tubes producing the flames, A, which are developed under the openings of a series of vertical tubes, B, whereby a strong upward current of air is induced, which, becoming heated by contact with the sides of the tubes, is gathered into the chamber, C, and thence finds an exit through the tube, D. The ring burner, E, placed above the Bunsen flames, A, is made to give small and closely-ranged flames, which can only be extinguished by total stoppage of the supply of gas. These small flames, called "safeties," are intended to instantly light the Bunsen burners, so

soon as the cock, F, is opened, and also to ignite any gas which may escape from the atmospheric burners from an accidental cause. The result of the united action of the independent sets of burners is that the gas from one cannot escape ignition by the other. There is thus a guarantee that all the gas supplied to the stove is being consumed, and that consequently no explosion can take place. The radiating tubes being made of good conducting material, and the air currents being rapidly heated, the apparatus is said to act well as a warming and ventilating stove; but no particulars of its working are given.

A GAS-FIRED LOCOMOTIVE.

Gas-firing, as applied to locomotive boilers, has had a trial in America, and apparently with some measure of success. The fuel was made by the Holland hydrogen process, which consists essentially of the well-known principle of mixing superheated steam with naphtha. The first locomotive fitted with the Holland apparatus had a kind of furnace containing 352 burners composed of short pieces of upright pipe. In the furnace were also four strong iron retorts connected by iron pipes with the water-tank of the tender, also with an oil-tank on the tender, and with the steam space in the boiler. When sufficiently heated, the retorts pass superheated steam and petroleum vapour together to the 352 burners, which, in turn, keep up the heat of the retorts as well as the boiler. From a carefully noted trial it appears to have taken 2½ hours to get up the full pressure of 120 lbs. in the boiler, 26 gallons of oil having been expended. Naphtha is very cheap in New York, the total cost of the 26 gallons being only 78 cents, or 3s. 1½d. English currency. This was considered to be much less than the cost of coal, and it was

calculated that a fast train could be run with petroleum and water gas at a cost of 36 cents (1s. 6d.) per hour. The appearance of the flame is said to be similar to that of pure hydrogen, scarcely visible, but possessing great heating properties. There are no particulars available of the cost of repairs and renewals of the water gas apparatus, nor does it appear that more than one locomotive engine has been fitted with it.

THE VELOCITY OF LIGHT.

Dr. J. Young and Professor G. Forbes have recently been engaged in a re-determination of the velocity of light through space, using chiefly an electric arc-light as the source of the luminous rays the velocity of which was to be measured. The final results of these experiments, after making all necessary corrections, gave for the electric light rays a mean observed velocity in *vacuo* of 187,273 miles per second. A curious fact was observed in the course of the investigation, which was that blue rays travel quicker than red rays, the difference being about 1·8 per cent. of the whole velocity of light. It results from this observation that the more the blue rays predominate in any particular light, the greater is its total average velocity. This is also apparently proved by the fact that when the results of Messrs. Young and Forbes' experiments show a superior velocity to the previously recorded estimations, these latter are also found to have been deduced from observations of the setting sun, petroleum, or lime light. In this way the electric light rays are shown to possess a higher velocity than those of the lime light, which is in its turn superior to the rate of emission of the sun near the horizon, the petroleum rays being slower still.

Legal Intelligence.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

TUESDAY, JUNE 21.

(Before the LORD CHIEF JUSTICE, Baron POLLOCK, and Justice MANISTY.)
BOARD OF GUARDIANS OF LISKEARD UNION, APPELLANTS, v. LISKEARD WATER-WORKS COMPANY, RESPONDENTS.

This was an appeal against the decision of the Judge of the Liskeard County Court, given on Jan. 19 last year, and reported in the JOURNAL, Vol. XXXV., p. 168. The facts of the case are as follows:—The Water Company sued the Board of Guardians to recover (nominally) three-quarters of a year's rent for water supplied to the Liskeard Workhouse; contending that, under their special Act of Parliament, they could charge at the rate of £40 per annum. The evidence showed that the inmates of the workhouse, inclusive of the officers, numbered about 160 persons, and upon the appellants in the present case applying to the respondents for a supply of water, the latter declined to furnish it at their ordinary domestic rates, upon the grounds that the workhouse was not a dwelling-house within the meaning of the 33rd section of their special Act of Parliament; that the appellants (the Poor Law Union) were not owners or occupiers of any house or part of a house within the meaning of the same section; and that they were not persons entitled to demand a supply of water for the use of the officers and inmates of the workhouse, the latter not constituting one family within the meaning of the Act. The matter being taken before the local County Court, the Judge (Mr. M. Bere, Q.C.) stated it to be his opinion that the contentions on the part of the respondents were right. A case was then applied for and granted, in order that the opinion of this Court might be obtained upon the following questions:—Was the water to be supplied for public purposes? Was it required for private purposes? Were the appellants one family or more?

Mr. CHARLES HALL, on behalf of the appellants, said that the main point in the case was what was the meaning of the words "domestic uses," as distinct from the words "public purposes." The 33rd section of the Company's special Act of Parliament provided that the Company should—at the request of the owner or occupier of any house, or part of a house, in a street where the Company's main-pipes were laid, or of any person who, under the provisions of the Act, or any Act incorporated therewith, should be entitled to demand a supply of water for domestic purposes—furnish the said occupier with a sufficient supply of water for domestic purposes at a rate not exceeding 6 per cent. per annum on the rental value.

Baron POLLOCK: You find the words "domestic purposes" in all Water-Works Acts, and the antithesis is "trade purposes."

Mr. HALL said he should argue that there was nothing in the section dealing with trade or public purposes which included a workhouse or poorhouse. The objects of the Act were that domestic use was not to be interfered with, nor were the cleanliness and comfort of the inhabitants to be interfered with. Water for use in a house, for cleanliness or for enjoyment by the inhabitants, was for domestic use. The 34th section of the Company's Act stated that water for domestic purposes was not for railways, baths, washhouses, nor for horses or cattle, or washing carriages, where the horses or carriages were let for hire or were the property of a dealer, or used for the purposes of any trade, manufacture, or business whatsoever. The 35th section enacted that the Company might supply any person, board, or corporation with water for other than domestic purposes at such a rate and upon such terms and conditions as should be agreed upon between the Company and any such person, body, or corporation. The County Court Judge held that the purpose for which the appellants required the water was not for domestic use. He contended that the Company were in this position: They had, under the powers granted to them by Act of Parliament, practically a monopoly for the supply of water; and it was for them to show that they were not bound to supply the water. If there was any doubt about it, the public ought to have the benefit of the doubt. The 35th section of the Water-Works Clauses Act (10 & 11 Vict., cap. 17) clearly stated that the undertakers should provide and keep in the pipes laid down by them a supply of clear and wholesome water sufficient for the domestic use of all the inhabitants in the town or district within the limits of the special Act who were, as therein-after provided, entitled to demand a supply, and willing to pay a water-rate for the same. The 36th section dealt with the penalties for neglecting to supply water for domestic purposes; and the 37th section related to public purposes, such as the cleansing of sewers and drains, cleansing and watering streets, and supplying baths and washhouses, &c. He contended that this showed what public purposes were. Commenting upon the 37th clause, he argued that there was nothing whatever in it about the supply being for one family. It merely provided that if there was more than one family, the rate was to be not less than a minimum amount. But in this case the Company were not damaged because the

amount was so much larger, being at the rate of 6 per cent. per annum. Nor was there any restriction whatever as to the number of families in a house. If there was more than one family, there must be a minimum, and he submitted that this was the real meaning of the section. It was admitted that the appellants had offered to pay 6 per cent., and therefore the Company were not damaged in this respect, though they would be if an attempt were made to get the water supplied at a low rate as for one family. The minimum rate was 4s. 4d. for a family, and the amount offered was £12 per annum.

The LORD CHIEF JUSTICE: There must be 24 families, each with its water-closet, for the Company to get £12.

Mr. HALL said that if there were 30 families the rates would be more than £12. However, the fact he relied upon was that there was nothing in the section excluding the appellants, whether they were a family or not.

Mr. CHARLES, Q.C., for the respondents, contended that the offer of 6 per cent. per annum on the rack-rent was not enough. The supply of water to the respondents was not for domestic, but strictly for public purposes. Supposing the workhouse were let out to a considerable number of families.

The LORD CHIEF JUSTICE: Does a family mean relationship?

Mr. CHARLES admitted that it was very difficult to say.

The LORD CHIEF JUSTICE inquired whether paupers in a workhouse, under one head, and dining together, were not one family as much as a nobleman and his servants.

Baron POLLOCK: You would exclude also the case of a private school with boarding scholars.

Mr. CHARLES said that the other point he relied on was a better one.

The LORD CHIEF JUSTICE: We may assume the paupers to be a family?

Mr. CHARLES said he reluctantly acquiesced in the assumption; for he contended that under section 35 of the Act the water was really for public purposes.

Baron POLLOCK: The washing of paupers and giving them water to drink could hardly be other than domestic purposes.

The LORD CHIEF JUSTICE said that water for horses and cattle, and for washing carriages, had been held to be for domestic purposes under the Water-Works Clauses Act. Words in the Company's special Act were to have the same meaning as the same words in the general Act, unless there were something in the context inconsistent with such construction.

Mr. CHARLES argued that public purposes meant those purposes which were described in section 37.

Baron POLLOCK inquired what was the purpose of a workhouse if it was not for public purposes.

Mr. CHARLES replied that it was for the maintenance of the poor. His only remaining argument was whether a house of this kind really was a house within the meaning of section 33.

The LORD CHIEF JUSTICE: What is it?

Mr. CHARLES: It is like a prison.

The LORD CHIEF JUSTICE: Is not a prison a house? It is sometimes called a prison-house.

Mr. CHARLES said that the word in the section was "house," and meant dwelling-house.

The LORD CHIEF JUSTICE held that a workhouse was clearly a dwelling-house; and in giving judgment said: I am of opinion that the appellants are entitled to what they claim in this case upon all the points, and I am clearly of opinion that the workhouse is a dwelling-house within the meaning of the 33rd section of the Company's Act. It has been already held, and Mr. Charles has very properly told us he does not oppose it, that the Poor-Law Guardians are the owners and occupiers of the house for some purpose; but then it is said these occupiers are not supplied with water for domestic use, because the paupers of England are a quasi-public body, and the maintenance of the paupers of England, in this large sense, is a public purpose. There is no doubt, in a certain way, that this is perfectly true; but first of all in the prosecution of all public purposes there may be domestic uses—there may be things for domestic use, and this is one. In the second place, we have not to deal with what may be considered a public purpose in a general meaning, but what is a public purpose within the meaning of these two Acts of Parliament. Now, for domestic purposes water is to be supplied at one rate, and for public purposes it is to be supplied at a rate—not fixed in the Act of Parliament, but to be agreed. Mr. Hall's argument, which I confess appears to me to be an unanswerable one when put altogether, and which I desire to adopt, is this: There are two Acts—a public and a private Act. In the private Act the public Act is incorporated, and it is enacted that the words used in the private Act shall have the same meaning as the words used in the public Act, except where it is necessary to construe them in another way. Now, the words "public purposes" in the public Act are confined, by the true interpretation of sections 37 and 43, to certain purposes specified in the 37th section; and amongst these public purposes so specified in the 37th section this is not one. If this remain doubtful, which I do not think it does, the argument is strengthened by the addition, in the 34th section of the private Act, of certain things which, but for the additions, would, under certain decisions of this Court, have been held to be domestic purposes; and those are expressly excluded by the words "public purposes." There public purposes are left by themselves, and then certain other things which had been held to be domestic purposes, are specially exempted by the operation of the 34th section. Therefore, taking these three sections together, it seems to me to be clear that the words "public purposes" in the special Act are to be used in the same sense as the words "public purposes" in the general Act, and the words "public purposes" in the Act do not include this particular purpose—domestic purpose or use. I do not know that there is any other point left except that the paupers are not one family, for the purpose of bringing them within the proviso of the 33rd section. The proviso may be open to the observations which Mr. Charles has made on it, but I prefer to say the proviso does not arise, because in this case it is clear, for the purposes of this Act, the paupers in the workhouse are one family. I will not attempt to define a family, because I am very likely to give a definition out of which some difficulty might arise; but it is quite plain to me, where there is one system, under one organization, carried on in a building, however large, the persons who are all subject to the head of the building, and are all a part of the system or establishment carried on in the building, are, for the purpose of this Act, one family. The mere size of it, as has been pointed out, makes no difference, because there may be a nobleman with as many retainers or servants in his service as the paupers in the workhouse number. It is not essential that they should be connected. This is obvious; first of all because every large family is made up of inmates, many of whom may not be either blood or marriage connections; and, at any rate, besides this, there are the domestic servants, who are never, or scarcely ever, connected by blood or marriage with the persons who are at the head of the family. Yet they are all, for such purposes as this, considered as one family. Then there is the further illustration, suggested by Baron Pollock, of a large school where there may be 30, 40, or possibly 150 or 200 young men or boys, under one head and roof, and under one system of organization in feeding, and for all practical and ordinary purposes one family, although entirely disconnected one with the other, and brought from the four

quarters of the globe. I think, therefore, there is nothing in any of the points the respondents have made. I think the County Court Judge was wrong in giving effect to them, and that the appellants are entitled to succeed.

Baron POLLOCK: I am of the same opinion, and I can only add that I am glad we are able to come to this conclusion, because it is manifest that the intention of the Act is to require the supply of water for all purposes—domestic on the one hand, public on the other; and if by any ingenuity it was found there was some supply not provided for, the consequences would be extremely inconvenient.

Justice MANISTY: I also am of the same opinion.

THAMES POLICE COURT.—THURSDAY, JUNE 23.

(Before Mr. LUSHINGTON.)

A WATER COMPANY FINED FOR DEFECTIVE SUPPLY.

The *East London Water-Works Company* were summoned by Sarah and Mary Reilly, owners of Sampson's House, Albion Street, Mile End, for unlawfully neglecting or refusing to furnish an adequate supply of water, for which the rates had been duly tendered and paid. There were no fewer than 28 summonses against the Company, for not providing a proper supply of water to the complainants' tenants on different days; but only one summons, which served as a sample of the remainder, was taken.

It appeared that there are on the premises two cisterns 23 feet from the ground, but the adjoining houses are supplied by butts only 4 feet from the ground. Each cistern when full holds about 60 gallons of water, but from the 15th of May to the 19th of June the supply had been insufficient for the wants of the persons living in the house, and they had to borrow water from neighbours. The supply-pipes in the cisterns were in proper order, but the water was laid on for only 20 minutes, and flowed only in dribbles. It was proved that on the 19th of May there was an inadequate supply of water, although if the pipe had flowed freely for the 20 minutes, instead of in the slow manner it did, there would have been sufficient to fill the cisterns.

Mr. LUSHINGTON, in the result, said he could not doubt that on the 19th of May the cisterns were not properly filled, and there was not a sufficient pressure of water. He should therefore impose the full penalty of £10 for this offence. The rate had been paid on the houses for the last two years, and the complainants were entitled during the whole of this time to a proper supply of water. They had been losing tenants in consequence of the insufficient supply, and he fined the defendants 20s. and 2s. costs on each of the 27 summonses, and £5 5s. costs, making a total of £44 19s., to be handed over to the persons who paid or tendered the rate.

LAMBETH POLICE COURT.—THURSDAY, JUNE 23.

(Before Mr. ELLISON.)

UNFOUNDED COMPLAINT AGAINST A GAS COMPANY.

The *South Metropolitan Gas Company* answered a summons taken out by Charles Wilson, the occupier of certain premises in Station Road, Camberwell New Road, for wilfully failing, after having notice in writing, to furnish a supply of gas.

Mr. WASHINGTON appeared for the Company.

Complainant, in his evidence, stated that he rented several billiard saloons, and the premises in question, a railway arch, he used for such a purpose. He denied owing the Company anything.

Mr. WASHINGTON, after cross-examining the complainant at some length, urged that the Company had been fully justified in the course adopted. There was power given to cut off the supply of gas, and refuse to renew it whilst any money was due for a former supply. He handed in several papers, which he contended fully showed that the complainant was still indebted to the Company for gas.

In support of this statement he called Mr. Alfred E. Allen, one of the collectors of the Company. He was proceeding to call other evidence, when

Mr. ELLISON said there was no reason to do so. He was perfectly satisfied that there was collusion between the complainant and others with regard to the tenancy of the premises. The documents produced and the evidence given showed the Company to be quite justified in refusing the supply. He dismissed the summons; and, upon the application of Mr. Washington, made an order against the complainant for £1 1s. costs.

DONCASTER CORPORATION WATER SUPPLY.—On Monday last week Mr. E. J. Smith held an inquiry at Doncaster with respect to an application to the Local Government Board by the Doncaster Corporation for sanction to borrow £10,000 to complete their water-works. The Town Clerk (Mr. Shirley) said the water-works had been opened, and the inhabitants were now furnished with a good, plentiful, and excellent supply of water, greatly to the comfort and health of the borough. He stated that the Corporation had already borrowed £160,000, and as they had power to raise £170,000, they applied for the sanction of the Local Government Board to borrow the additional £10,000. There had already been laid out upon the undertaking £165,819 8s. 10d., so that £5819 of the money proposed to be borrowed had already been spent. The estimated cost of the completion of the works was £6787 9s. 11d. Mr. Brundell added that there were still some leakages in the reservoir, and they were dealing with them by a process of burrowing, to meet which £500 was included in the estimates. Reckoning the sums to be paid to noblemen and gentlemen for easements, &c., the Corporation would require £12,607, although they had only sanction to borrow £10,000, and this would close the capital account. After some remarks from the Engineer as to the waste of water, the inquiry concluded.

THE ELECTRIC LIGHT IN THE HOUSE OF COMMONS.—Further experiments with the electric light were made in the House of Commons last Friday night. In addition to the 12 Brush lanterns in the roof, there were 34 small incandescent lights on the Swan system under the galleries. These lights superseded 64 gas-lights in the roof and 34 gas-jets on the pillars. There was, *The Times* says, a perceptible diminution of heat under the galleries, and the light there was steady and clear. Though some alterations had been made in the deeply-ground glass which encased the opal globes in the roof, no change was observable from the previous experiment. Opinion is still divided as to the comparative merits of the old and new systems of illuminating the chamber. A London correspondent of several country papers says: "The second trial of the electric light in the House of Commons has not produced a more favourable impression than the first. There is great difference of opinion as to the merits of the light, so far as reading by it is concerned, but very few members are enamoured of it. The Swan light under the galleries does its duty in a very perfunctory manner. The light is like that of an oil lamp, and is thrown on the upper panels, where nobody wants it. As a contribution to the illumination the performance of the Swan cannot be highly rated. The Brush light from the roof still flickers very much, and the noise of the engine will sometimes be heard even above the voice of Alderman Fowler. On the whole, the effect suggests that somebody has been trying to make daylight, and has made it very badly."

SUPPLEMENT

TO THE

JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

Vol. XXXVII.

LONDON, JUNE 28, 1881.

No. 946.

BRITISH ASSOCIATION OF GAS MANAGERS.

EIGHTEENTH ANNUAL MEETING.

PAPERS READ.

(1.)

ON THE TREATMENT OF GAS IN CONDENSATION,
AS EFFECTED BY ST. JOHN'S APPARATUS.

By Mr. R. P. SPICE.

The invention to which I invite your attention is one having for its object that which we all aim at effecting in one way or another—namely, the increased economy of the retort-house, by so treating the gas as it leaves the retorts that the effect may be a greater yield, per ton of coal, of gas of a higher illuminating power, without promoting the formation of naphthaline.

The process, devised by Mr. St. John, of New York, is an extremely simple one, and consists of an arrangement of rectangular boxes, with external connections and internal dip-pipes, the superficial area of each set or series of the latter being equal to the area of the former; the “dip” or seal in each box being regulated by valves or taps, which control the current of tar and liquor as it flows continuously through the entire series of boxes.

The gas, tar, and liquor, as driven from the retorts, being conducted from the retort-house into the first box of the series, is made to pass through the whole; and afterwards the gas passes through vertical boxes to effect condensation, and thence, as may be desired, through scrubbers, for the purpose of arresting ammonia in the usual way.

This being the process, the question is—What is the effect? Having watched it in operation, and compared effects and causes, with as much regard to accuracy as the recorded facts at the Rochdale Corporation Gas-Works have enabled me, I have arrived at the following conclusions concerning the working of the two years 1878 and 1881; and my reasons for dealing with these two years are, that the year ending March 25, 1878, was the last in which the working was conducted without any aid from St. John's apparatus, and that ending March 25, 1881, was the first throughout which all the gas was passed through the apparatus, while in the two intervening years the process was only partially in use. The following are the facts:—

Gas made in.	1881 = 265,736,000 feet.	
	1878 = 245,043,000 "	
Increase in 1881 over	1878 = 20,693,000 "	
Make per ton of coal and cannel in	1881 = 10,211 "	
	1878 = 9,438 "	
Increased production per ton	1881 = 773 "	
Cannel carbonized in	1878 = 7,508 tons	
	1881 = 3,630 "	
Less cannal in 1881 than in	1878 = 3,878 "	
Coal carbonized in	1878 = 18,453 "	
	1881 = 22,393 "	
Excess of coal used over	1878 = 3,940 "	
Coal and cannal carbonized in	1881 = 26,023 "	
	1878 = 25,961 "	
Increase of quantity carbonized in	1881 = 62 "	

Average cost per ton of cannal in the four years ending March 25, 1881	£0 19 10
Average cost per ton of coal for the same year	0 11 8½

Cannel carbonized in 1878 = 7508 tons, the average price being 19s. 10d. =	£7,445 8 8
Coal carbonized in 1878 = 18,453 tons, the average price being 11s. 8½d. =	10,802 7 4½
Total	£18,247 16 0½

Cannel carbonized in 1881 = 3630 tons, the average price being 19s. 10d. =	£3,590 15 0
Coal carbonized in 1881 = 22,393 tons, the average price being 11s. 8½d. =	13,108 14 0
Total cost of coal and cannal in 1881	£16,699 9 0

The cost of coal and cannal in 1878 being on the average of four years	£18,247 16 0
And the cost in 1881, at the same rates	16,699 9 0

The difference is the saving in cost effected by reducing the proportion of cannal required to maintain the same standard of illuminating power	£1,548 7 0
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This comparative statement does not, however, give more than a small part of the total sum of the advantages realized in the year 1881 by means of the apparatus. To exhibit this in its entirety, I propose to refer to the financial account given in the statistics published by the Corporation, which are furnished as an appendix to this paper.

The profit of the year 1881 is stated at	£11,331 8 4
That of the year 1878 at	8,622 9 2

The apparent difference being an increase of	£2,708 19 2
But before the profit of 1881 was struck, the account was debited with an additional payment of £236 14s. 3d. for interest and an extra payment of £400 towards the sinking and depreciation funds, besides which £900 less was charged for public lighting, and 3d. per 1000 feet less was charged for gas supplied to private consumers in 1881 than in 1878; and, to put the two years on all-fours, these corrections must be made, viz:—	
Excess paid for interest	£236 14 3
Excess debited to sinking and depreciation funds	400 0 0
Less charged for public lighting	900 0 0
Less charged private consumers	2,743 12 0
	4,280 6 3

Increase on 1881 over 1878	£6,989 5 5
Subject to a reduction on account of the advantage due to the less amount paid per ton for coal and cannal in the latter year, amounting to not more than £1000	1,000 0 0
	£5,989 5 5

This increased economy, amounting in money value to 6d. per 1000 feet on the 219 million feet of gas sold in the year to private consumers, is attributable to the very gradual condensation effected by so passing it through the warm tar and liquor, on its way to the scrubbers and purifiers, that all the valuable light-giving compounds contained in the hydrocarbons separated from the coal in the retorts, are taken up by, and become chemically incorporated with the gas, instead of being thrown down, as they too commonly are by our older methods of condensation, finding their way, as they do, partly by gravitation, into the tar and liquor tanks, or settling, in the still more objectionable form of naphthaline, into various parts of the plant beyond the exhauster, occasioning serious inconvenience, expense, and loss.

This evil commonly extends beyond the gas-works into the distributory plant, occasioning thereby trouble and annoy-

ance to consumers, obliging them to complain and to send for the "gas man" to clear the service-pipes by using the familiar "service cleanser." It is, perhaps, not saying too much, to refer to this as being the curse of modern gas manufacture, and to describe the product as valuable matter wasted by being put into the wrong place.

If the use of this apparatus did no more than enable us to work at economically high heats without causing, as such heats unquestionably do, the inconvenience and loss due to the formation and deposit of naphthaline, it would be well

worthy of our consideration; but as it has been proved beyond question that by its use a large percentage of cannel is dispensed with in the production of 18-candle gas, and the commercial result is to bring to the credit side of our balance-sheets, for the benefit of shareholders, ratepaying proprietors, and consumers alike, a large addition to profit, enabling us to reduce the selling price while maintaining or increasing illuminating power and purity, it behoves us to see to it that such benefits are largely secured for the common good.

[APPENDIX.]

STATISTICS OF THE ROCHDALE GAS-WORKS, AS PUBLISHED BY THE CORPORATION.

	From March 25, 1877, to March 25, 1878.	From March 25, 1878, to March 25, 1879.	From March 25, 1879, to March 25, 1880.	From March 25, 1880, to March 25, 1881.
<i>Receipts.</i>				
Gas sold to private consumers	£38,266 19 7½	£38,237 2 3½	£38,865 0 9	£40,148 10 2
Gas supplied to public lamps	4,970 16 4	4,369 1 8	4,391 10 0	4,070 15 1
Tar and ammoniacal liquor	3,227 13 8½	3,017 11 2	3,082 17 1	3,320 5 4
Coke	2,643 8 4	2,507 14 8	2,184 16 5	2,719 13 10½
Sundries	168 6 11	80 0 0	24 14 3	51 14 5
	£49,277 4 11	£48,211 9 9½	£48,548 18 6	£50,310 18 10½
<i>Expenditure.</i>				
Cannel and coal used	£19,034 7 7	£17,360 10 8½	£15,980 1 4½	£16,382 13 1½
Lime used	160 19 11½	166 3 3	7,195 9 0	—
Salaries and wages	7,945 16 11½	7,640 19 11½	4,544 8 3	7,362 6 4
Expended on works, &c.	2,914 2 8½	3,688 18 6½	122 8 0	3,129 1 2
Printing and stationery	174 18 3	144 8 1	7,242 0 8	156 11 4
Interest of money	7,045 15 3	7,291 17 0	1,789 18 3	7,282 9 6
Rates and taxes	1,223 17 3	1,346 4 1	385 13 7	2,027 15 7
Rent of land	161 14 1	160 6 11	—	245 9 10
1-75th part of money borrowed paid to sinking and depreciation funds . .	1,993 3 8	2,393 3 8	2,393 3 8	2,392 3 8
	£40,654 15 8½	£40,192 12 2½	£39,662 17 9½	£38,979 10 6½
Profit this year	8,622 9 2½	8,018 17 7	8,886 0 8½	11,331 8 4
	£49,277 4 11	£48,211 9 9½	£48,548 18 6	£50,310 18 10½
<i>Production.</i>				
Number of feet of gas sold to private consumers	202,638,400	202,826,800	207,604,500	219,488,500
Do. estimated to have been burnt by street lamps	14,939,500	13,806,900	12,947,600	14,102,000
	217,577,900	216,633,700	220,552,100	233,590,500
Do. consumed on the works	2,258,600	2,304,200	2,263,900	1,557,500
Do. lost by leakage and condensation	25,206,500	25,810,100	26,983,000	30,588,000
	245,043,000	244,738,000	249,799,000	265,736,000
Loss per cent. by leakage and condensation	10-28	10-54	10-80	11-51
Number of tons of cannel used	Tons. cwt. qrs. 7,507 12 0	Tons. cwt. qrs. 6,673 17 0	Tons. cwt. qrs. 4,237 18 0	Tons. cwt. qrs. 3,630 8 0
Do. coal used	18,453 8 0	18,125 5 0	20,602 2 0	22,392 13 1
	25,961 0 0	24,799 2 0	24,840 0 0	26,023 1 1
Gross average production of gas from each ton of cannel and coal used . .	9,438 cub. ft.	9,868 cub. ft.	10,056 cub. ft.	10,211 cub. ft.
Illuminating power, average	17-91 candles.	18-23 candles.	18-22 candles.	18-13 candles.
Average price of cannel per ton at works	£1 0 5-38	£0 19 11-01	£0 19 7-61	£0 19 4-79
Do. coal per ton at works	0 12 2-22	0 11 9-01	0 11 5-61	0 11 5-84
<i>Cost of Gas.</i>				
Net cost of gas per 1000 feet, reckoned on quantity sold, including 1-75th part of debt paid to sinking and depreciation funds	£0 3 1-44	£0 3 2-31	£0 3 1-40	£0 2 9-79
Net cost of gas per 1000 feet, reckoned on number of feet made, and excluding 1-75th part of debt paid to sinking and depreciation funds . .	0 2 7-95	0 2 7-57	0 2 6-72	0 2 3-54
<i>Selling Price of Gas.</i>				
Invoice price of gas per 1000 feet in the borough	£0 3 11	£0 3 11	£0 3 11	£0 3 8
Do. do. out of the borough.	0 4 7	0 4 7	0 4 7	0 4 4
Amount charged per lamp per annum	2 18 6	2 10 0	2 10 0	2 6 0
Amount of discount allowed	2,295 9 2	2,184 10 2	2,385 13 1½	2,600 18 3
Number of services	19,312	19,815	20,162	20,391

Discussion.

Mr. J. WEST (Manchester) asked what was the best temperature for the gas to enter the apparatus, and again at what temperature it came out. The principal merit of the apparatus, it appeared to him, was to get rid of all the tar, so that no naphthaline should be formed.

Mr. W. CARR (Halifax) said it seemed to him that Mr. Spice claimed for this process three things—first, that it produced a large credit balance which could be used in reduction of price; secondly, that it increased the illuminating power of the gas; and, thirdly, that it prevented the deposit of naphthaline. These were three very important matters, and if the apparatus would do all that was claimed for it there could be no doubt about the advisability of adopting it. Still, he thought that Mr. Spice had hardly proved his case in the paper he had just read. The particulars given, although very good as far as they went, were hardly sufficient to demonstrate that the improvement in the results at Rochdale was owing to the application of this particular apparatus. It might be fairly admitted that it did increase the illuminating power, and though at first he was sceptical on this point, he had satisfied himself that it did really do so; but with regard to the other two matters he was by no means satisfied. He did not know whether the increase of illuminating power was not obtained more or less at the expense of

the tar used in the apparatus. He knew that, at the time it was at work at Rochdale, a great improvement was going on in the management from year to year, and probably if they looked over the balance-sheets of 1877 and 1878—before the apparatus was put up—they would find that the same improvement had taken place between these two years. They also knew, as had been pointed out in the President's address, that considerable improvement had been going on over the same years in other works; so they might as well say that the improvement which had taken place in the balance-sheet at Leeds from year to year was due to the absence of the St. John apparatus, as to say that the improvement at Rochdale was altogether due to its presence. Much of the advantage gained at Rochdale was due to the fact that the management altogether had improved. He knew that the make of gas per mouthpiece had increased from something like 4000 to about 6000 cubic feet during these years, which, in itself, would put something to the credit side of the balance-sheet. As to the naphthaline, he did not know what to say about it. They were always more or less at a loss to know the laws which governed the formation and deposit of naphthaline. He knew works where the St. John apparatus was not used, where they were as free from naphthaline as they were in works where it was used; whereas there were others which were more or less troubled with it. His own experience had

been that the trouble did not increase with any increased temperature of distillation, for when he worked low heats he had more trouble with naphthaline than when he worked high. He did not say that the higher heats were the cause of the reduction, for he must confess that he was unable to account for it in any way; but he could not accept the statement that because they were not troubled with naphthaline at Rochdale it necessarily followed that it was because they used the St. John apparatus.

Mr. G. E. STEVENSON (Peterborough) said from Mr. Carr's remarks he judged that during the last few years there had been an increase in the temperature of the retorts at Rochdale, and he understood Mr. Spice to say that with the St. John apparatus it was possible to work the retorts at a high heat, and at the same time produce gas of good illuminating power. Would Mr. Spice be so good as to say what was the reduction in the percentage of cannel used in the last year for which he gave the figures—viz., 1881—in comparison with the year 1878, before the apparatus was put up. He should also be glad to know what increase of illuminating power took place, or was there an increased make of gas with the same illuminating power as previously? The question was a very important one—whether the St. John apparatus enabled gas of high illuminating power to be produced, and at the same time a larger quantity to be obtained per ton of coal carbonized. The increase in the make per ton—viz., 773 feet—was greater than the 500 feet over which a discussion took place a few months ago. He did not understand very clearly the construction of the apparatus, or the principle on which it acted, and he should be pleased if Mr. Spice would say whether the heat of the tar was maintained artificially, or did the hot gas itself heat the tar and take from it the hydrocarbons with which the gas became charged?

Mr. T. O. PATERSON (Birkenhead) said that his experience of the St. John apparatus at Rochdale was perhaps the first in this country, and he might say that although he did not find it carried out to the letter everything which the patentees claimed for it, yet the result was so far satisfactory as to induce the Corporation of that town to purchase the apparatus. It was said they were to have a very considerable increase in the yield of gas per ton of coal carbonized, which, however, did not, to his knowledge, result. The increase in illuminating power, however, was quite up to, and indeed better than was claimed by the patentees. When working without the apparatus during the winter months, they used about 33 per cent. of cannel, but during the time the apparatus was being used the percentage was reduced more than one-half, or down to 15 per cent., whilst at the same time the quality of gas was fully maintained. As to the utility of the apparatus as a condenser, he considered it acted more as a carburetter and a washer than as a condenser. The tarry matter was thoroughly washed out of the gas during its course through the apparatus, and the temperature of the tar at the inlet being maintained at 120° to 130° Fahr., it was quite possible to secure an increase of 1½ to 2 candles in illuminating power.

Mr. R. MORTON (London Gas Company) said that it would be interesting to know what would be the result of using this apparatus where gas was made without cannel. At Rochdale cannel was used, and it was well known that tars from cannel and from common coals differed very materially; so that whilst gas might be able to take up illuminating power from cannel tar, he was afraid that the tar resulting from common coal, or with a very small percentage of cannel, would not have the same effect. It would be interesting to know, therefore, whether the apparatus had been applied where common gas only was made.

Mr. C. E. BOTLEY (Wormwood Scrubbs, &c.) wished to ask Mr. Spice in what position he recommended the apparatus to be placed—immediately after the hydraulic main, or in conjunction with the horizontal main? With regard to temperature, Mr. Paterson said that from 120° to 130° Fahr. was the most favourable temperature for taking up hydrocarbons, and he would like to ask whether the same result would not be arrived at by carrying the gas in contact with the warm tar round the building. The plan he had adopted, on leaving the hydraulic main, was to take the heavy tar off in one direction to the tar-well, and conduct the gas round the buildings in contact with the lighter tar, so that it might take up the lighter hydrocarbons in its passage? Was it the particles of gas being brought into violent contact with the particles of tar in the same way as in the Pelouze and Audouin condenser that produced the advantages that were claimed for the St. John apparatus?

Mr. HENRY WOODALL (Leeds) asked if there were any dif-

ference in the mode of purification employed—whether oxide was used at one time and lime at another; or whether within the period referred to more efficient apparatus had been erected for taking out the carbonic acid in any way, because the taking out of this impurity would naturally have a great influence on the quality of the gas.

Mr. DENNY LANE (Cork) thought it was a pity that a diagram of the apparatus was not exhibited, as it was a novelty. He thought that the arrangements for condensation in gas-works had not been carried out in as thorough and scientific a manner as some other departments of gas manufacture. He had rarely seen any automatic regulation of condensation in gas-works; but, if consideration were given to the number of changes that took place from the presence in combination of gas and tar, it was surely high time that there should be some definite method laid down for conducting the condensation. In former times, Mr. Lewis Thompson explained the presence of naphthaline in some cases and its absence in others in this way: He said that naphthaline was likely to occur in very cold or very hot weather, but not at other times; and the way in which he endeavoured to account for it was this. He said that certain hydrocarbons passed over when there was a moderate temperature, and that they were sufficient to keep the naphthaline in solution. At a very low temperature these hydrocarbons did not pass over, but were carried down in the condenser, and thus the naphthaline, not having the hydrocarbon to keep it in a state of solution, was deposited in the mains. On the other hand, when there was a very high temperature in the condenser, the result was that a larger proportion of naphthaline was carried forward than there was of solvent to suspend it. He (Mr. Lane) should be glad to know if these views were still entertained; for, if so, they pointed to what he had already remarked—that it was highly desirable they should ascertain the best conditions of condensation, and that these should be maintained under a system which would be practically automatic.

Mr. H. COCKEY (Frome) regretted that he had only been able to hear the paper indistinctly; but he gathered the general facts stated, and the advantages said to be derived from the use of the apparatus. These he took to be an increased quantity of produce from the coal, higher illuminating power, and absence of naphthaline. He could not say anything about the produce, because he did not hear enough of the figures to gather what the results were, but as to the illuminating power, it struck him that there was nothing very particular in the figures quoted. He had himself, on a small scale—manufacturing something under 30 million feet per annum—in former years found that if the illuminating power were to be kept up, even to 14 or 15 candles, it was necessary to introduce a great deal of cannel; but for the last two or three years there had not been a particle of cannel used, and they had been able to keep the standard up to 17 candles. Then as to the naphthaline, by the introduction of higher heats and a more regular means of condensation, they had been able to do away with it entirely. He attributed this to the regular and gradual condensation. A short time since he saw the venerable Manager of the works at Brighton, Mr. Rutter, who, by introducing the same kind of gradual condensation, had been able to do away entirely, or except in an infinitesimal degree, with the naphthaline, which a few years ago troubled him excessively. It struck him, therefore, that they required some more proof than they had yet had that all the results attributable to the agency of the St. John apparatus were derivable from it.

Mr. C. GANDON (Crystal Palace District Gas Company) asked Mr. Spice if he did not consider that the action of the St. John apparatus was somewhat similar to that of Mr. Young's analyzer, because, as he understood, in both instances the gas and tar were kept together for some time in a hot state. The suggestion thrown out by Mr. Morton—whether the benefit derived was not chiefly to be expected in the case of gas of high illuminating power—was of some importance. With regard to naphthaline, there was no doubt that the higher the illuminating power of the gas the less likelihood was there of a deposit of naphthaline. With 14 to 16 candle gas there was no doubt an advantage by keeping it in contact with the tar, so long as the two were hot; but if they came in contact when cold, the very opposite would be the result, and there would be a decrease instead of an increase of illuminating power. Whether the increase due to the contact between the hot gas and tar was altogether permanent, was a matter of some doubt, on which he had not been able thoroughly to satisfy himself; but he certainly thought that keeping the gas and tar in contact in a hot state was a move in the right direction.

Mr. R. O. PATERSON (Cheltenham) said that some of the figures Mr. Spice had given struck him as rather remarkable. He made out that the net advantage of the St. John apparatus was a money gain of £5900 per annum at Rochdale, and, working this out per 1000 feet of gas, it came to 6d. per 1000. This was followed by a statement that the advantage was obtained by preventing the hydrocarbons, which usually went to the tar-well, from going there, and retaining them in the gas. If this was the main advantage of the apparatus, and the large amount of 6d. per 1000 feet was gained, assuming that 10,000 feet of gas were made per ton of coal carbonized, it was equivalent to deriving the enormous advantage of 5s. per ton of coal from the use of the apparatus; in other words, taking 5s. per ton of coal out of the tar-well and putting it into the gas. He was not aware of any one deriving such a revenue as this from tar, even with rich hydrocarbons in it. On the general question he thought the statement made by his brother had considerable weight; for, in judging of the value of the apparatus, one year should not be compared with another simply, because the conditions might vary so enormously in the two years. The comparative trials to which his brother referred gave this as the net result—that comparatively little was gained in the amount of gas yielded per ton, but there was a decided improvement in the illuminating power of the gas up to an extent of $1\frac{1}{2}$ candles, which appeared to be a fairly intelligible result. This he (Mr. Paterson) thought would be about the fair maximum value of the apparatus. It was also claimed for it that it prevented the deposit of naphthaline; but this he presumed could only mean that it did not promote the formation of it, and it must leave them, in the long run, very much as good managed works were at present in this respect. He would be glad to have Mr. Spice's explanation of the figures he had quoted from the paper.

Mr. A. C. FRASER (Bolton) said that a few years ago he had had some little experience in making gas without any cannell whatever, and with only ordinary coal produced gas of 20-candle power; but the tar produced at the low temperature—about 1700° Fahr.—was so valuable that it readily fetched 6d. a gallon, whereas ordinary tar was then only worth $\frac{3}{4}$ d. to a 1d.

Mr. H. TOWNSEND (Bradford) said that one of the chief advantages claimed for the St. John apparatus was the prevention of the deposit of naphthaline; but, as Mr. Carr had said, there were works where naphthaline was unknown, even where the apparatus was not used. He happened to be connected with a works where this was, happily, the case, for since he had been at Bradford he had not had the pleasure of seeing his old friend "naphthaline" in any form. The Engineer, too, who had directed these works for a great many years told him that it was quite out of his experience; in fact, one of the pleasures he had looked forward to in connection with this meeting was to renew his acquaintance with his old friend. The cause of the absence of naphthaline was a very gradual reduction in the temperature; the tar was taken direct from the hydraulic main, and afterwards the gas passed through a breaker, which effected the mechanical deposition of most of the remaining portion of the tar. They always aimed at not reducing the gas to a lower temperature than 60° Fahr. at the outlet of the condenser.

Mr. C. EASTWOOD (Dewsbury) said he would like to know the selling price of the tar at Rochdale in 1878 and 1881.

Mr. J. CHEW (Blackpool) said he had listened attentively to both the paper and the discussion, but unfortunately he could not hear distinctly all the figures in the paper. Certainly Mr. Spice had made some rather startling assertions, and, as far as he (Mr. Chew) understood, he claimed a gain of something like 6d. per 1000 feet by the use of the St. John apparatus. If this was so, it was an immense advance on what anybody had done before, and it occurred to him, on hearing this statement, to ask Mr. Spice where the increase of illuminating power came from. He was under the impression, rightly or wrongly, that the gain was to be derived from taking the gas at the right temperature, and passing it through the tar previously made from the same gas. If he were wrong, Mr. Spice would correct him; but if this were the case, he would find that not more than three-fourths of a candle, or one at the outside, could possibly be gained from the tar deposit, even in the tar well manipulated upon by some of the highest authorities; and if the gas was first to drop the tar and then take it up again, he could not see that there was such a great gain after all. As had been remarked, the value of the tar robbed of the light oils and naphthas was very much decreased, and the tar distiller would certainly not give the same price for it after all the light oils were taken from it as he did before. It was only a

valuable commodity to him in proportion to the light oils in it. If a tar distiller found that he could get 20 gallons of light oil from tar distilled in any particular works, he would give a certain price for it; but if at another works gas was manufactured in such a manner that all the possible light oils were taken from it, it would be found that not more than 7, 8, or 9 gallons of light oil could possibly be obtained from a ton of tar, and he would not give as much for it. His (Mr. Chew's) own experience was that where low heats and plenty of cannell were used, a tar rich in light oil and naphtha was produced; but, on the other hand, where there were good sharp heats and common coal was used, there was not much, if anything, left in the tar that the gas was capable of carrying to the consumers' meters.

Mr. CORBET WOODALL said, like many others, he laboured under the disadvantage of not hearing the paper very distinctly; but what he gathered, as much from the discussion as from the paper, brought him to the conclusion that there was something inherently wrong in the manner in which the particulars upon which the paper was based, had been laid before the Association. The inexorable logic of the balance-sheet did not apply to such a case as this, and he entirely agreed with the remarks just made by Mr. Chew, that in order to form an estimate of the value of such an apparatus as that dealt with in the paper, it was desirable that experiments should be made with it and without it, as nearly together as possible; both the materials used and the methods of investigation being the same in each case. As it was, so far as he could gather, they had in this case only the comparison of the balance-sheet and that of the illuminating power of the gas in different years. As almost every one who had spoken had suggested, there were so many circumstances which might influence both the one and the other, that it was impossible to arrive at anything like a conclusion as to the absolute value of the apparatus from any such figures. It had just been suggested to him that the value of 18-candle gas delivered into the holder in Yorkshire was from 7d. to 8d. per 1000 feet; and if this were so in a works where the St. John apparatus was not used, it would be interesting to know what was anticipated would be the value where it was in use, and whether or not they were speedily to have realized the condition which the Mayor had referred to that morning. Mr. Morton asked whether this apparatus had been used with common coal, which led him (Mr. Woodall) to speak of his own experience with it. Shortly after it was introduced, he had an opportunity of making a trial at the Phoenix Gas-Works, Vauxhall, and the result was that the gain in illuminating power was so slight that he was not disposed to recommend its use. He was bound, however, to say, that the method on which the experiment was conducted—owing to the manner in which the apparatus was fitted up—was unsatisfactory in itself; and, therefore, he would rather not name the exact results obtained in these trials. His main object in rising to speak was to suggest that this paper and discussion pointed out the wisdom of the resolution passed that morning—to encourage more direct and exact methods of investigation both into new processes proposed to be applied to manufacture, and into those difficult and doubtful questions which were raised as to the results obtained by one method or another.

Mr. F. W. HARTLEY begged to remind the members of a most interesting paper which was contributed some time ago by Mr. Leicester Greville to the JOURNAL OF GAS LIGHTING. Those disposed to consider this subject fully might, with the assistance of Mr. Greville's paper, be able to judge how far their tar was likely to be depreciated in value by the application of the St. John apparatus. Mr. Greville showed that the gas was enriched immensely by a very small addition of naphtha, which could be obtained sometimes from coal tar. The hydrocarbons contained in common coal gas, and which gave light, were not more than 4 per cent., and thus it could easily be understood that a very slight addition of light naphtha or benzole vapour would considerably increase the illuminating power.

Mr. T. NEWBIDDING (Manchester) said they were much obliged to Mr. Spice for bringing this subject forward, although most present would agree that he had presented it perhaps in rather an exaggerated form; but he (Mr. Newbidding) was sure, from the discussion that had arisen, they would all derive much benefit from the paper that had been read. There was one point which he should not like to be overlooked with respect to comparing the illuminating power of gas at the present day with what it was some years ago. In most gas-works the proportion of cannell used had been materially reduced within the past five or six years, and this was due not only to improved methods of condensation and

purification, but very much (perhaps the greatest proportion) of the advantage must be ascribed to the improved gas-burners produced by Mr. Sugg and others. Within the last five or six years gas-burners had been improved to such an extent that the illuminating power of gas had been developed from 17 to 22 per cent., and this fact in itself largely accounted for the very material reduction which had taken place in the proportion of cannell necessary to be used in its production.

Mr. W. Sugg said it was important to bear in mind that the illuminating power of the gas in the towns from which the members came, who took part in the discussion, was not always mentioned, and this was an important omission. It was almost invariably the case that where the gas was of a quality between 17 and 18 candles, naphthaline was nearly unknown; but where from 14 to 16 candle gas had to be supplied, there was some difficulty in keeping naphthaline from depositing. There was no doubt, from the knowledge he had acquired, not so much from practical working—and therefore he spoke with some diffidence—as from information obtained from various works which he had visited, that where condensation was carried on very slowly, and the heat was brought down very regularly and gently, and never went down to a very low point, there was less trouble with naphthaline than where sudden changes or ebills came on the condensing apparatus. Take the case of the old City of London Gas-Works, when under the direction of Mr. Mann. Even at a time when the illuminating power of the gas was not so high as it was now, he had no trouble with naphthaline, because he adopted the process of carrying the cooling main round the retort-house, and brought the gas slowly down to the ordinary temperature of the atmosphere, but never below it. With regard to the alteration of the standard of illuminating power owing to the use of improved burners, there was no doubt that some years ago, when the illuminating power of gas was first taken, there was no standard burner for the purpose of testing it, and people used different kinds. But, besides this, the apparatus used with the burners had been essentially improved, and a different mode of using the candles had been introduced. At the present time they were dealing with very careful methods, where a large number of errors had been eliminated. In the old times he had seen photometers put up close to walls where there was a great deal of reflection, but they had had now for a good many years a body called the Metropolitan Gas Referees, who had given very great attention to improving these matters, and who had entirely eliminated all possibility of reflection from the improved apparatus for testing now in use; and their action had not only influenced London, but every city in the Kingdom.

Mr. SPICE, in reply, said he did not imagine that so many questions would have arisen with regard to the paper. His idea was that members would be surprised that he should have ventured to make such startling assertions; but he proposed to refer them all to Rochdale, and let them examine the facts for themselves, and if they did this it would confirm all he had said. He was not there as the exponent of a favourite system, nor with any ulterior object; he was there as one of themselves, to bring before them facts worth taking note of and examining into. He had been to Rochdale and inquired carefully into this matter, and he had not learnt that the great financial results he had mentioned had been, in any important measure, due to other improvements which had been introduced at the works whilst these experiments were going on. Guided solely by the facts he had ascertained, and by the statistical statements published by the Rochdale Corporation, extending over four years, he had given, in a condensed form, the actual results, and he defied any gentleman present to show that the conclusions he had arrived at were not based on the facts published by the Corporation. Some gentleman incidentally asked what might be expected if 6d. could be saved out of 8d. He had not come before them with any conjuror's trick of this kind, but with a statement of facts realized at a particular works. In round numbers, 7000 tons of cannell were formerly used, and 3500 tons now sufficed to produce the same results. The illuminating power of the gas was not lowered but raised. For 1878 it was 17·91 candles; in the year following it was 18·23, when the apparatus was partially used; in the next year, when it was also only partially used, it was 18·21; and in the year ending the 25th of March, 1881, it was 18·13, or 0·22 candle higher than in 1878. Besides this, with only 62 tons more coal used, 20,693,000 cubic feet more gas were made. This was due to working at higher heats, and keeping the coal a longer time under the operation of distillation. So much more gas was obtained from the same quantity, practically, of raw material; the raw material being less rich in illuminating

power than that which was used in 1878. It was not that this money would have gone into the tar-well—it would not have gone anywhere—it would not have been created. Some of the rich matter might, and some of it undoubtedly would have gone into the tar; and some, by these high heats, might have taken the form of naphthaline, which meant light-giving power kept from going to the gas-holder and the consumers' burners. As to the imagined decreased value of the tar, the tar and ammoniacal liquor in 1878 fetched £3278 13s. 8½d.; the next year, £3017 11s. 2d.; the next, £3082 17s. 1d.; and the next, £3320 5s. 4d.; so that they had not lost in diminished value of the tar any part of the great gain in gas-rental. With regard to the question as to where the apparatus was used where only common coal was employed, he must answer, "Nowhere;" but it was now in course of introduction, and he believed he might say in course of rapid introduction. The advantages in such cases could not be anything like the ones he had portrayed in those works where cannell was used to produce 18-candle gas; but every engineer would say that taking more gas out of a ton of coal, and improving that which he did take out, must result in benefit, wherever it was applied, and the precise benefit in each case must be a matter depending upon circumstances. It was not a new trick or a new idea; it was simply following out and more effectually doing that which Mr. Cockey intimated, and which had been suggested three or four years ago—breaking up the tar in its passage from the retorts to the condenser. With regard to condensation, Mr. Denny Lane had touched a point which was worth consideration, and was indeed an essential element—the *gradual* condensation of the gas. Some twelve months ago he introduced a jet of steam in an inner pipe in the condenser, and had the results of the experiment recorded; and he found that warming up the lower part of the condenser effected an improvement in the illuminating power of the gas to the extent of 0·75 candle; not that the ¾ of a candle was realized just where it was warmed, but after the whole process was completed, and the gas had been stored and sent out to the town. All these things were in the same direction in which Mr. St. John had gone; but Mr. St. John, he ventured to think, had gone farther than most or any of them. At all events he had done so much as to entitle his invention to serious consideration.

The PRESIDENT said that the discussion had been so full and exhaustive that it was not necessary for him to add anything to what had been said. He confessed that he had been a little startled at the figures which Mr. Spice had put forward. As had been very properly remarked, 6d. per 1000 feet was an extraordinary saving to effect by the process under consideration, as it would almost entirely wipe away the cost of gas manufacture. He was not one of those who thought that they could eat their cake and have it too, and he was not sanguine enough to think that if they made use of the light oils for enriching their gas they would not reduce the value of the tar. What they had to determine was whether the light oil was of more value to them for such a purpose, or as forming a constituent of the tar which they sold to the distiller. He would only add that at the Adderley Street works of the Birmingham Corporation a St. John apparatus had been in use for some months, and any member who wished might, by a visit to these works, obtain any information with regard to the apparatus which the officials there were themselves possessed of.

(II.)

ON GAS SUPPLY, BOTH FOR HEATING AND ILLUMINATING PURPOSES.

By C. W. SIEMENS, C.E., D.C.L., F.R.S.

When, within the memory of living men, the gas-burner took the place of the time-honoured oil-lamp, the improvement, both as regards the brilliancy of the light and the convenience of the user, was so great that the ultimate condition of perfection appeared to have been reached. Nothing apparently remained for the engineer to effect but improvements in the details of the works and apparatus, so that this great boon of modern times might be utilized to the largest extent. It is only in recent years that much attention has been bestowed upon the utilization of bye-products, with a view of cheapening the cost of the production of the gas, and that the consumer has become alive to the importance of having a gas of high illuminating power, free from noxious constituents, such as bisulphide of carbon; thus providing a gentle stimulant for steady progress on the part of the gas-works manager.

This condition of steadiness and comfort has been somewhat rudely shaken by the introduction, within the last year or two, of the electric light, which, owing to its greater brilliancy and cheapness, threatens to do for gas what gas did for oil half a century before. The lighting of the City of London, and of many public halls and works, furnishes indisputable proof that the electric light is not an imaginary, but a real and formidable competitor with gas as an illuminant; and it is indeed time for gas engineers and managers to look seriously to their position with regard to this new rival—to decide whether to meet it as a foe, and contest its progress inch by inch, or to accept at once the new condition of things, conceding the ground that cannot reasonably be maintained, and to look about in search of such compensating fields as may be discovered, for a continuation or extension of their labours.

For my own part, I present myself before you both as a rival and a friend; as a rival, because I am one of the promoters of electric illumination; and as a friend, because I have advocated and extended the use of gas for heating purposes during the last twenty years, and am by no means disposed to relinquish my advocacy of gas both as an illuminating and as a heating agent. Speaking as a gas engineer, I should be rather disposed to regard the electric light as a welcome incentive to fresh exertion, confidently anticipating achievements by the use of gas which would probably have been long postponed under the continued *régime* of a monopoly. Already we observe, both in our thoroughfares and in our apartments, gas-burners producing a brighter and more powerful light than was to be seen previously; and although gas will have to yield to the electric light the illumination of our light-houses, halls, and great thoroughfares, it will be in a position, I believe, to hold its own as a domestic illuminant, owing to its great convenience of usage, and to the facility with which it can be subdivided and regulated. The loss which it is likely to sustain in large appliances as an illuminant would be more than compensated by its use as a heating agent, to which the attention of both the producer and the consumer has latterly been largely directed.

Having, in the development of the regenerative gas furnace, had exceptional opportunities of recognizing the many advantages of gaseous over solid fuel, I ventured, as early as 1863, to propose to the Town Council of Birmingham the establishment of works for the distribution of heating gas throughout the town; and it has occurred to me to take this opportunity (when the Gas Managers of Great Britain hold their annual meeting at the very place of my early proposal) to lay before them the idea that then guided me, and to suggest a plan of operation for its realization, which at the present day will not, I venture to hope, be regarded by them as utopian.

The proposal of 1863 consisted in the establishment of separate mains for the distribution of heating gas to be produced in vertical retorts, that might be shortly described as Appold's coke ovens heated by means of "producer" gas and "regenerators." The heat of the retorts was to be increased beyond the ordinary limit, in order to produce a coke suitable for locomotive and other purposes; and the gas produced being possessed of less illuminating but of the same heating power, and being, with a view to cheapness, less thoroughly purified than ordinary retort gas, was to be distributed through the town as a heating agent, to be applied to the small boilers and furnaces of the numerous little factories peculiar to the district, as well as for domestic purposes. The Corporation applied for an Act of Parliament, but did not succeed in obtaining it, owing to the opposition of the existing Gas Companies, who pledged themselves to carry out such an undertaking if found feasible by them. I am ready to admit that at the time in question the success of the undertaking would have involved considerable practical difficulty; but I feel confident that the modified plan which it is my present object to bring before you would reduce these difficulties to a minimum, and open out, on the other hand, a new field of vast proportions, for the enterprise and energy of those interested in gas-works, and of great benefit to the public.

The gas-retort would be the same as at present, and the only change I would advocate in the benches is the use of the regenerative gas-furnace. This was first successfully introduced by me at the Paris Gas-Works in 1863, and has since found favour with the managers of gas-works abroad and in this country. The advantages that have been proved in favour of this mode of heating are—economy of fuel; greater durability of retorts, owing to the more perfect distribution of heat; the introduction of an additional retort in each bed, in the position previously occupied by the fire-grate; and, above all, a more rapid distillation of the coal, resulting in

charges of four hours each, whereas six hours are necessary under the ordinary mode of firing. The additional suggestion I have now to make consists in providing over each bench of retorts two collecting-pipes, the one being set aside for illuminating, and the other for a separate service of heating gas. I shall be able to prove to you, from unimpeachable evidence, that the gas coming from a retort varies very greatly in its character during progressive periods of the charge; that during the first quarter of an hour after closing the retort the gas given off consists principally of marsh gas (CH_4) and other occluded gases and vapours, which are of little or no use for illuminating purposes; from the end of the first quarter of an hour, for a period of two hours, rich hydrocarbons such as acetylene (C_2H_2) and olefiant gas (C_4H_4) are given off; whereas the gases passing away after this consist for the most part again of marsh gas, possessing low illuminating power.

M. Ellissen, the late chief of the experimental department of the Paris Gas-Works, and actual President of the French Society of Gas Engineers, has favoured me with the result of a most interesting series of experiments, which he carried out in connection with the late M. Regnault, the eminent physicist, some years ago; the object of the experiments being to discover the proper period of time to be allowed for each charge. The accompanying diagram (see Appendix) gives the results of these experiments, showing in a striking manner that although the average illuminating power produced by the distillation of the coal did not exceed 1.35 Carcel burners, or 13.5 standard candles, according to our English mode of measurement, the gas given off from the end of the first quarter of an hour, during a period of two hours, possessed an illuminating power of 1.616 Carcel burners, or 16.16 standard candles.

According to the figures given in the valuable experiments of M. Ellissen, it appears that nearly two-thirds of the total production of gas takes place in the above period, whilst the remaining third is distilled during the first quarter of an hour and the last hour and three-quarters. It hence follows that by changing the direction of the flow of gas at the periods indicated, allowing the first results of distillation to flow into the heating-gas main, then for two consecutive hours into the illuminating-gas main, and for the remainder of the period again into the heating-gas main, one-third volume of heating and two-thirds of illuminating gas would be obtained, with this important difference, that the illuminating gas would be of 16.16 instead of 13.5 candle power, and that the heating gas, although possessed of an illuminating power of only 11.05 candles, would be preferable to the mixed gas for heating purposes, in being less liable in its combustion to deposit soot upon heat-absorbing surfaces, and in giving, weight for weight, a calorific power superior to olefiant gas.

These experiments not having been made for the particular objects I have in view, no account was taken of the quantity or quality of the gas coming from the retort during the first quarter of an hour. Judging by the nature of the curves given by M. Ellissen, it is reasonable to suppose that during the first quarter of an hour a considerable quantity of gas of very inferior illuminating power is given off, which, if taken into account, would further improve the result given in favour of separating the illuminating from the heating gases.

It will be observed that although the candle power of the illuminating gas would be raised to only 16.25, if two-thirds of the gas were set apart for this purpose—i.e., after the first 25 minutes of distillation up to 2 h. 35 m. from the commencement of the charge—a gas equal to 18.04 candles could be obtained if the proportionate quantity of heating and illuminating gas were reversed, which might be effected by continuing the distillation for illuminating purposes from 25 m. to 1 h. 27 m. after the commencement of the charge; whilst if equal quantities of heating and illuminating gas were produced, which would result from allowing the illuminating gas to flow into its receiver from 25 m. to 2 h., the candle power of this portion of the gas would be raised to 16.78, as shown in the figures given below:—

Total gas produced from a ton of coal, 10,573.20 cubic feet, of 13.50 candle power.

	Illuminating Gas.		Heating Gas.	
	Cub. Ft.	Candle Power.	Cub. Ft.	
Illuminating gas passing into its main 25 m. after commencement of charge:				
If two-thirds of quantity is used for illumination, from 25 m. to 2 h. 35 m. . .	7048.8	16.25	3524.4	
If half of quantity is used for illumination, from 25 m. to 2 h. . .	5286.6	16.78	5286.6	
If one-third of quantity is used for illumination, from 25 m. to 1 h. 27 m. . .	3524.4	18.04	7048.8	

These important results are borne out by a series of photometric observations which were made some years ago by Mr. Sugg, which he has further supplemented verbally in stating

that the average illuminating power obtained by the distillation of Newcastle coal might be taken at 14-candle power, whilst two-thirds of the quantity, if separated in the manner I propose, would produce an average of 16 candles.

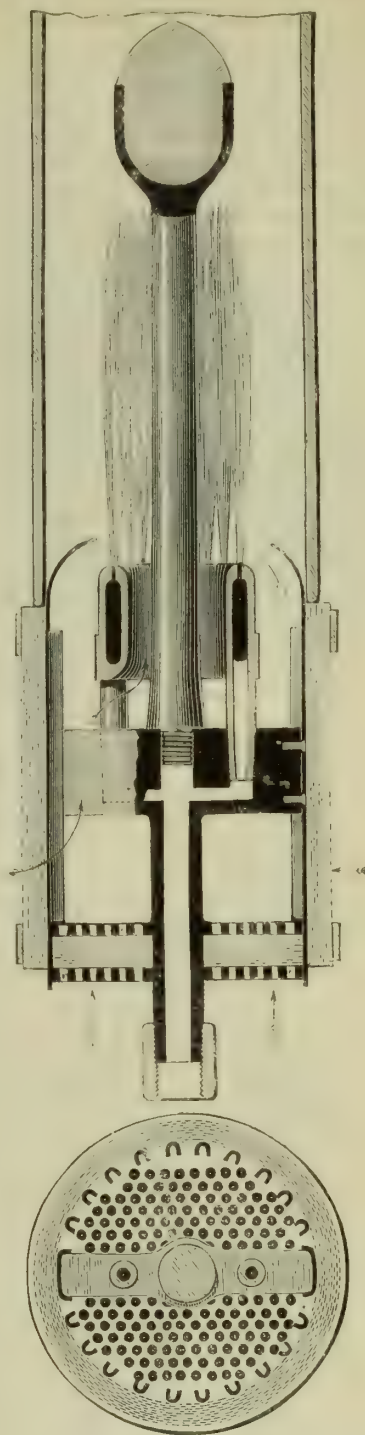
The working out of this plan would involve the mechanical operation of changing the direction of the gas coming from each bench of retorts at the proper periods of the charge. This could be accomplished by means of a simple reversing valve, similar to that applied for many years in reversing the current of the regenerative gas furnace, and a sand-glass may be placed in front of each bench of retorts, for the guidance of the man in charge as to the time when the reversal should be made. In order to distribute the two gases, a double set of gas-mains would certainly be required; but these exist already in the principal thoroughfares of many of our great towns, where, at one period or another, competing gas companies have been established, and it would not, I think, be difficult to utilize these services for the separate supply of illuminating and heating gas, the latter being taken into the houses and establishments only where it was asked for by the occupiers.

The public could well afford to pay an increased price for a gas of greatly increased illuminating power, and the increase of revenue thus produced would enable the gas companies to supply heating gas at a proportionately reduced rate. It would not be necessary to employ upon the heating gas the same expense and trouble in purification as is required for illuminating gas, because the products of combustion of the heating gas would not, as a rule, enter the apartments, but be conducted into the atmosphere through the ordinary chimneys. Heating the retorts by means of the regenerative gas furnace would, as already indicated, lead to an increased production of gas from each bench of retorts, and thus compensate for the reduced amount of illuminating gas in each operation. The heating gas might, without inconvenience, be sent through the pipes at a greater pressure than the illuminating gas, in order to make a given size of mains transmit an increased quantity.

The question may fairly be asked, whether a demand would be likely to arise for heating gas similar in amount to that for illuminating gas; and I may state that I am decidedly of opinion that although at the present moment the amount of gas supplied for illuminating purposes exceeds that for heating, the diminution in price of the latter would very soon indeed reverse these proportions. Already gas is used in rapidly increasing quantities for kitcheners, for the working of gas-engines, and for fire-grates. As regards the latter application, I may here mention that an arrangement for using gas and coke jointly in an open fire-place combined with an exceedingly simple contrivance with a view of effecting the combustion of the gas by heated air, has found favour with many of the leading grate-builders and with the public. Although this arrangement was suggested by me only last winter, several hundred of these grates are already in use in London, Manchester, Leeds, Glasgow, and other towns, showing how fully alive the public are at the present time to that great crying evil, "the smoke nuisance." It may be as well for me to mention here, that neither the regenerative gas coke fire-grate just alluded to, nor the plan I here advocate of separating the produce of gas-retorts, has been made by me subject-matter of letters patent; my time being already too much occupied in other directions to give that amount of constant attention to these subjects which the working of a patent necessitates.

As regards the use of illuminating gas, I have one more suggestion to make, which I feel confident will be viewed by you not without interest. The illuminating effect produced in a gas flame depends partly upon the amount of carbon developed in the solid condition in the body of the flame, and partly upon the temperature to which these particles are heated in the act of combustion. Having already shown how, by separation, a gas of greater luminosity may be supplied, it remains to be seen how the temperature of combustion may be raised. This may be effected to an extent that seems surprising, by certain mechanical arrangements, whereby a portion of the waste heat produced by the flame itself is rendered available to heat the gas and air sustaining the combustion of the flame, say to 600° Fahr., or even beyond this point.

The arrangement I have adopted for this purpose is represented on the sectional diagram, and I have also the pleasure of placing the burner itself before you, to enable you to test its efficiency by actual trial. The burner is of the ordinary Argand type, mounted in a small cylindrical chamber of sheet copper, connected with a vertical rod of copper, projecting upwards through the centre of the burner, and terminating



SIEMENS'S REGENERATIVE ARGAND GAS BURNER.

in a cup-like extension at a point about 4 inches above the gas orifices, or on a level with the top of the flame. A small mass of fire-clay fills the cup, projecting upwards from it in a rounded and pointed form. The copper vessel surrounding the burner is contracted at its upper extremity, with a view of directing a current of air against the gas-jets on the burner, and on its circumference it is perforated for the admission of atmospheric air. The bottom surface is formed of a perforated disc covered with wire gauze, and wire gauze also surrounds the circumference of the perforated cylinder. The external air is heated in passing through these "regenerative" surfaces, and the flame is thus fed with air, heated to the point above indicated, which by more elaborate arrangements might be raised to a still higher degree. The ball of fire-clay, in the centre of the burner, which is heated to redness, serves the useful purpose of completing the combustion of the gas, and thus diminishes the liability to blackening of the ceiling.

The arrangement for transferring the heat from the tip of the flame to the air supporting its combustion is applicable also to an open batwing burner; but I have not yet had time to ascertain accurately the amount of increase of luminosity that may be realized with this class of burner.

I may here mention that another solution of the problem of heating the incoming air by the waste heat of the products of combustion has lately been brought under public notice by my brother, Frederick Siemens, which differs essentially

from the plan I have suggested, inasmuch as he draws the flame downwards through heating apparatus, and thence into a chimney. Experiments made officially and with great care have proved that by these methods the luminous effect of gas can be practically doubled. In practice both these methods of intensifying a gas flame will probably find independent application according to circumstances, the cause of increased luminous effect being in both cases the same.

From a purely theoretical point of view it can be shown that of the caloric energy developed in the combustion of gas, a proportion, probably not exceeding 1 per cent., is really utilized in the production of luminous rays; and that even in the electric light nine-tenths of the energy set up in the arc is dispersed in the form of heat, and one-tenth only is utilized in the form of luminous rays. It would lead us too far here to go into the particulars of these calculations, but it is important to call attention to them, in order to show the large margin still before us for practical improvements.

By the combined employment of the process for separating the illuminating from the heating gas with the arrangement for intensifying the luminosity of the gas flame previously described, the total luminous effect produced by a given consumption of coal gas may, according to the figures given, be increased threefold; thus showing that the deleterious

effects now appertaining to gas illumination are not inseparably connected with its use.

My principal object in preparing this communication has been to call your attention generally to the important question of an improved gas illumination, and more particularly to the subject of a separate supply for heating gas, which, if carried into effect, would lead, I am convinced, to beneficial results, the importance of which, both to gas companies and to the public, it would be difficult to over-estimate.

[APPENDIX.]

“Paris, June 4, 1881.

“Dear Sir,—I send you herewith the result of my experiments, together with tables and curves. The very ingenious proposal that you have made would permit such a division of the total production of gas, that two-thirds could be employed for lighting and one-third for heating purposes, resulting in splendid illumination and much more rational heating.

“I am, dear Sir, &c.,

(Signed) “A. ELLISEN.

“Dr. C. William Siemens.”

Distillation in 4 hours.

Time of Observation.	Charge of 100 kilos. per Retort.				Charge of 110 kilos. per Retort.				Charge of 120 kilos. per Retort.			
	Gas Produced		Illuminating Power.	Numbers proportional to the Products of Columns 1 and 3.	Gas Produced		Illuminating Power.	Numbers proportional to the Products of Columns 1 and 3.	Gas Produced		Illuminating Power.	Numbers proportional to the Products of Columns 1 and 3.
	Per 100 kilos. of Coal.	Per Cent. of Total Production.			Per 100 kilos. of Coal.	Per Cent. of Total Production.			Per 100 kilos. of Coal.	Per Cent. of Total Production.		
	(1)	(2)	(3)		(1)	(2)	(3)		(1)	(2)	(3)	
0 h. 15 m.	Cub. Met.			Litres.	Cub. Met.			Litres.	Cub. Met.			Litres.
" 30	2:571	8:412	98	1:764	1:430	4:868	140	1:540	2:024	6:773	105	1:785
" 45	2:714	8:878	74	1:406	1:949	6:636	72	1:080	3:214	10:758	70	1:890
1 h. 00 m.	2:999	9:813	78	1:638	2:599	8:849	74	1:480	2:499	8:866	75	1:575
" 15	2:857	9:346	84	1:680	2:469	8:407	79	1:501	2:619	8:765	84	1:848
" 30	2:714	8:878	91	1:729	2:209	7:522	84	1:428	2:381	7:968	86	1:720
" 45	2:999	9:813	94	1:974	2:339	7:965	90	1:620	2:262	7:570	91	1:729
2 h. 00 m.	2:571	8:412	95	1:710	2:339	7:965	98	1:764	2:262	7:570	97	1:843
" 15	2:143	7:009	97	1:455	2:079	7:079	103	1:648	2:262	7:570	102	1:938
" 30	1:714	5:607	105	1:260	2:079	7:079	105	1:680	2:262	7:570	108	2:052
" 45	1:429	4:673	109	1:090	2:209	7:522	109	1:853	1:786	5:976	119	1:785
3 h. 00 m.	1:429	4:673	121	1:210	1:690	5:752	115	1:380	1:786	5:976	125	1:675
" 15	1:286	4:206	129	1:161	1:560	5:310	127	1:524	1:309	4:382	128	1:408
" 30	1:143	3:738	147	1:176	1:560	5:310	140	1:820	1:191	3:984	140	1:400
" 45	0:858	2:804	160	960	1:299	4:425	153	1:530	0:953	3:187	149	1:192
4 h. 00 m.	0:715	2:336	166	830	1:040	3:540	169	1:352	0:714	2:390	159	954
	0:429	1:402	178	534	0:520	1:771	175	700	0:357	1:195	164	492
	30:571	100:000	Mean 100:8		29:370	100:000	Mean 103:3		29:881	100:000	Mean 101:4	

Distillation in 4 hours 48 minutes.

0 h. 15 m.	2:571	8:412	166	2:982	2:467	8:190	174	2:326	2:024	6:719	166	2:822
" 30	3:000	9:812	102	2:142	3:117	10:344	101	2:424	2:738	9:090	100	2:800
" 45	2:857	9:346	93	1:860	2:857	9:483	94	2:068	2:857	9:486	90	2:160
1 h. 00 m.	2:571	8:412	96	1:728	2:857	9:483	94	2:068	2:857	9:486	88	2:112
" 15	2:286	7:477	98	1:568	2:727	9:052	97	2:037	2:619	8:695	89	1:958
" 30	2:286	7:477	107	1:712	2:467	8:190	102	1:938	2:381	7:906	95	1:900
" 45	2:143	7:009	112	1:680	2:337	7:759	107	1:926	2:143	7:115	98	1:764
2 h. 00 m.	2:000	6:542	118	1:652	2:207	7:328	109	1:853	1:905	6:324	110	1:760
" 15	1:857	6:074	122	1:586	1:819	6:084	111	1:554	1:786	5:929	118	1:770
" 30	1:715	5:607	127	1:524	1:559	5:171	117	1:404	1:667	5:533	126	1:764
" 45	1:571	5:140	132	1:452	1:299	4:310	126	1:260	1:428	4:743	128	1:536
3 h. 00 m.	1:428	4:673	141	1:410	1:169	3:879	129	1:171	1:309	4:347	134	1:474
" 15	1:286	4:206	147	1:323	0:909	3:017	136	952	1:072	3:557	136	1:224
" 30	1:143	3:738	153	1:224	0:778	2:586	143	868	0:833	2:767	144	908
" 45	0:857	2:804	166	996	0:650	2:155	151	755	0:715	2:372	152	912
4 h. 00 m.	0:571	1:869	171	684	0:520	1:724	169	676	0:595	1:976	157	785
" 15	0:286	0:935	174	348	0:260	0:862	174	348	0:476	1:582	165	660
" 30	0:143	0:467	176	176	0:130	0:432	183	183	0:476	1:582	169	676
" 48	—	—	—	—	—	—	—	—	0:238	0:791	179	358
	30:571	100:000	Mean 121:0		30:129	100:000	Mean 111:2		30:119	100:000	Mean 114:0	

“Experiments on the Variation of Production of Gas, and of its Illuminating Power, at Different Periods of the Distillation.

“Tables I. and II. contain the results of experiments made in a bench of seven retorts, of the type of the Compagnie Parisienne, each retort being charged respectively with 100, 110, and 120 kilogrammes (220 lbs., 242 lbs., and 264 lbs.).

Table I. corresponds to a distillation of 4 h. 00 m.

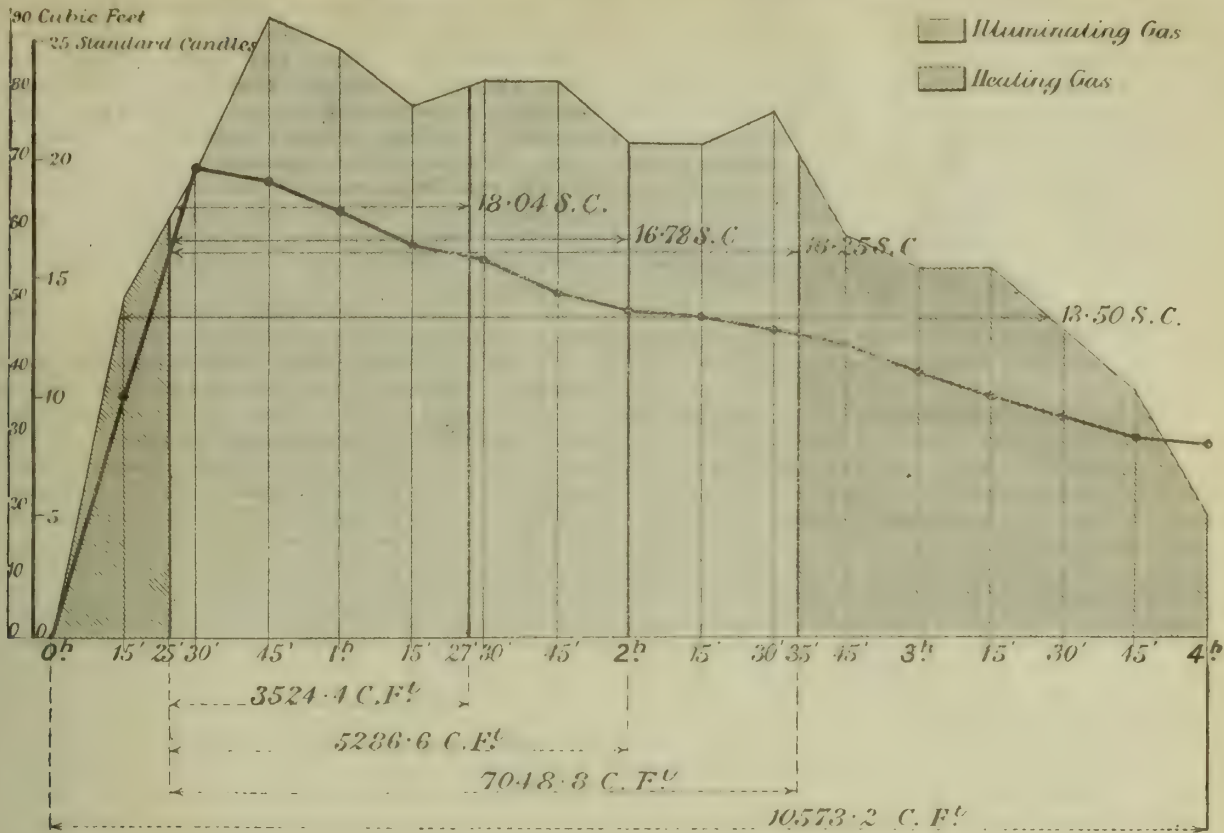
Table II. “ “ “ 4 h. 48 m.

The period of distillation has been divided into intervals of 15 minutes, and the results recorded on each horizontal line refer to the gas produced during the quarter ending the time mentioned on each line.

“In each of the two tables the case of a charge of 110 kilos. (242 lbs.) has been chosen as the standard, and the results

have been graphically represented by means of two curves, one in red for the gas produced, and the other in blue for the illuminating power. The line of abscissæ being divided into equal parts, each representing 15 minutes, each ordinate of the red curve gives the gas produced during the preceding quarter of an hour, and the corresponding ordinate of the blue curve indicates the illuminating power of this same gas. The production of the gas has been further divided into two portions—the one destined for illumination, and the other for heating and motive power.

“The gas produced during the first quarter of an hour is generally of low illuminating power, and varies besides with the hygrometric condition of the coal. In the following calculation it has been accordingly classed with the heating gas, and the gas produced during the interval from 15 m. to 2 h. 15 m. of the working has alone been reserved for illuminating purposes:—



I.—Distillation in Four Hours—Charge, 110 kilos. (242 lbs.)

I. Gas produced per 100 kilos. of coal distilled—		Cubic Metres.	Per Ton
1. From 15 m. to 2 h. 15 m.		18.062	6502.32
2. From 0 m. to 0 h. 15 m. and from 2 h. 15 m. to 4 h.		11.308	4070.88
Total		29.370	10573.20

II. Gas produced per 100 cubic mètres obtained—		Cubic Mètres.
1. From 15 m. to 2 h. 15 m.		61.502
2. From 0 m. to 0 h. 15 m. and from 2 h. 15 m. to 4 h.		38.498
Total		100.000

III. Mean illuminating power of the produced gas—		Litres.	In English
1. From 15 m. to 2 h. 15 m.		87.7	16.16
2. From 0 m. to 0 h. 15 m. and from 2 h. 15 m. to 4 h.		128.2	11.05
Mean of the total mixed gas as per calculation		103.3	—
Illuminating power of mixed gas as per direct trial		105.7	13.50

II.—Distillation in 4 h. 48 m.—Charge, 110 kilos. (242 lbs.)

I. Gas produced per 100 kilos. of coal distilled—		Cubic Metres.	Per Ton
1. From 15 m. to 2 h. 15 m.		20.388	7339.68
2. From 0 m. to 0 h. 15 m. and from 2 h. 15 m. to 4 h. 48 m.		9.741	3506.76
Total		30.129	10846.44

II. Gas produced per 100 cubic mètres obtained—		Cubic Mètres.
1. From 15 m. to 2 h. 15 m.		67.673
2. From 0 m. to 0 h. 15 m. and from 2 h. 15 m. to 4 h. 48 m.		32.327
Total		100.000

III. Mean illuminating power of the produced gas—		Litres.	In English
1. From 15 m. to 2 h. 15 m.		101.1	14.02
2. From 0 m. to 0 h. 15 m. and from 2 h. 15 m. to 4 h. 48 m.		132.4	10.07
Mean of the total mixed gas		111.2	12.77

“It is not proposed to stop at the results obtained by distillation in 4 h. 48 m.—that is, five charges per 24 hours. Experience has proved that the best conditions of working are found in the use of active charges rapidly distilled by raising the temperature of the furnaces.

“From these experiments it results that it would be possible to divide the products of distillation of coal into illuminating gas and gas for heating purposes and motive power. Thus, in place of producing, as is generally done, by means of a distillation of four hours and 110 kilos. (242 lbs.) per retort, a mean result per 100 kilos. of coal distilled of 30 cubic mètres of normal gas, which corresponds to an expenditure of 105 litres to produce the light of a Carcel burner consuming 42 grammes of oil per hour, there may be produced—(1st) about 18.5 cubic mètres of illuminating gas of an illuminating power of 87 litres; and (2nd) about 11.5 cubic mètres of heating and motive power gas of an illuminating power of 128 litres; or, per 100 cubic mètres of gas produced, 61.50 cubic mètres of illuminating gas, and 38.50 cubic mètres of heating and motive power gas.

“This result would be obtained by receiving into separate reservoirs the gas produced during the first 15 minutes, and

during the last 1 h. 45 m. of the distillation, and in reserving for illuminating purposes the gas made in the interval of 15 m. to 2 h. 15 m. of the charge from the commencement of the distillation. (Signed) “A. ELLISSEN.

“Paris, June 4, 1881.”

Discussion.

Mr. F. W. HARTLEY said Dr. Siemens occupied such an extremely eminent position, that it required some courage to attempt, in the slightest degree, to challenge any observations he made. However, it was not an unfamiliar project, this division of gas into illuminating and non-illuminating portions. It had been suggested again and again during something like the last 20 years, and several years since it was proposed by a dear old friend of theirs, Mr. Lewis Thompson, in a paper addressed to the Board of Trade; but he (Mr. Hartley) must say that when he saw this paper he thought Mr. Thompson had lost something of his old mental vigour. While it was theoretically true that the gases given off at the beginning and latter end of the charges might be valuable for thermal purposes, they had to consider the question from a practical point of view, and although they could get higher luminosity from the gas given off in the middle, and thereby obtain improved illuminating power, there were other considerations to take into account. One was this: If two sets of mains were required, two sets of meters would also be required in the houses, and two sets of inspectors, or at all events additional superintendence. Therefore, inasmuch as the mains cost from one-third to one-half of the whole gas plant, it followed that the interest on the extra expenditure would have to be paid by one-third of the gas made. Now, seeing that the pressure must be maintained in these mains, during the daytime, upon gas which was of lower gravity than ordinary coal gas, the amount of leakage would be greater than now prevailed under equal pressures. Hence the loss by leakage was likely to be a serious item. Thermal gas could be made cheaply, but if the cost of distribution was added, and the quantity which people were likely to use was taken into consideration, he thought it would be seen at once that any such project was likely, at all events for a long time to come, to be totally unprofitable. He did not say that it might not, under special circumstances, succeed. But for general application it would be an utter impossibility; and even in a large town like Birmingham, which was a special case where gas was more widely applied in the manufacturing arts than perhaps anywhere else throughout the Kingdom, he yet ventured to think it would not answer the purposes of the Corporation to separate the gases into two portions for sale, at the cost of duplicating their mains. In London there were mains enough in the streets already—in fact, far too many, and the efforts of the Companies had been to reduce the number. But, apart from this, he ventured to doubt

another thing. They knew as a practical fact that the thermal power of gas increased with the illuminating power, although the increase was not in proportion to the greater illuminating power or cost. He was sorry that his memory did not serve him with regard to the heating power of marsh gas, or he should be able to say pretty nearly what result might be expected from gases given off at the beginning and at the end of the distillation. He would, however, limit himself to the practical considerations he had mentioned, and would repeat, in conclusion, that this scheme, which had been put before the world any time during the last 20 years, was not one to commend itself to the consideration of the meeting. He said this because he had thought much and felt strongly on the subject, and he was sure Dr. Siemens would be the last to blame him for speaking out so bluntly upon it.

Mr. W. SUGG said, if he rightly understood Dr. Siemens, his idea of taking off the gases in two quantities applied not exactly to the present time, but to the time when gas should be so largely used for the purpose of warming dwellings and for manufacturing purposes, such as heating furnaces, boilers, &c., that the consumption would be very largely increased. It was no doubt a fact that Dr. Siemens himself proposed at one time to manufacture (exclusively for heating purposes) a gas which might be made more cheaply than that made for illuminating; but he said at the time that this could not then be practically carried out, because there was not a sufficiently large demand for such kind of gas. Now suppose gas were more largely used for heating, the demand for gas for this purpose would increase in greater proportion than for illuminating. Thus in a room in an ordinary house lit by two or three burners each consuming 5 feet of gas an hour, if a stove was fixed up which burnt 30 feet an hour there would be something like double the quantity used per hour for the gas-stove than for illumination, and this would go on all day. Therefore it looked as if the demand for gas for heating purposes would in time grow to be a large proportion of that delivered to the public. Then came the question whether the present mains would be capacious enough to supply gas for both purposes, and if it were necessary to lay down a double main for the conveyance of the supply of gas—one for illuminating purposes and the other for heating—it might be worth while to consider the advisability of supplying a gas for heating purposes only from a separate main. As to the question of meters, it would, of course, follow that there must be a meter for both; but it did not follow that there need be two distinct sets of inspectors, any more than where there were at present two meters in one house. With regard to the use of gas for heating purposes, it seemed to him (Mr. Sugg) that if the last part of the charge were better for heating purposes than the middle part of it, which was certainly much better for illuminating, there would be no engineering difficulty in supplying the gas through separate mains, more especially as the gas for heating would be more effectual if delivered at a higher pressure. Another thing to be considered was this: Supposing a large supply of gas were required for heating purposes, when a large building or a number of factories were using it, and they suddenly ceased at six or seven o'clock, would it not be very inconvenient to have such a large volume of gas thrown suddenly on the lighting mains? But if it were supplied separately no such difficulty would ensue. There need not be any trouble in keeping the mains tight, and there could be no doubt that improvements in the jointing of pipes, &c., would follow the extended use of gas at higher pressures; engineering difficulties, therefore, need be no bar. He felt convinced that the public would sooner or later demand a higher illuminating power in their gas. They had gradually crept up from 14 to 17 and 18 candle gas, and possibly they would go on to a still higher illuminating power as the way of burning it was better understood; because in using higher illuminating gas, less was needed, and there would be less heat and fewer products of combustion. If they succeeded in carrying out systems of ventilation in combination with lighting, they might delay the demand for gas of higher illuminating power; but if they did not, this demand must follow on the better understanding of the way of using it.

Mr. A. C. FRASER (Bolton) said some few years ago he was asked by Mr. Coxwell, the famous aeronaut, to provide, for ballooning purposes, a gas of as light a specific gravity as possible. He collected the gas in a small holder by taking off the first produce from the retorts and that given off at the tail end of the charge. Mr. Coxwell was very well satisfied, and made a successful ascent. Later on he had occasion to make another ascent, when, as he had not given any notice, gas of the ordinary quality was supplied, and he (Mr. Fraser)

was blamed for supplying a gas that proved to be unsuitable for ballooning purposes. He was quite sure this paper would commend itself to them in this respect. He did not believe there were any practical difficulties but what were surmountable, in separating the gas better adapted for heating purposes from that eminently suitable for illuminating purposes. But one question appeared to have been overlooked; and this was the question of purification, which was one of vast importance. If they took away the gases that passed over at the commencement of carbonization, and those at the latter part, they would very considerably reduce the expenses of purification.

Mr. C. E. JONES (Chesterfield) said this paper, from a gentleman whose name was known all the world over as foremost in the rank of science, was extremely interesting, and for it they were indebted to Dr. Siemens. If they considered the scientific points which he had brought forward, they must admit that they were theoretically complete. But, unfortunately for them, they had to look upon matters not only with regard to their scientific aspect and their symmetry and beauty, but also to consider the matter from a commercial point of view. The great cry now was for cheap gas, and, as Dr. Siemens had told them, electricity was a rival in the field, making great headway. If they were to be in a position to cheapen the production of gas to the public, would not the separation of the gases entail such expenditure on capital account as would make so desirable a reduction in price exceedingly remote? He was of opinion that they would of necessity have to duplicate nearly every part of the gas apparatus to adopt the principle here recommended. They would require connecting valves and diverting pipes in order to control the gas coming off from the retort, so as to separate the first and last from the middle portion of the charge; and this would entail a large capital expenditure. They would also require additional gasholders, and additional distributing plant; and notwithstanding Mr. Sugg was so sanguine as to the result of the system, at present it was a well-known fact that gas dues for heating were proportionately very small. He must take exception to one observation of Mr. Sugg, who said the cry was for increased illuminating power. He held that gas above 20-candle power, with the present burners, was of no practical advantage to the public; but if Mr. Sugg would bring out a burner that would consume 20-candle gas, and give its best photometrical result, without blackening people's ceilings or creating some other inconvenience, it would then be time for the public to demand a higher quality of gas. At present there were no burners in ordinary use capable of consuming it advantageously.

Mr. W. FOULIS (Glasgow) did not understand Dr. Siemens to suggest discontinuing the supply of gas for lighting purposes, but that they should enter on a new manufacture, and make gas for heating purposes. If it paid to lay mains for the sale of 100,000 feet of gas for lighting purposes, it would also pay to lay another main to serve 100,000 feet for heating; and if it would pay to supply a meter for lighting gas, it would also pay to supply one for heating gas. The practical difficulty, therefore, was not insuperable, provided there was a demand for the gas. A great deal of talk had taken place about the difference in the heating property of gas of high illuminating power and gas of low illuminating quality, and he had been carrying out a number of experiments on the subject. He still had his doubts about it, as his experiments were not yet complete; but they seemed to indicate that gases of low illuminating power were better suited for heating purposes than gases of high illuminating power.

Mr. W. CARR (Halifax) said they would all agree that the paper had been extremely interesting, and when they heard the discussion that was taking place they found that there was certainly need for a paper on the subject, since there were scarcely two speakers who agreed on the fundamental principles upon which it was based. Mr. Foulis disputed with Mr. Hartley as to the thermal effect of different gases, and also disagreed with others as to the practicability of having two sets of mains. He confessed himself that he thought Dr. Siemens, in his love for what appeared to be an old idea of his, had been somewhat carried away by his enthusiasm, and had lost sight, in some measure, of the practical aspect of the question. He would adopt Mr. Foulis's standard, which was the proper one to take. If it was possible at the present time to supply gas of good illuminating power at 2s. per 1000 feet, would it pay to produce a heating gas and sell it at 1s. per 1000 feet, and lay a separate set of mains for doing so? If there was a demand for it equal to the consumption of illuminating gas, he believed it would pay; but he should say that the con-

venience to the consumer, and the practicability of the whole thing, if taken on another line, would be exceedingly increased. If, for instance, the gases were supplied in bulk, of a given quality, at 1s. 6d. per 1000 feet all round, it would be much better for all parties than having two separate classes, one for heating and one for lighting. From his experience he thought it was quite feasible that gas for illuminating purposes could be supplied at 2s. per 1000 feet, and if it were found profitable to supply gas for heating at 1s. per 1000, it would be quite feasible, from the same works, to supply gas for all purposes at 1s. 6d. per 1000, because the heating gas would be used at times when the illuminating gas was not wanted, and the works would become useful at times when they were now dormant. In this way it would be a great convenience to the consumers, who would not be troubled with duplicate apparatus and separate meters, but would simply have to turn on one tap and take the gas for all purposes for which they required it. Any inquiry they could make which would tend to extend the use of gas for heating or any other purpose than illumination, was one well worthy of consideration, and they were all very much indebted to Dr. Siemens for the excellent paper he had given, which, as had been said, was conceived from a scientific point of view, and he had brought to bear upon it perhaps as much scientific knowledge as any one individual in the country could have done. The gas-fire of which Dr. Siemens had submitted a model was an exceedingly suggestive one. It might not perhaps be the best one of the kind that could be brought out, but it was a novelty—it was a departure on a new line, and would be likely to lead to some tangible result. It utilized two products of gas-works, coke and the gas itself, and it showed a way in which the gas might be used with considerable advantage. For himself, after the experience of the last two or three winters in a northern town, he had almost despaired of ever getting gas extensively used for heating purposes, because, from the gas-fires they had at the present time, it was almost offering an insult to any poor consumers to tell them they ought to have gas-fires when the thermometer was at something like 20° below freezing. A gas-fire as at present constructed was a very poor apology for a fire such as was required for keeping a room at a comfortable temperature; but with coke in combination with gas there might be a fire of some service. In milder climates gas-fires would be useful, but he was afraid they would never come into general use except in some such combination as Dr. Siemens had put before them. He did not know whether Mr. Hartley was quite correct in saying that gases of high illuminating power were of higher thermal power; but he should agree with him that, taken in the aggregate, those gases which had higher illuminating power were generally of high thermal power, because they had all the constituents of gas of low illuminating power with the addition of certain hydrocarbons not possessed by the gas of lower quality, and therefore they must be of higher thermal value. If one began to analyze the gas and take out the heavy hydrocarbons, and leave only the hydrogen, carbonic oxide, and a few of the lower luminous gases (such as marsh gas), gas of high thermal value, which had a low luminous value, would be the result. He was glad to find that Dr. Siemens, who had given so much attention to electric lighting, could also give a little to the improvement of illumination by means of gas. It was a considerable tribute to the value of gas as an illuminating agent that he had done so; and they were indebted to him for his investigations in this direction. For this kind of thing they generally looked to Mr. Sugg, and to one or two other gentlemen who had followed in his steps, and they had been content to accept their investigations as being about all that could be done; but he was glad to find that Dr. Siemens had been able to do something beyond what any of those gentlemen had been able hitherto to accomplish. The statement that he could double the illuminating power of the gas by the adoption of his improved burner, or by the application of the regenerative principle to any other ordinary burner, was a most important matter, and they ought not to lose sight of it.

Mr. HENRY WOODALL (Leeds) said the consummation they all desired, of cheapening gas, was being brought about to a greater extent than was always perceived. If the price of gas was reduced by 10 per cent., and if the consumption was increased 10 per cent. in the same period, what was the cost of this extra supply to the public? Clearly not a farthing. Many of them had been working under such conditions for years past. Year by year it had been possible to reduce the price of gas by 10 per cent., and never during the same period had they had an increase exceeding 10 per cent. At Leeds during five years the abatements in the

price of gas were quite equal to the increase of consumption; therefore there had been an increase of consumption without any increase whatever in the accounts. This all pointed to the development of the present plant and improvement in the processes employed; but suppose they had to erect additional plant, and to bear all the cost of interest and maintenance upon the expenditure, he did not hesitate to say that the extra sale of gas under these conditions would not cost more than 8d. to 9d. per 1000 feet in many towns—the present illuminating power being maintained—and, in many towns the increase could be had for 6d. per 1000 feet. Little by little the public were being made acquainted with this circumstance, and with the way in which these economical principles were operating in their favour, and although they might not, in twelve months, arrive at the condition Dr. Siemens desired, it would inevitably come to this, that on the extra gas they consumed the public would not be required, in the great majority of manufacturing towns, to pay more than 1s. per 1000 feet.

Mr. J. C. MAJOR (Wolverhampton) said he was neither a member of the Association nor a gas manager; but, with the permission of the President, he should like to say a word or two, because he had heard the paper with very great pleasure. He did not regard the question from a manager's point of view; and he did not think gas engineers looked sufficiently to the increase of revenue to be derived from the improved manufacture of residuals. He thought the time might come when the present residuals would be worked as the main object of the distillation of coal, and the gas itself be called the residual. He had been in the trade of a tar distiller something like thirty years, and he remembered the time when they had very much lower heats, with consequently better crude bye-products, for the high heats now used tended to diminish the value and quantity of these products. He thought the right direction to move in was that which Dr. Siemens had indicated, and so encourage a demand for gas for manufacturing purposes. He believed the gas of the future would be gas for heating, especially for manufacturing processes; and if gas companies would call themselves coal distillers, and work in the direction of giving improved so-called bye-products, they would probably do the right thing. Although his interest was wrapped up with that of gas companies, he felt certain the electric light was the light of the future, and therefore it behoved gas managers to look to other things as well as the extension of gas lighting—namely, the production of cheaper gas for heating purposes, and better bye-products.

Mr. G. E. STEVENSON (Peterborough) wanted to know how Dr. Siemens or any one else could arrive at the conclusion that heating gas, produced by the method proposed, could be made cheaper than illuminating gas. Dr. Siemens said that two-thirds of the gas out of coal should be taken into one receiver and one set of mains, and be used for illuminating purposes, and the last third should be conducted into a separate set of apparatus, and used for heating purposes. By this method he could not see that the cost of the last third would be any less than that of the first two-thirds. Take it in round numbers that 9000 cubic feet of gas were produced per ton of coal, 6000 feet of this quantity were devoted to illuminating purposes, and 3000 feet to heating; but a ton of coal was carbonized, the cost of which was just the same as before. There was obtained from the 6000 feet a return, in proportion, from the consumers; and also from the 3000 feet again a return. By the use of duplicate mains the leakage would be greater; but even if it would not—if only 10 per cent. were lost—nothing would be gained; there would be produced 9000 feet of gas, and whether it was sold part in one way and part in another, the cost of working a ton of coal would be the same as before. Therefore he did not comprehend what Mr. Henry Woodall had said about the cost being 1s. per 1000 feet. If it could be produced for 1s. per 1000 feet for heating purposes, it could be for illuminating purposes, provided a different material was not used. To his mind the only way in which a cheaper gas for heating purposes could be produced was by using a different material. If a cheaper kind of coal or slack, or any other material, could be used which cost less, then it would be cheaper; but if the same kind of coal was used, and the total quantity of gas divided into two portions, the cost must be the same.

Mr. G. B. IRONS (Gosport) expressed his admiration for the paper, which was based equally on sound scientific and practical considerations. Illuminating gas was carburetted hydrogen; it depended for its luminous power on carbon, but for its carrying power on hydrogen. Now, hydrogen had three times as much thermal power as any other substance, and if, in the process of manufacture, they separated the

most luminous from the less luminous and most heating gas, they only followed a very ancient principle in the practice of the butcher, who cut up the prime joints to suit certain customers, and disposed of all the rest (of the animal) for the various purposes and wants of other customers. It was no secret that The Gaslight and Coke Company had determined to let out gas apparatus for heating purposes, and that from investigation they found the annual consumption already, from services and meters fixed specially to supply gas for heating and motive power, beyond anticipation.

Major G. W. DRESSER (New York) wished to ask a question on the supposition that the scheme which Dr. Siemens suggested was carried out, and that the means for the distribution of the gas were established, and the process in full operation. The plan proposed only provided for the sale of one-third as much heating as illuminating gas, but when the heating gas business increased beyond one-third of the total manufacture, what were they going to do?

Dr. SIEMENS said he proposed they first should make one-third, afterwards one-half, and finally two-thirds heating gas, and one-third luminous gas.

Major DRESSER said that was just the point. When the thing was established the process would not supply the exact quantity of either gas required, and then how were they going to make up for the deficiency of either gas?

Dr. SIEMENS: Make more.

Mr. DENNY LANE (Cork) said he was very sorry, for the first time, to differ from an authority so eminent as Dr. Siemens. On the tomb of a countryman of his own—Goldsmith—Johnson wrote that there was no kind of writing that he had not touched, and none he had touched which he had not adorned. In science he might say the same thing about Dr. Siemens. Whether they turned to the production of electricity, or its application; to heating, or its application; or whether they turned to the marvellous improvements in the manufacture of steel—on every side they recognized Dr. Siemens as one of the greatest men of practical science that this age had produced. But on the present occasion he (Mr. Lane) was compelled to differ from him, and his attention was called to the subject when Dr. Siemens first proposed the division of gas into two parts, in a lecture he delivered a short time since at Glasgow. He (Mr. Lane) then referred to a very valuable paper read at the last meeting of the Association by Mr. Harrison Veevers, in which he gave the production of gas and the quality of illuminating power in each hour from the first to the sixth. The only thing he (Mr. Lane) regretted about this paper was an omission which could be easily supplied by gentlemen present—namely, that it was principally confined to experiments with Lancashire coal and cannel. His own experience was more confined to Newcastle and Welsh coal. In all these practical questions the important matter of degree must be taken into account. If there was, at the beginning and the end of the distillation, a very large production of gas of high heating and low illuminating power, but in the middle a very large production of high illuminating and low heating power, he would then admit that the proposal before the meeting would be eminently practical; but examining the table he had referred to, it would be seen that the difference between the proportions produced in the middle and the first and last periods of the charge, were not so great as to warrant so important a change. Mr. Sugg had put this question: Supposing that the consumption of gas were very largely increased, would it not then be necessary to lay a second main? He should say, from a practical engineering point of view, certainly not; he would lay a larger main, because if there were taken into account the great amount of friction resulting from using two mains instead of one of the same area, and the large amount of leakage from the number of joints and surfaces more or less permeable, any engineer who had capital at his command would never think of laying two mains in place of one, but would put a larger main in place of a smaller one. He (Mr. Lane) had been much struck with the observations made that evening on the effect of price and the raising of the illuminating power. They all knew that between the interest on capital, the cost of distribution, and the inevitable leakage, a very large proportion of the amount paid by the public was not paid actually for the material supplied to them, but for plant, and, above all, for the plant necessary in distribution, the greater part of which was not used during the daytime. He believed that, taking into account the increased amount of leakage that would arise from a duplicate system of mains, and the increased amount of friction, and the therefore higher initial pressure at the gas-works, and the small difference, according to the experiments of Mr. Veevers, between the middle and the first and last

portions of the charge, there would be no practical advantage whatever derived from dividing the product into two parts. He was sorry to differ from Dr. Siemens, but he had no doubt the paper would be of value in setting them all thinking, and endeavouring to ascertain more exactly the difference in the qualities of the gas given off at different stages of a charge.

Mr. W. J. WARNER (South Shields) said Dr. Siemens's was a beautiful theory scientifically, and might do a great deal to obviate the evil of which so much complaint was now made—viz., that arising from smoke. But they must remember what had been said as to the duplication and complication of gas apparatus and distributing plant, which must of necessity enhance the cost of manufacture. This was no light matter. Many people required gas of higher illuminating power than the companies at present supplied, and if they could get rid of the portion of gas first drawn off, they could supply gas of higher illuminating power out of the same coal. In some districts where there was pressure put by the public on gas undertakings, it might be necessary so to work; but the general demand would be met, with the resources they at present had at command, by introducing a small percentage of cannel. With regard to the burners which had been brought out, there had been a little reflection cast on the names of Sugg and Hartley; but, if his memory served him right, either one or both those gentlemen were engaged years since with a principle somewhat similar to that which Dr. Siemens had brought forward. They all remembered, too, a gentleman who had made a name for himself in connection with electricity—Professor Faraday—who had also done something for gas-burners, and the object of his burner, which was in use in the Houses of Parliament, was to do what Dr. Siemens did—to heat very highly the atmospheric air on its way to the flame. Some years ago, in connection with the late Mr. Parkinson, he had made a burner somewhat similar to the one before them, with this exception, that there was no gauze around the bottom.

Mr. CORBET WOODALL said it seemed to him that the whole value of the suggestion made by Dr. Siemens depended upon the settlement of the question which lay between him and Mr. Hartley—whether or not the gas of lower illuminating value collected at the end of the charge was of greater thermal value than the higher illuminating gas given off in the middle of the charge. Certainly the proposition made by Dr. Siemens was at variance with the ideas most of those present entertained. He had always been of opinion, founded on the observations of careful experimenters, that with the specific gravity of gas free from carbonic acid, the illuminating value went up, and with it the thermal value. If the thermal value of the gas at the later portion was not greater than that of the higher illuminating gas, he could not see any advantage in separating the supply into two channels, while it would entail much extra cost. Mr. Henry Woodall had remarked upon the advantage which accrued to the consumer from the increase of the business of a gas company. It must be borne in mind that what was anticipated in the paper was that the supply of heating gas would be a new business. They were all anxious to encourage in every way the use of gas for such purposes, largely with the idea that they would be supplying in those hours when gas was not used for lighting purposes, and because the more they could increase the use of gas in the daytime the more they would increase the effective value they would get out of their plant. But if, in order to obtain this increased business, they had to lay down duplicate plant, costing just as much as that for ordinary purposes, he thought the time to which his brother referred would be very much thrown back; because they would fail to get the advantage out of the further use of their present plant. Granted that the heating power was not greater in the one case than the other, it seemed to him clear that laying down duplicate systems of mains was simply putting gas companies and the public to great inconvenience, and adding to, rather than diminishing the cost at which the gas of either character could be supplied to the consumer.

Dr. SIEMENS said he was very well satisfied with the discussion. He did not come there to be flattered, but to put a proposition before the meeting, and have it sharply criticized; and he must say he had obtained what he wanted. If he did not agree with some of the observations which had been made, he might say that he agreed with others; and that, through the discussion which had taken place, at any rate an interest had been excited which sooner or later would produce its fruit. The observations of Mr. Hartley required, perhaps, the most direct reply. He had introduced the question of novelty, and said this was an old proposition, and therefore inferred it was not worth consideration. Mr. Hartley

would have obliged him if he had said who it was proposed the distribution of heating gas to the Board of Trade, and when he did so. For his own part he might say that 18 years ago he vigorously advocated such a plan in Birmingham, and spent between £5000 and £6000 in experimenting upon it, failing only in the House of Lords. He thought a proposition he had been engaged on for 18 years should not be put aside because somebody else had thrown out a hint in a similar direction, probably very much after that time. He brought it forward again in a somewhat modified form now, being as convinced to-day as he was 18 years ago of its value if it were once adopted. The question of the cost of plant, of which Mr. Hartley and several others had made a point, he could not accept. If an engineer wanted to construct a railway, he did not inquire what had been the traffic by the stage-coach during the last 20 years, but what were the capabilities of developing a traffic. Now, with public feeling alive to the importance of heating gas, and with the public clamour for gas of a higher illuminating power, it was for gas companies to supply gas of this higher illuminating power, although it might be at increased cost. Similarly they ought to develop other means of supply, in order to meet the demand for heating gas. This at the present time amounted to a very large proportion of the possible supply, and he felt very certain it would increase with extreme rapidity to ten times its present amount, if consumers did not meet with great difficulty in obtaining it. In his own house he burnt probably as much gas for heating as for illuminating purposes, but he very often had to relinquish the use of it in despair, because in the middle of the day the gas failed, or the supply became so small as to be useless. If heating gas could be supplied at the rate of 1s. per 1000 feet, the consumption of it would be so enormous that it would be a matter of consideration how the demand for it could be met by additional means. The only question which gas engineers should place before themselves was whether, as Mr. Denny Lane put it, to give a mixture of heating gas without illuminating power, and of illuminating gas saddled with an undue amount of heating power, and collect the same into a largely-increased main, taking up the old mains; or whether it would not be better to keep the old mains for the supply of illuminating gas, and put down a second main, at least equal in capacity, to supply heating gas. Suppose the supply of the second main was equal to the supply of the present one, the cost of working expenses would not be increased thereby; there would be double the amount of gas supplied, and the working expenses should certainly be rather less than double. The question of heating *versus* illuminating power had been spoken of by several gentlemen, and although some differed from him as to the question whether the lighter gas had the greater heating power, others took a somewhat different view. He was rather surprised to hear this question discussed at all before such an assembly, because it was well known that hydrogen had a calorific power of 62,000 units per pound, whereas olefiant gas had a calorific power of about 21,000, or, roughly speaking, about one-third of that of hydrogen. Now marsh gas and hydrogen gas went for nothing in illuminating gas—absolutely for nothing, except for heating the atmosphere of the room. It certainly had one useful effect as regarded the seeming interest of the gas suppliers, that it made the gas-meter go round without giving anything to the consumer, but it was heat which he would rather be without. So long as the public were satisfied to receive the ingredients mixed together, it would be simply a question of £ s. d. whether or not it would be cheaper for the gas companies to supply both the gases together. He said "No," for this reason, that in many towns—in London certainly—cannel coal was largely mixed in the retorts to bring the illuminating power up to the standard of 16 candles; but he had shown that by using inferior coal without the addition of cannel, 18-candle power could be obtained. In Paris they used coal decidedly inferior to Newcastle, and attained this standard, and therefore there was a practical object for the gas engineer to aim at. If he could supply illuminating gas equal to that produced from a mixture of Newcastle and cannel coal from Newcastle coal alone, he obtained his product from a cheaper ingredient; and, what was of great importance, he also obtained a much better coke, because cannel coal residue spoiled the coke for almost any purpose. What had given rise to the idea that gas of higher illuminating power also possessed a higher heating power was that it was a heavier gas—that in a cubic foot there was more weight. But the value of gas was not in its bulk, but in its low density; each ton of coal produced about 5 or 6 cwt. of gas, and if a portion of it passed away in the form of hydrogen or of marsh gas, of comparatively low specific gravity, surely this was no reason for not supplying it

separately, and putting upon it such a value as its calorific power warranted. Weight for weight, substance for substance, the light gas possessed much higher calorific power; although, weight for weight, he was ready to admit that the contrary was the case as regarded illuminating power. Mr. Warner said the burner that had been shown was not new, but was suggested by Faraday. He had the most intense admiration for Faraday, and should be proud indeed to find that Faraday had suggested the same thing; but he must say that the last lecture Faraday ever delivered before the Royal Institution was on this regenerative principle, and that he went with him (Dr. Siemens) to the neighbourhood of Birmingham and elsewhere, to look at the first furnaces he constructed on this plan, and expressed his great delight with the principle involved, but he certainly gave no hint (in his lecture or to himself) that the principle had been borrowed from him. With regard to Mr. Sugg, he knew he had taken a very prominent position in improving gas-burners, and had produced very remarkable results. But Mr. Sugg seemed not to be aware that he had trespassed on his plans; on the contrary, he believed this principle would apply to the beautiful arrangements which Mr. Sugg had already produced. He should be sorry if there were any feeling of antagonism between a man of Mr. Sugg's energy and position and himself. All these improvements should work together to one end—to get from gas a larger result both as an illuminating as well as a heating agent. Nor could he accept it as a reproach to his burner, or to the one now under trial at the Corporation Gas-Works, that similar thoughts had been thrown out previously, for if they had, and they had not been acted upon, it was time they should be brought forward again, and examined on their own merits. He thanked the meeting for the time and attention they had given to his suggestions, and hoped that at any rate they would receive further consideration.

The PRESIDENT said they should all be agreed as to their indebtedness to Dr. Siemens for coming forward with such a very interesting contribution to their proceedings. He had told them he appeared there in two characters—that of a rival and that of a friend—and he (Mr. Hunt) believed they would be disposed to value him as a friend rather than fear him as a rival. He had seen almost every public exhibition of the electric light—including the latest one in the City of London, to which Dr. Siemens had referred—but he must confess that although he had seen much to admire, he had seen nothing to shake his belief in the future of coal gas. It had been stated that the electric light was cheaper than coal gas; but this, he apprehended, had yet to be proved, and for the present they were prepared to challenge the proof. He thought there was no doubt whatever that, on equal grounds, coal gas would be found to be as cheap as the electric light. In the streets generally coal gas had not had a fair chance, and he apprehended the authorities of the City of London had been somewhat more desirous of setting up a rival to coal gas than of permanently improving the illumination of the streets. If they would offer the same facilities to gas engineers to show what gas would do in the public streets of London, as they had offered to eminent electricians, he was quite convinced that, at all events, gas would not come off second best; and he needed no other weapons for such a contest than those with which Dr. Siemens and his eminent brother had furnished them. They had seen before them what coal gas was capable of producing under the magic art of Dr. Siemens, and the burners they had used at the Windsor Street Gas-Works were of at least equal illuminating power in proportion to the consumption of gas. He should be very pleased if any gentlemen who were interested would call at night and see these burners lit up in their full splendour, when he thought their faith in coal gas would be very much increased. Turning now to Dr. Siemens as a friend, the proposal put before them for separating gas less valuable for illuminating purposes was described by Mr. Hartley as an old one. He did not think Dr. Siemens quite caught from Mr. Hartley who it was proposed it; it was their old friend Mr. Lewis Thompson, he believed about 20 years ago.

Mr. HARTLEY stated that when he said about 20 years ago, he did not know that Dr. Siemens had been the author. He knew that it had been proposed about that time since. It was about 10 years ago that the letter he referred to was sent by Mr. Lewis Thompson to the Board of Trade.

The PRESIDENT said in his address that morning he referred to a letter which Dr. Wallace addressed to the JOURNAL OF GAS LIGHTING only a few months ago, making this very proposal, and although it was not original on his part, it came rather in the light of a novelty; but the objection put by Major Dresser was the one which had been in his mind when he described the proposal as impracticable. If a distinction

were made between heating and lighting gas in the manner proposed, then two consumptions would have to be dealt with; and while on the one side they would be fixed by the illuminating power of the gas they had to supply, and also by the consumption of it, on the other side they would be committed to a consumption of heating gas. The demand for the two kinds of gas could not always be balanced in accordance with the make, or they would be compelled to have recourse to some other agency to supply the deficiency on the one side or on the other. Another drawback was this: The two-thirds lighting gas which Dr. Siemens would produce would have an illuminating power of 18 candles, and this would have to be supplied at a somewhat advanced rate in order to enable them to supply the one-third heating gas (which would have an illuminating power of about 11 candles) at a lower price. He very much questioned whether, if a consumer had the choice between 18-candle gas at a high figure, and 11-candle gas at a low one, he would not choose the latter, and they would therefore find a very much greater demand for the lower-priced gas than for the higher, and thus another difficulty would crop up. Then came the question about the heating power of the gas. Dr. Siemens had told them that the heating power was very much greater than that of olefiant gas; but this was for equal weights, and all their calculations were based on volume, and must be reduced to weight before they could be worked out on any practical basis. He thought Mr. Henry Woodall's remarks were not quite apprehended. What this gentleman meant was that they were going in the direction of cheaper gas, and if they could succeed, by increasing their business, in supplying it at a much lower figure, they would do away altogether with the necessity, even supposing such a necessity to exist, of supplying two gases; and he quite agreed with him. He thought their efforts should be directed more and more to the cheapening of the gas supplied at one uniform quality, and at as low a figure as possible. But however much they might be disposed to differ from Dr. Siemens with regard to these matters, they all owed him a deep debt of gratitude for coming amongst them, and as he was not likely to be present at the end of their proceedings, it would be only right that they should depart from their usual custom to accord him now a cordial vote of thanks for his paper.

This proposal was carried by acclamation.

(III.)

THE ADVANTAGE OF THE REGENERATIVE SYSTEM OF HEATING.

By Mr. G. E. STEVENSON, of Peterborough.

In a paper entitled "Regenerative Furnaces as applied to the Heating of Retorts," read before the Association last year, the subject was considered chiefly in reference to a certain form of furnace recently patented on the Continent and in England. In the present paper I propose to deal more generally with the principle of the regenerative or gas furnace, and to demonstrate theoretically, as well as on practical grounds, the advantage which this method of heating possesses over that of the direct combustion of fuel.

Whether it was the necessity of obtaining an intense and uniform heat, or the desirability of economy in the fuel used, which first led the inventor of the regenerative system to apply his energy and genius in this direction, I am not aware; but assuredly one of the first thoughts present to his mind must have been the fact of the absence of control over the process of combustion in ordinary furnaces, and the necessity, not only of ascertaining what actually takes place in a furnace, but of being able to regulate the chemical action going on, and thus ensure a uniform result having some approximation to that which should theoretically follow the consumption of a given quantity of fuel.

The key to the process that takes place in the interior of a furnace is the analysis of the effluent gases. From such analyses it can be ascertained whether the combustion has been complete, or whether unburnt gases are being permitted to pass away not utilized. Also, if free oxygen be found to be present in the waste gases, it is known that too much air has passed through the furnace, and by quantitative analysis the extent and proportion of this excess may be ascertained. The usefulness of such analyses, even in the case of an ordinary furnace, must be evident; but it is only when applied to the control of a gas furnace that their full importance becomes manifest.

In calculating the heat-energy developed in a furnace, we proceed, as is well known, upon the basis of a unit of weight of the substance undergoing combustion developing a certain

number of what are called "heat-units," by which we mean so many of the same units of weight of water raised one degree in temperature. The English unit of heat is 1 lb. avoirdupois raised one degree Fahrenheit.

Complete and reliable experiments have been made by eminent scientific chemists to determine the heat-effect of the combustible elements, and, provided we know the composition of any combustible material, we are in a position to calculate the heat which that material will develop. The following table gives the principal combustible elements with the proportion of oxygen required for their combustion, and the number of British heat-units which they develop according to Favre and Silbermann:—

TABLE I.

Combustible.	Oxygen.	Product.	Heat Developed.
1 lb. hydrogen and 8.000 lbs. oxygen produce	9.000 lbs. steam, and develop	62,032 units.	
1 lb. carbon " 1.333 lbs. oxygen "	2.333 lbs. carb. oxide "	4,453 "	
1 lb. carb. oxide " 0.571 lb. oxygen "	1.571 lbs. carb. acid "	4,325 "	
1 lb. carbon " 2.666 lbs. oxygen "	3.666 lbs. carb. acid "	11,544 "	

When we are dealing with the chemical constitution of the fuel, weight for weight, the above table forms a suitable starting point for estimating the value of the fuel for heating purposes; when, however, we require to know what has taken place through the analysis of the effluent gases after combustion, we need a table based upon a unit of volume instead of weight. The following table is constructed on the basis of an equal temperature of 32° Fahr., and a barometric pressure of 29.922 inches of mercury:—

TABLE II.

Product.	Combustible.	Oxygen.	Heat Developed.
1 c. ft. steam is prod. from 1 c. ft. hydrogen and	1 c. ft. oxygen with develop.	of 327 units.	
1 " carb. oxide " 0.0314 lb. carbon "	1 " oxygen " "	139 "	
1 " carb. acid " 1 c. ft. carb. oxide "	1 " oxygen " "	318 "	
1 " carb. acid " 0.0314 lb. carbon "	1 " oxygen " "	457 "	

This table gives an insight into certain relationships, the existence of which is not indicated by the former table. First we see that the combustion of hydrogen and likewise of carbonic oxide result in an equal volume of gaseous products (leaving out of consideration the expansion due to increase of temperature), and that the heat developed per unit of volume is very nearly equal. We also see that a cubic foot of carbonic oxide contains the same weight of carbon as a cubic foot of carbonic acid, and that the production of one cubic foot of carbonic acid by the combustion of a cubic foot of carbonic oxide absorbs exactly as much oxygen as the production of a cubic foot of carbonic oxide from carbon. In the combustion of hydrogen to water, of carbon to carbonic oxide, and of carbonic oxide to carbonic acid, in each of these three cases the gaseous product has a volume double that of the oxygen consumed; when, however, carbon is burnt direct to carbonic acid, the oxygen consumed is equal in volume to the carbonic acid produced. From these facts we are enabled to determine the composition of the products of combustion, provided that no oxygen be contained in the fuel itself.

The atmospheric air consists, as you are aware, of 79 per cent. of nitrogen and 21 per cent. of oxygen by volume. When air is consumed in supporting combustion, the nitrogen remains unchanged, but the oxygen becomes replaced by the products of combustion, carbonic acid, carbonic oxide, aqueous vapour, &c. These gases may be present in different proportions, but the sum of them will be such that the oxygen contained by them will be proportionate to the accompanying nitrogen in the ratio of 21 to 79. If, however, free oxygen be present, this must be added to that contained in the products to maintain the above proportion in relation to the nitrogen. In the case of the complete combustion to carbonic acid, if this be theoretically perfect there will result 1 cubic foot of waste gases for every cubic foot of air entering at the furnace, and these gases will consist of 21 per cent. of carbonic acid and 79 per cent. of nitrogen.

Let us now take two analyses of waste gases from an ordinary retort-setting, published by Dr. Bunte, the chemist at the Munich Gas-Works. No. 1 is taken when the fire had burnt down previous to clinking, and No. 2 when the furnace was properly filled and doing full work.

Analysis No. 1.		Analysis No. 2.	
Carbonic acid . . .	8 per cent.	Carbonic acid . . .	16 per cent.
Free oxygen . . .	12 "	Free oxygen . . .	4 "
Nitrogen . . .	80 "	Nitrogen . . .	80 "

It will be seen that in analysis No. 1 there is 12 per cent. of free oxygen as against 8 per cent. of carbonic acid, and therefore as the carbonic acid is equal in volume to the oxygen it has replaced, 2½ times the quantity of air theoretically necessary has passed through the furnace. By the help of Table II. we can easily calculate the heat developed per cubic foot of the waste gases produced. It is only necessary to multiply the number of heat-units given in the table for the product by the percentage contained in each cubic foot of the mixed

gases. Thus, for Analysis No. 1, we have $0.08 \times 457 = 36.56$ units, and for Analysis No. 2, $0.16 \times 457 = 73.12$ units, or exactly double that of No. 1, corresponding to the double proportion of carbonic acid present.

To ascertain, with any degree of accuracy, the intensity of heat developed, it is necessary to go back to the weight of the carbon consumed and the quantity of air used per pound of carbon. In Analysis No. 1 we have $2\frac{1}{2}$ times the necessary quantity of air; therefore, as 1 lb. of carbon requires for its complete combustion, in round numbers, 12 lbs. of air, we have $12 \times 2.5 = 30$ lbs. of air passing through the furnace per pound of carbon consumed. From these 30 lbs. of air the 1 lb. of carbon will abstract 2.666 lbs. of oxygen to form carbonic acid, leaving 3.999 lbs. of oxygen free, accompanied by 23.335 lbs. of nitrogen. The pound of carbon will develop, according to Table I., 14,544 units of heat by its combustion. Of this, however, at least 10 per cent. will be dissipated by radiation from the fire-grate and walls of the furnace, leaving 13,090 units for heating the products of combustion. A certain amount of heat will be absorbed in raising the temperature of the gases, which will be dependent on their specific heat. The specific heat is that proportion of heat required to raise the gases one degree in temperature, water being raised one degree by one unit of heat. The specific heat of the principal gases with which we have to do is given by Regnault as follows:—

Oxygen	0.2182	Carbonic acid	0.2164
Hydrogen	3.4046	Carbonic oxide	0.2479
Nitrogen	0.2440	Aqueous vapour	0.4750
Atmospheric air, 0.2379.			

By the combustion of 1 lb. of carbon are produced 3.666 lbs. of carbonic acid, and to raise this quantity one degree absorbs $3.666 \times 0.2164 = 0.793$ unit of heat. Similarly the accompanying free oxygen, which in Analysis No. 1 we found to be 3.999 lbs., absorbs $3.999 \times 0.2182 = 0.872$ unit, and the 23.335 lbs. of nitrogen absorb $23.335 \times 0.244 = 5.693$ units; therefore—

Carbonic acid	0.793 units
Oxygen	0.872 "
Nitrogen	5.693 "
Total	7.358 units

will be absorbed per degree of temperature. Dividing by this the number of heat-units = 13,090, we get an initial temperature for the products of $13,090 \div 7.358 = 1779^\circ$ Fahr. In Analysis No. 2, in which the excess of air amounts to one-fourth of the theoretically requisite quantity, we should get, proceeding by the same method, an initial temperature of 3459° Fahr. The details of the calculation are as follows:—

Combined oxygen	2.666 lbs.
Free oxygen	0.666 "
Nitrogen	11.668 "
Air passing through furnace per pound of carbon consumed	15.000 lbs.
Carbonic acid	$3.666 \times 0.2164 = 0.793$ units.
Oxygen	$0.666 \times 0.2182 = 0.145$ "
Nitrogen	$11.668 \times 0.2440 = 2.846$ "
Total	3.784 units.
$13,090 \div 3.784 = 3459^\circ$ Fahr.	

To maintain the retorts at a uniform heat, the products of combustion must not be cooled by contact with them to a lower temperature than that at which the retorts themselves are to be maintained, which temperature, for the effective carbonization of coal, should not be less than 1500° Fahr. The heat available for carbonization is, therefore, the surplus heat over and above this temperature. In the case of Analysis No. 1, we have $1779^\circ - 1500^\circ = 279^\circ$ surplus, or barely 16 per cent., and in the case of Analysis No. 2 we have $3459^\circ - 1500^\circ = 1959^\circ$, or 56 per cent. of the total quantity of heat.

These examples of ordinary furnaces suffice to show the disadvantage of any system by which the process of combustion cannot be equally maintained. At the time when the furnace has burnt down, as in Analysis No. 1, one of two things must occur—either the carbonization of the coal must be suspended, or the heat of the retorts must diminish; there is sufficient heat to maintain the retorts alone at the required temperature, but hardly any margin for work to be done in them. In Analysis No. 2 there is a margin of 56 per cent., and a higher result than this is not to be expected from ordinary retort-settings.

Having now seen the important bearing of the analyses of the effluent gases from a furnace or retort-setting upon the process of combustion, let us proceed to examine the principle of the generator, or gas furnace. In this method of heating the process of combustion is divided into two stages—first, we have incomplete combustion, or the production of combustible gas; and, secondly, complete combustion and the

utilization of this gas in the oven itself. First, there enters at the slit or grate of the generator a certain quantity of air, which consumes a portion of the fuel, producing carbonic acid gas, with its accompanying development of heat. The gases, consisting of 21 per cent. of carbonic acid and 79 per cent. of nitrogen, then ascend through the stratum of unburnt fuel, taking from it another equivalent of carbon, and the carbonic acid becomes reduced to carbonic oxide. The initial temperature at the slit of the generator will be about 4400° Fahr., allowing 10 per cent. loss by radiation from the slit and surrounding brickwork. The carbonic oxide possesses double the volume of the carbonic acid originally produced, for not only is the 21 per cent. of carbonic acid reduced, but also 21 per cent. of carbonic oxide is formed from the fuel. The heat effect of 1 lb. of carbon burning to carbonic oxide is given in Table I. as 4453 units. The product of 1 lb. of carbon thus consumed is 2.333 lbs. of carbonic oxide, accompanied by 4.667 lbs. of nitrogen. The carbonic oxide has a specific heat of 0.2479 unit; therefore, $2.333 \times 0.2479 = 0.578$ unit of heat will be rendered latent in raising the carbonic oxide, and $4.667 \times 0.244 = 1.138$ units in raising the accompanying nitrogen one degree in temperature—together 1.716 units. Dividing by this the 4453 units developed, we get 2600° as the temperature of the gases in the generator after the carbonic acid has all been reduced, and supposing no loss to have occurred through radiation. If the generator be constructed separate from the retort-setting, there will be a loss on this account of something like 20 per cent. before the gases reach the point of secondary combustion, and the temperature will be reduced to about 2000° Fahr.

We now come to the secondary combustion of the carbonic oxide to carbonic acid. From 1 lb. of carbon is produced 2.333 lbs. of carbonic oxide, and by the further combustion of this quantity of carbonic oxide, $4325 \times 2.333 = 10,091$ units of heat will be developed, making up the total quantity produced by 1 lb. of carbon burning to carbonic acid. The oxygen required to consume this quantity of carbonic oxide is exactly equivalent to that required in the primary combustion of the 1 lb. of carbon to carbonic oxide—viz. 1.333 lbs. If no excess of air be supplied, the calorific intensity produced will be found in the following manner, supposing the carbonic oxide not previously heated:—

<i>Heat absorbed in raising the Gases 1° in Temperature.</i>			
3.666 lbs. of carbonic acid	$\times 0.2164$	=	0.793 units.
9.334 lbs. of nitrogen	$\times 0.2440$	=	2.277 "
13.000	Total	=	3.070 units.

$10,091 \div 3.070 = 3287^\circ$ Fahr. But the gases arrive at the burners with a temperature of 2000° , this being the result of the 4453 units of heat developed in the primary combustion, less 20 per cent. loss through radiation = 3563 units. These must be added to the 10,091 units produced by the secondary combustion, making a total of 13,654 units, and the resulting temperature is $13,654 \div 3.070 = 4447^\circ$ Fahr. In this case we get a surplus heating power equal to 66 per cent. of the total quantity developed.

Having thus followed the process of the gas production and its subsequent utilization, we are now in a position to see something of the advantage of the regenerative system of heating. It will be evident that it is easier to approach theoretical perfection in practical working by using the double process of producing a combustible gas and afterwards burning this gas under the retorts, than by the ordinary method of firing, because we supplement a deficiency of air in the first instance by supplying it in the second process, where it is completely under control. There is less danger of an excess of air being admitted, for, when dealing with the solid fuel, there must of necessity be less air admitted than is requisite for complete combustion, and when we come to deal with the fuel in a gaseous condition, the intimate mixture of air and fuel is easily attained. In practice the results do not, of course, come up to theory, but they approach far more nearly to it than by the old system, as the following analysis of waste gases from a retort-setting heated by a generator furnace will show:—

Carbonic acid	19.0 per cent.
Oxygen	1.5 "
Nitrogen	79.5 "

But we have not yet touched upon the chief advantage to be obtained from the use of the gas furnace. Hitherto we have considered only the process of combustion; we have now to consider the question of "regeneration." By the regeneration is understood the heating of the air supplied to the furnace, and the utilization for this purpose of the heat contained in the products of combustion after they have left the object to be heated, and passed away towards the chimney flue. The question of regeneration assumes a position of

importance simultaneously with the adoption of generator furnaces. Under the old system, it is impossible to avail ourselves of this advantage to any appreciable extent. Hot air cannot be introduced under a fire-grate without melting the fire-bars, added to which it is well-nigh impossible to close up the grate from the external air, as the necessities of clinkering and clearing away the ashes render constant access to the fire-grate imperative. It will presently be shown that the primary air supply may be partially heated in the case of a slit generator, but I am not aware that any one has found it practicable with a grate furnace. With the generator furnace, however, the secondary air supply used for the combustion of the carbonic oxide may be heated to any extent, and the whole of the heat taken from the waste gases and transferred to the air entering at the burners is rendered available for useful effect.

In determining the value of the regeneration, we have to take into consideration—first, the quantity of air that passes through the regenerator per pound of fuel used; and, secondly, the temperature at which it issues from the regenerator and arrives at the point of ignition. As regards the quantity of air, 12 lbs., in round numbers, are required for the complete combustion of 1 lb. of carbon, of which, as has already been shown, one-half is required for the primary, and one-half for the secondary combustion. The specific heat of atmospheric air being 0.2379, the 6 lbs. of air, forming the secondary supply will, if heated 1000°, take up $1000 \times 6 \times 0.2379 = 1427$ units of heat, and deliver them back again to the retorts. Taking the hypothetical case of the generator furnace in which 13,654 units per pound of carbon were brought to bear on the retorts, we should have with air heated 1000° an increment of more than 10 per cent., or altogether 15,081 units of heat per pound of carbon consumed. This amount of heat would produce an initial temperature of 4912°, and, as the gases leave the retorts at 1500°, the percentage of useful effect would be nearly 70 instead of 66 without regeneration.

I have put the temperature of the effluent gases at 1500° Fahr., as this corresponds pretty well with the general working of retorts; but you will easily perceive that, by applying the principle of regeneration, the temperature of the gases may be much greater on leaving the retorts, and yet no loss result therefrom. With the ordinary method of heating there is a limit to the temperature at which the retorts can be worked with economy, because the higher the temperature of the effluent gases in proportion to the initial temperature of combustion, the less the proportion of useful effect produced. With the regenerative system, on the contrary, it matters not how hot the gases are when they leave the object to be heated, provided the heat is afterwards withdrawn from them and transferred to the air supply. The process is accumulative, and thus a high heat may be maintained without waste of fuel or destructive draught.

There is still another element in the process of combustion in the generator furnace, which has lately been brought into prominence, and that is the use of steam. If steam be introduced into a furnace heated by coke, the steam becomes decomposed into its elements, the oxygen being absorbed in the combustion of the fuel, and the hydrogen set free and rendered available for combustion at a later stage of the process. As much heat is absorbed and rendered latent by the dissociation of the hydrogen and oxygen as is afterwards redeveloped by the combustion of the hydrogen, and thus a certain proportion of heat development is transferred from the primary to the secondary combustion.

Assuming that for every pound of carbon consumed, half a pound of steam were introduced into the generator, we should have 1 lb. of carbon producing 2.333 lbs. of carbonic oxide, and developing 4453 units of heat, and $\frac{1}{2}$ lb. of steam resolved into 0.055 lb. of hydrogen and 0.445 lb. of oxygen. The dissociation of the hydrogen and oxygen would absorb $62,032 \div 18 = 3446$ units of heat, and this deducted from the 4453 units developed by the combustion of the carbon to carbonic oxide would leave $4453 - 3446 = 1007$ units of net sensible heat effect. For the combustion of the carbon $1.333 - 0.445 = 0.888$ lb. of oxygen must be supplied by the atmospheric air, this amount being accompanied by $0.888 \times 3.5 = 3.108$ lbs. of nitrogen. In raising the gases one degree, therefore, will be absorbed—

Carbonic oxide . . .	2.333 lbs.	\times	0.2479	=	0.578 units.
Nitrogen	3.108 lbs.	\times	0.2440	=	0.758 "
Hydrogen	0.055 lb.	\times	3.4046	=	0.187 "
Total					1.523 units.

Allowing 20 per cent. loss by radiation, as before, we have $1007 - 202 = 805 \div 1.523 = 528^\circ$ Fahr. as the temperature of the combustible gases. In the secondary combustion there

will be 2.333 lbs. CO + 1.333 lbs. O = 3.666 lbs. CO₂ with development of 10,091 units, and 0.055 lb. H + 0.445 lb. O = 0.500 lb. H₂O, with development of 3446 units—together, 13,537 units; added to which we have 805 units from the primary combustion, making in all 14,342 units. At the termination of the process the proportion of the gases will be the same as before, with the addition of half a pound of steam; therefore—

3.666 lbs. carbonic acid	\times	0.2164	=	0.793 units.
9.334 lbs. nitrogen	\times	0.2440	=	2.277 "
0.055 lb. steam	\times	0.4750	=	0.237 "
Total				3.307 units.

$14,342 \div 3.307 = 4336^\circ$ Fahr. will, therefore, be the temperature produced.

We see that by the use of steam the temperature in the generator is very considerably reduced, and the final temperature is also somewhat lower; the total amount of heat developed is, however, the same for the carbon contained in the fuel with the addition of that due to the hydrogen of the steam. The total number of heat units is spread over a larger volume of gaseous products, with a consequent reduction in temperature. If the regeneration be thoroughly carried out, some advantage may be obtained with the use of steam; but without regeneration an actual loss will be incurred, through the increased volume of the effluent gases and the reduced initial temperature.

When it is considered what a reservoir of heat is contained in the waste gases of a retort-setting, the idea of heating not only the secondary but also the primary air supply is forcibly presented to the mind. That there is much practical difficulty in applying such a method to a grate furnace has been abundantly proved, but it might be applied to a slit generator, and would probably greatly facilitate the melting of the clinker and its removal from the slit of the generator.

In the design shown in the accompanying illustrations,* an attempt has been made to apply such an arrangement in the place of the small subsidiary grate which the original Liegel furnace possesses below the slit. In the experience already gained in this country with this kind of furnace, the small grate has not been found to work well, and has been abandoned. It is difficult to regulate the quantity of fuel burning on the grate so as to maintain a uniform heat from it, and it is found preferable to work with an increased draught, and thus melt the clinker by the heat of the furnace alone. This excess of draught is prejudicial to the economy of fuel, and causes to be formed in the generator a larger proportion of carbonic acid than ought to exist. By heating the primary air supply, I believe that a much less draught will be sufficient. The ashpit is intended to be closed up, and only a small trap-door opened when the slit requires clinkering, and with such an arrangement much less heat than at present will be lost by radiation from the slit.

In this design the regenerative principle is much more fully carried out than hitherto. The generator is brought forward clear of the setting, and a greater space rendered available for regenerating flues. The waste gases traverse the central flues in the groups on either side of the setting, while the smaller channels are devoted to the secondary air supply. The primary air supply is conducted through the lowest channels, and comes in contact with the waste gases after the greater portion of their heat has been absorbed by the secondary air supply. These flues are intended to be constructed of fire-clay tiles, tongued and grooved at the joints so as to prevent leakage; and as there are two layers of such tiles in the roof and floor of each set of flues, the upper layer breaking joint with the lower, it is not likely that much of the air will find its way amongst the waste gases. The setting was designed for a large works in the North of England, but its adoption has been postponed.

In the year 1877 a Committee was appointed by the German Association of Gas and Water Engineers to experiment upon generator furnaces. The Committee spent more than a year in experimenting with different kinds of coal, both with and without the use of steam, and a full report was published, a reproduction of which would be impossible in a paper such as this. The experiments, however, led to the following conclusions:—1. The stronger the draught with which the generator is worked the greater the percentage of carbonic acid contained in the gas produced. This varied in the case of the slit generator from 1.9 per cent. to 5.8 per cent., the highest draught being about 0.35 inch. 2. The greater the percentage of carbonic acid the higher the temperature in the generator, and consequently the greater the loss of heat by radiation.

* See pp. 1154-55.

In the experiments with steam it appeared that a *greater* draught was required to produce the same result than with air alone; the temperature in the generator was, however, less than when no steam was used. The proportion of steam which could, without detriment to the ultimate heat-effect, be used, varied, according to the different kinds of coke burnt, from 50 to 80 per cent. of the weight of the coke, and the average analysis of the generator gases was as follows:—

Carbonic acid	9 per cent.
Carbonic oxide	19 "
Hydrogen	10 "
Nitrogen	62 "

In concluding this paper, I venture to hope that the importance of the subject will be thought sufficient excuse for occupying the time of the Association at so great a length. It is not a question, primarily, of any particular form of furnace, but of a principle, the value of which has long been recognized in other branches of the engineering profession, and is now rapidly becoming applied in other countries for heating retort-settings. It is to be hoped that the difficulties in the way of introducing it into our own works may be speedily removed, and ourselves saved the reproach of being behindhand in the application of scientific knowledge.

Discussion.

Dr. SIEMENS said he had listened with much pleasure to the paper. He was glad to see that the chemical principles upon which combustion generally, and more particularly combustion in the regenerative gas furnace, depended, were being so thoroughly investigated; and from the attention paid to the paper he perceived that gas engineers took a deep interest in these questions. The first furnace applied to gas retorts on the regenerative principle was one erected in London by the Chartered Gas Company at their Goswell Road station in 1862. It answered its purpose very well. It heated two beds of retorts in a satisfactory manner, and with economy; but the reason why it was not extended at this station was on account of want of room. The Company decided to increase the number of retort-beds, and they did not see where to place the additional gas producers. Moreover, some difficulty was experienced in providing room for the regenerators below the furnace. It was at the Paris Gas-Works in the following year that he first met with conditions favourable to the introduction of the system. The Paris Gas Company had continued to a large extent the use of the regenerative system ever since; and he believed had reaped considerable advantages. The author of the paper had pointed very ably to all these advantages, except that he did not lay stress on the greater output from a bed of retorts when heated on the regenerative system; and this he (Dr. Siemens) looked upon as perhaps the most important point of all. In applying the regenerative mode of heating, one additional retort could be placed in each bed, and the whole of the retorts could be heated uniformly. He did not say they were to be heated to a higher temperature, because this would involve danger to their permanence; but if they could be heated practically uniformly, it implied something more than heating them to a higher temperature, because the material being all brought up to the highest point of heat which it could permanently bear, and not being subjected to unequal expansion, would produce the maximum effect during the greatest length of time. This was, therefore, one of the greatest recommendations of the regenerative mode of heating. The author of the paper also called attention to the importance of aiding the production of gas, especially when coke was employed, by the use of steam, and said this was a recent introduction; but such was hardly the case, because the retorts in Paris were worked by gas produced with coke, with the addition of water below the grate to aid in the decomposition of the fuel. With regard to this question of the introduction of water—water gas as it had been called—a great deal of misconception had arisen, and very extraordinary statements had been made, evidently put forward by gentlemen who had not thoroughly understood the question. If gas were developed from wet coal, it would not be at all desirable to introduce water, because it would only prevent the attainment of the high temperature which was essential to produce the re-conversion of the carbonic acid into carbonic oxide. Therein consisted the danger of the use of water to any great extent. Of course, by the decomposition of water and carbon into hydrogen and carbonic oxide, no positive gain of heat could be expected. The number of units of heat-energy which could be given out by the combustion of these gases was necessarily involved in the decomposition of the water and carbon which were required to produce them; and all the good to be expected from the process was

to transfer the heat from the gas producer to the furnace. Instead of having a hot gas producer, there was a cool gas producer, and the sensible heat which there was in the first place was changed into latent heat, and this heat was re-developed in the furnace. If the gas had to travel a considerable distance, the advantage of the employment of as much water as possible in the decomposition of the fuel was manifest, because the sensible heat of the gas would be lost in transit, and in this case the hydrogen and carbonic oxide produced by the decomposition of water would be re-delivered to the furnace. All these principles had been well understood by the author of the paper. With regard to the specific plan he had brought forward, he (Dr. Siemens) had no doubt it could be made to work satisfactorily; but he saw that it inherited some of the difficulties with which he formerly had to contend. It involved a considerable depth of brickwork below the retort-settings, and it would be desirable to adopt a plan whereby this depth could be materially reduced. Also with regard to the form of the gas generator with a slit, which recommended itself by its apparent simplicity and the want of stoking, if it could be ensured that the earthy matter contained in the fuel always ran out by itself in the liquid condition, it would work well, but he apprehended some difficulty would be met with in this direction. Some fuel contained earthy matters which resolved themselves into fusible slag, but others contained mostly silica, which would not form such a fusible slag, and would be liable to choke up the slit with clinker. If the air entering the slit could be heated, of course the difficulty would be diminished; but, on the other hand, another difficulty would arise—that of a closed ashpit. He had worked with closed ashpits to a considerable extent, but had seen good reason to abandon them, because it was very inconvenient to have to open a door before entering the ash-pit for the purpose of adjusting the fuel and removing clinker.

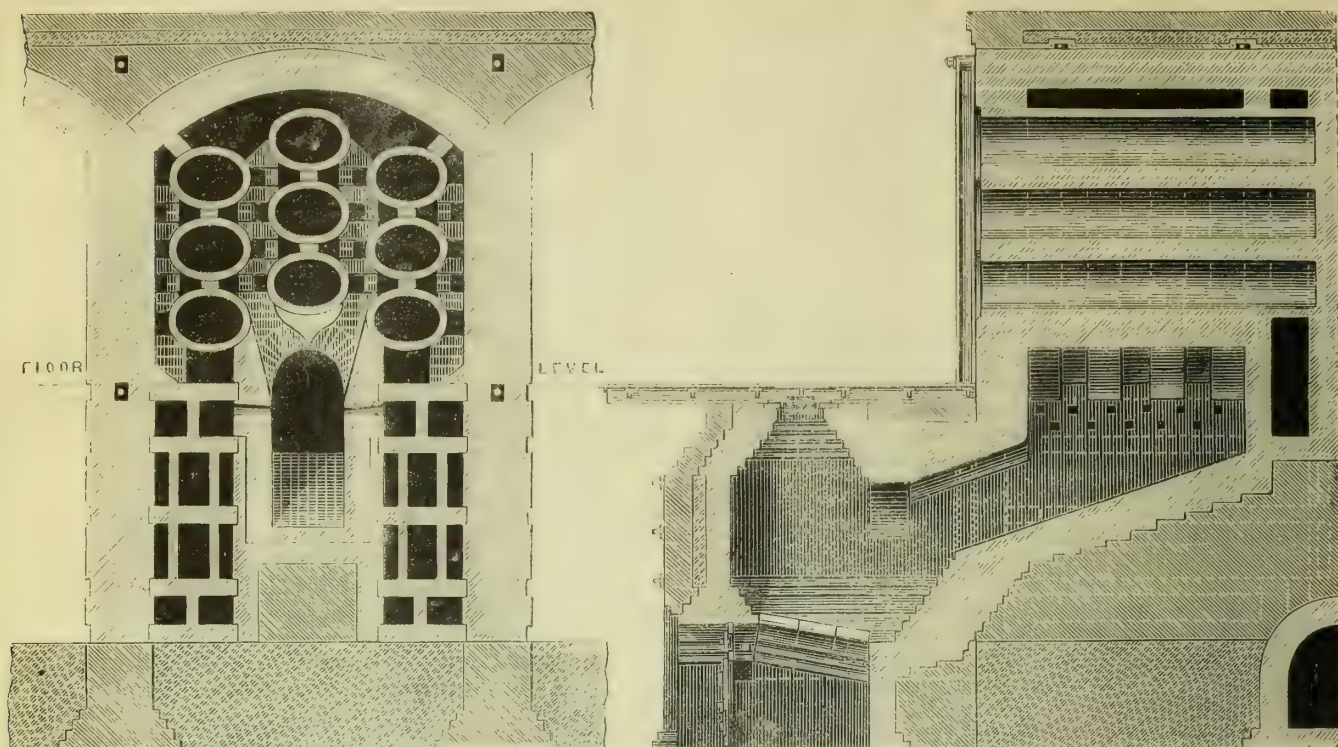
Mr. H. PEATY (Longport) said if gaseous fuel were to be the fuel of the future, gas managers could not do better than use it themselves, and thus advertise it while deriving benefit from its use. One point was thoroughly proved, which was that gaseous fuel was quite able to do all that was required to produce the temperature necessary for carbonization. In fact, it went a little too far, and produced heat enough to melt down the furnace. Gaseous fuel, however, could be applied without regeneration. What they required was not a blast furnace to reduce ores, but only a heat of about 2000° Fahr., and the advantage stated by Mr. Stevenson was only the addition of about 10 per cent. to the thermal effect by regeneration. Therefore, gaseous fuel could be introduced under the retorts in the same way as, if they were going to supply the public, it could be introduced into mains. If this view were correct, they could do without so complicated an apparatus underneath the setting, and thus save the expense of building it. A very small aperture underneath the setting would suffice to introduce the gas, and produce the desired combustion, whilst the cost of an apparatus such as had been described would be very great, there being a regenerating furnace for each set of retorts, whereas by supplying gaseous fuel by mains, one generator could be set up in any part of the yard. There were plenty of gas generators in the market, such as Siemens's, Wilson's, or Strong's, which he considered the best, as there was such a large proportion of hydrogen gas without the deteriorating effects of nitrogen, which must go on with Siemens's or Wilson's.

Mr. F. W. HARTLEY said he had not had any practical experience of the regenerative system, but had watched its progress, and seen a good many furnaces in operation; and certainly the principle on which they were based must attract the attention and admiration of every man who wanted to use fuel under the most economical conditions. There could be no question that a more equal heat was obtained in the setting, and the highest economy of fuel. He wished to correct an expression of the last speaker, that gas could be as well made at a considerable distance from the retort-settings, and conveyed to the furnace, because under such circumstances they would lose temperature and heat by storing the gases, and afterwards delivering them to the furnaces. The great advantage of this system in retort-settings seemed to be that the gases, as soon as generated, were delivered red-hot for combustion.

Mr. PEATY desired to add that he did not think so intense a heat was necessary, and that when warmed up again on entering the furnace it would be sufficient for all that was required.

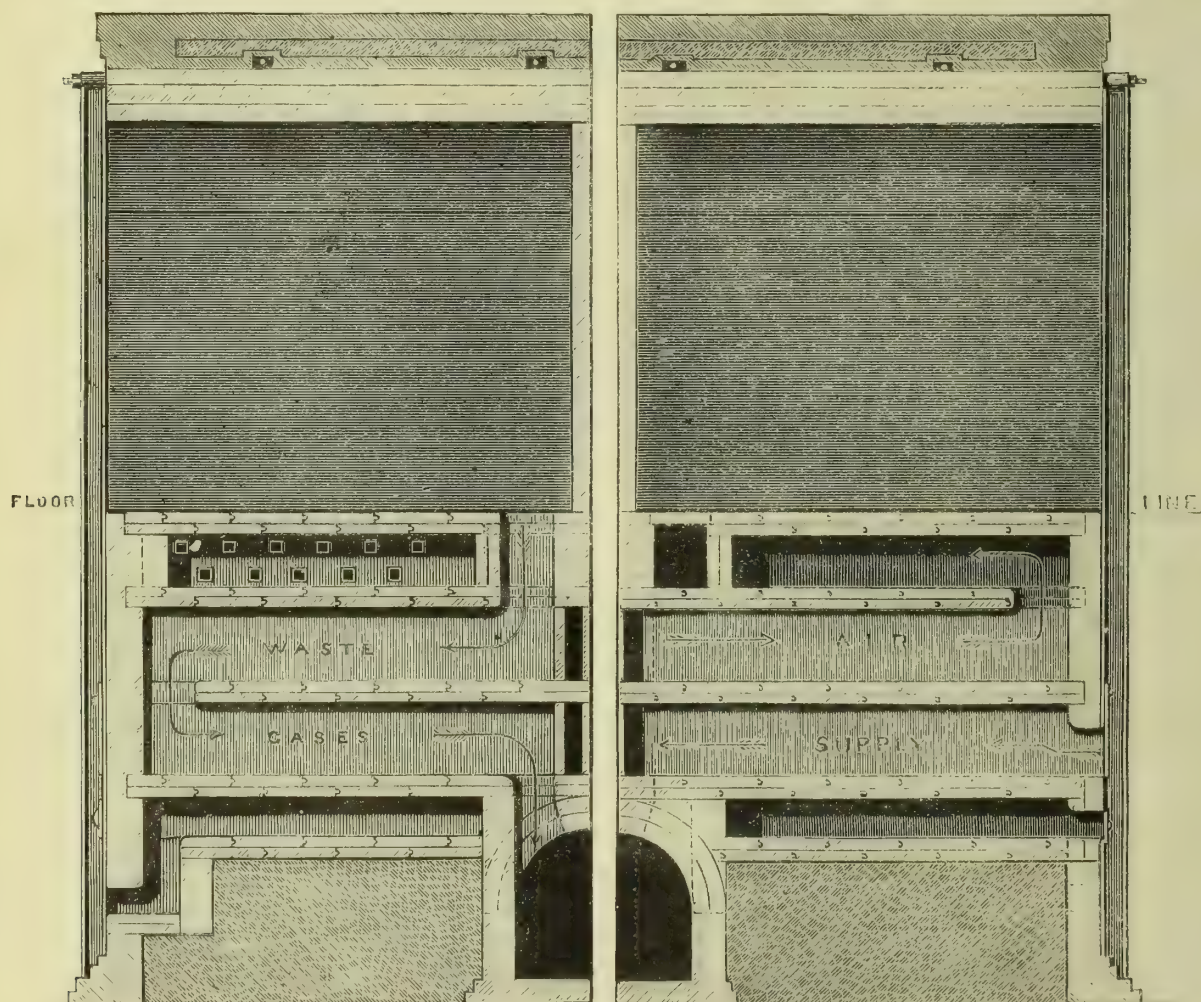
Mr. T. B. BALL (New Wortley) said they were all willing

LIEGEL-STEVENSON REGENERATIVE GAS FURNACE FOR RETORTS.



TRANSVERSE SECTION.

HALF LONGITUDINAL SECTION.



SECTIONS THROUGH REGENERATOR.

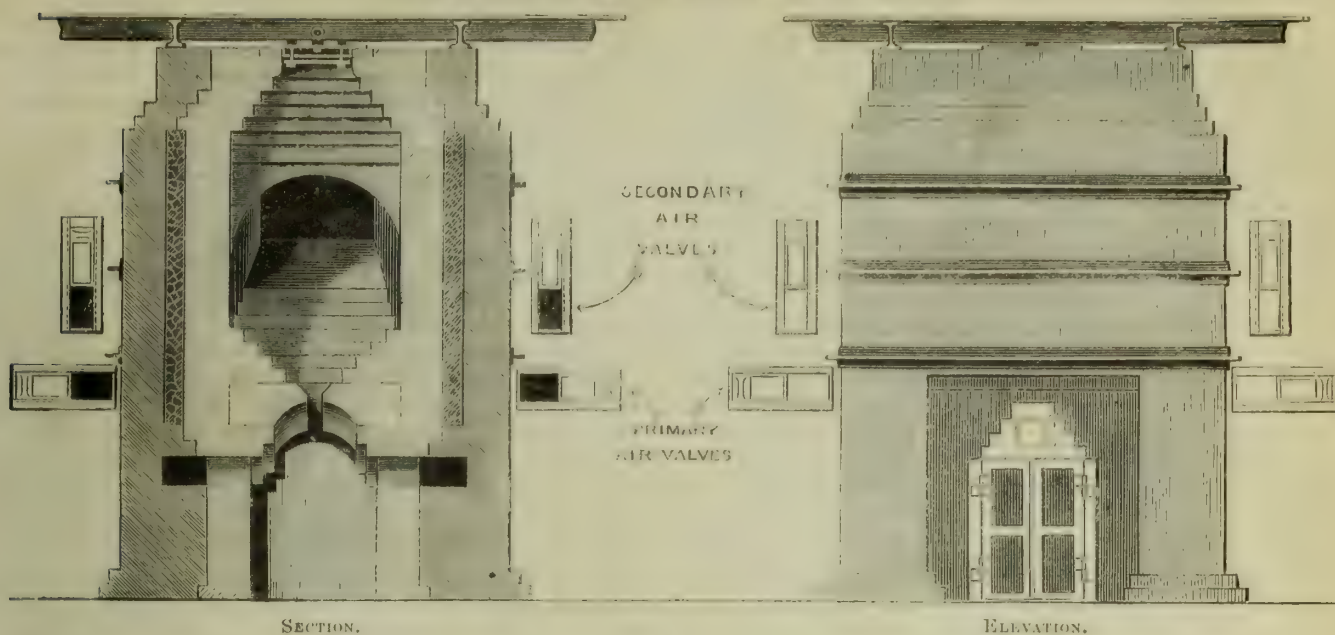
(Enlarged Scale.)

to admit that there were many practical advantages in the regenerator system, but he should like to have heard more of the economical advantages. It was obvious that the first cost of the setting shown must be greatly in excess of the ordinary setting; but they heard nothing except a passing remark by Dr. Siemens as to the increased production which might be expected. No doubt they could put an extra retort in, but it seemed to him (Mr. Ball) that the first cost of this setting must be very large, and that the economy, as far as fuel was concerned, must vary very greatly in different localities. In his own locality certainly the saving which might

result from economy in fuel would be very small indeed compared to the interest on the additional outlay which would be entailed by the erection of such a setting as they saw in the diagrams.

Mr. B. ASKEW (Northwich) wished to know if the two slits at the side of the furnace were the only points where the air was admitted for the combustion of the carbonic oxide. It would seem, he said, that the uniformity of temperature required that there should be a greater number of points for the admission of air, because the points where combustion took place were points of maximum intensity.

GENERATOR OR GAS PRODUCER.—ENLARGED SCALE.



SECTION.

ELEVATION.

Mr. STEVENSON pointed out on the diagram where the admission of air took place.

Mr. M. S. GREENOUGH (Boston, U.S.A.) said he had not come across the water for the purpose of instructing the British Association of Gas Managers; but at the same time he should not like to remain silent during a discussion in which the advantage of regenerative gas furnaces was questioned. His attention was first called to them three years ago, when he was last over in Europe, and it was Dr. Siemens's furnace in Paris, and the results there obtained, which convinced him of the necessity for other companies doing something of the same sort. A study from the other side of the water of the experiments here had shown him that they must turn to Germany for information on this subject, for there they had worked out the system upon a somewhat more economical plan than they had in Paris. He had just returned from a short tour in Holland, Germany, and France, where he had had the privilege of inspecting these furnaces in several Dutch cities, as well as in Berlin, Dresden, Frankfurt, Munich, and other places, so that he thought he was beginning to know something about the various systems. He wished to express most strongly his belief that they would have to come to some system of this kind. One gentleman had just asked for information as to the economy claimed. Now the economy of heating by gas was one point, and the economy of regeneration was another; and a previous speaker was perfectly right in saying it might not pay a company to put in an entirely regenerative system. This would depend on the value of coke in the locality. He might be able to heat his retorts more satisfactorily by a simple furnace, and yet it might not pay him to spend a large sum of money on regeneration. There was no doubt that by a proper system of regeneration, at least 10 per cent. of the weight of fuel could be economized. If the retorts could be heated with an expenditure of 17 to 18 lbs. of coke per 100 lbs. of coal carbonized, by using a gas furnace—and this could be done for 2 lbs. less by efficient regeneration—a very little calculation would show how much coke would be saved in a day, and how much this would be worth. His (Mr. Greenough's) own impression was that where there was a fair price for coke there would be no difficulty in getting back the interest on the capital involved. The point Dr. Siemens put was also a very good one as to the necessity for excavation for a furnace similar to that under discussion, and as to the impossibility of fusing all kinds of coke. Some cokes could be fused, and others, as was the case in Germany, it was impossible to fuse. The same thing was found in America, and this was a matter to be determined by experience, according to the coals of the country. If the coke would fuse and run in a slit furnace, then that was the best one to use; but if not, a hearth, or a grate furnace, must be used. Another point with regard to economy was this: He (Mr. Greenough) did not meet any one in Germany who placed the increased duration of his retorts at less than 15 to 20 per cent. above the time they would last under the ordinary firing and clinking system. He saw no gentleman who was getting from his retort less than 8500 to 9000 feet of gas per mouthpiece. Now, if 9000 feet could be made instead of 6000, the advantages were perfectly obvious, provided the gas was not spoilt or the

retorts subjected to such a heat as to rapidly burn them out, because a much smaller retort-house could be used. His own experience showed him that instead of 7200 feet of gas per mouthpiece in Boston, which they were previously obtaining, they were now, with a system of furnace firing, making from 9500 to 10,000 feet of gas per mouthpiece every 24 hours.

Mr. ALFRED WILSON (Middlesbrough), having obtained permission of the President to address the meeting, said he wished to refer to the question of gas regeneration, which was the first point in applying gas to heating retorts. Experience in other branches of manufacturing operations proved that the main advantage arose, not from the use of gas by itself, but from the facilities with which regeneration was coupled with it; it was the regenerative part of the operation which was the most productive of economy, and gaseous fuel was a necessity for regeneration. With respect to the gas generator of which Mr. Stevenson had shown drawings, the question of hot *versus* cold air, and cold air *versus* air and steam, was one of much interest. Some years ago he (Mr. Wilson) had the opportunity of making prolonged experiments with a gas generator worked by hot air. Most people would admit that that gas generator was most advantageous which gave the greatest facilities of working, and which gasified the greatest weight of fuel, per grate area, in a given time. It would be evident that the use of hot air was desirable if it could be used; but with the ordinary run of English coals it was quite impossible to work a gas generator with hot air, because though the temperature produced was high, it was not sufficiently high to permit the slag to be continuously run out, whilst at the same time it was so high that it did not allow of its being removed in the shape of clinkers. It was just sufficiently high to fuse the ashes and make them stick to the brickwork. It might be tapped out occasionally, but sooner or later the apparatus became blocked. His experience led him to conclude that in hot air generators it was absolutely necessary, when gasifying a large amount of fuel in a given time, to cool the gases rather than make them hotter. In the ordinary generator of Dr. Siemens he believed they gasified coal at the rate of 12 lbs. per square foot of grate area per hour, which was rather a slow speed; but in order to get a larger volume of gas, the apparatus became somewhat cumbersome, whereas if, with cold air under pressure, they attempted to gasify coal at a higher temperature, and if the process were pushed more rapidly, the temperature became so high that it was necessary to use steam to keep it cool. Steam put in at the bottom had two or three useful effects. The first was to keep the bottom cool, and thus to get the clinker; another was that it put the gas under slight pressure; and the third was that while there was no absolute gain with regard to heating power, it tended to produce gas which had less nitrogen in it. After several years of almost constant work, he had made up his mind that in a gas generator worked at high speed, some cooling action at the bottom was absolutely necessary. Referring to the retort setting described in the paper, he thought tiles and bricks would stand perfectly well; but the more important part of the question was this, that the adoption of an underground regenerative plan involved the entire reconstruction of the retort-setting. If the regenerator were

placed at the top of the setting, this difficulty could be to some extent relieved; but in such a case the air would naturally not descend through it down to the gas, because the chimneys in gas-works were not, as a rule, sufficiently high to draw the hot air down. If the draught were sufficiently powerful to draw the air down, the leakages at other points would become a serious objection. He had devised several methods for overcoming these difficulties, and he thought if gas managers would bring themselves to erect a fan or blower so as to place the air under a slight pressure—a small fraction of an inch of water would be sufficient—there would be no difficulty in working an overhead regenerator. The only thing which prevented it might be, that it would have to be built on the top of the retort-setting; but the alteration would be simple, and need not interfere with existing works. He had seen most of the gas-works in Paris, where Siemens's system was at work, and he must say it was answering their expectations, and giving great satisfaction. There the generators were placed below, on the reversing or continuous system. From the level of the charging-floor of the retorts to the bottom of the retort-setting was about 12 feet; but this was a height which was not available in most existing gas-works. He would like to say a word on the gas producer of which he had brought a model, the object of which was to produce the gasification of an increased amount of fuel per square foot of grate area in a given time. He had succeeded in making a good quality of gas at the rate of 30 lbs. of fuel per square foot per hour. The air supplied was introduced at the bottom by ports in the centre of the hearth, and there were no cooling tubes necessary in order to cool the gas. The object of getting an increased output from a comparatively small apparatus had been realized without difficulty. The carbonic acid was about 4 per cent., and he did not think in gasifying fuel at a high rate of speed any apparatus could be worked at a much lower average than this. It was self-contained and exceedingly compact. At the forthcoming meeting of the North British Association of Gas Managers in Glasgow he hoped to have the pleasure of reading a paper in which the application of this gas producer to heating retorts would be fully shown. In conclusion, he said that, when dealing with this subject, it was impossible to omit Dr. Siemens's name. The system of regeneration which he had worked out was of great importance, and any small advances they might make in details were really only links in the long chain of footsteps which bore the stamp of Dr. Siemens's genius.

Mr. J. CHEW (Blackpool) said he had no experience whatever in connection with the working of the generative system of heating retorts, and he had no bias except in favour of anything which would be economical in the manufacture of gas. The paper read by Mr. Stevenson was an exceedingly able essay on the chemistry of fuel; but, on the other hand, he did expect, from the two or three years' experience that gentleman had had in the practical use of the regenerator at Peterborough, that he would have favoured them with some absolute facts in connection with the wear and tear and so forth—as to the economical use—of the apparatus. They all recognized that an immense amount of waste heat was spent, going up the chimney, in the ordinary mode of manufacture. When the temperature went down below 1300° or 1400° Fahr. it was of no further use to them; and if there was any advantage in the system devised by Dr. Siemens, it was in economizing waste heat by heating the body of the furnace. On the other hand, gas men, as a rule, required to be convinced that a thing was economical before they spent an enormous amount of capital upon it. This system might have the many advantages stated by Mr. Greenough, but he had seen a great deal of literature on the subject, and, generally speaking, figures as to the actual work had been absent; and it was these figures which they really wanted. On the previous day he went through the Saltley works, where the generator system was in use, and perhaps the gentleman in charge of the works would be able to tell them something about the cost of erection—that was, if they had to alter existing furnaces to the generative principle, what the cost would be, and also something as to the cost of maintenance. This was the kind of information they wanted before they could recommend their Boards of Directors to introduce such a radical change into their works. Most gentlemen knew that some 12 or 14 cwt. of coke was produced from a ton of coal, and probably one-third of it was used for heating the furnaces. The London companies put 32 or 35 per cent. of the fuel carbonized by weight as used for this purpose, and if the regenerator system could reduce the amount by 10 per cent., undoubtedly they would have an increased amount of fuel for sale; but if, on the other hand, the increased amount of fuel was produced by an immensely large expenditure of

capital—the interest on which required to be paid—it might happen that “the game” would hardly be “worth the candle.” He was sorry that Mr. Stevenson had not given his practical experience of the regenerator principle, especially as he believed he promised something of the kind last year, and as he was still so strong an advocate of it.

Mr. STEVENSON, in reply, said he would first deal with the complaint of Mr. Chew and another speaker, that he had not given practical data. The fact was that in the present paper he had intended to deal with the matter theoretically, because in his paper last year, and in some correspondence on the question in which he had taken part, he had given the results of working in various places. He thought it was necessary, as the groundwork for going into this subject, to have the thing thoroughly stated theoretically. It was all very well to cry down theory, and to say facts were wanted. So they were, but working results could not be obtained unless there were some theory which caused the results to take place. His idea was that if he could convince the members, by his paper, that the principle was a right principle, and a better one than the ordinary system of working, then they would be prepared to believe the results when they saw them; but if he came and said he could save half the fuel generally employed, and make the retorts produce twice as much gas as usual, they would be inclined to say, “How is this? We are told simply that if we divide the process of combustion into two stages, after the finality of which we get the same result in heat produced, we can yet obtain all this saving;” and they would say, “We do not believe it.” But if they would go into the matter, and see how it was that it was impossible, under the old system, to carry out theory in practical working, whilst on the regenerative system it was not impossible to approach very nearly to theoretical perfection, then the thing became apparent. With regard to the working of the system, Peterborough and Maidstone were the only two places where he had been able to do anything at present with regenerator firing, for he had not succeeded in persuading any of his brother managers to introduce it. At Maidstone they had been working these furnaces throughout the whole of this year, but he was not sure whether Mr. West was present to state the results. They had, however, obtained very satisfactory results there, though he had not visited the works lately. The economy of fuel was such that during a period of half a year some 300 chaldrons more coke were sold than in the previous half year, although 100 tons less coal had been carbonized. At Peterborough they had one furnace working which was constructed as economically as possible with the view of saving the first cost, and he must say he was disappointed with the result, and was fully convinced, after working it for some time, that it was a mistake to try and economize the first cost too much at starting. The depth of fuel was not great enough, and therefore the carbonic acid first produced was not wholly converted into carbonic oxide, and in the gases, as they arrived at the point of secondary ignition, there was a very large proportion of carbonic acid, which maintained the generator in a state of greater heat than it ought to have been. The fact of not having a large open space, but having a small pit made for the men to go into, covered with folding doors, caused very great heat to accumulate in the pit. This furnace was not now working, and he had not as yet made any arrangements for extending or improving the system at Peterborough. The matter involved some personal questions between himself and the Directors of the Company, which he could not go into further; but he could state that the furnaces gave results inferior to those given at Maidstone and in Germany by full-sized furnaces, just in proportion to the imperfect shape and design of the furnace for the purpose for which it was intended, although the results were better than by the ordinary system of working. With regard to the expense of construction, he was prepared to assert that if the regenerative system were universally adopted in any works, the result would eventually be a saving in the capital account. The cost per mouthpiece of one of these settings would, of course, be greater than the cost of an ordinary retort-setting, but he had had a careful estimate of the cost made, and found it came, on the average, to £20 per mouthpiece, with all the fittings connected with the furnace itself, but without the retort-fittings. This included excavation and building a retaining wall in front of the generator, to allow space for moving about and working it. This figure was not excessive, especially considering the fact that one such retort-setting would produce as much gas in a day as two ordinary settings of seven retorts; so that eventually there would be a considerable economy, as the size of the retort-house need only be at the most two-thirds of the size

now required. He calculated the work this setting would do would be to carbonize 15 cwt. of coal per mouthpiece per day, with charges of 2½ cwt. of four hours' duration. The size of the retorts was 16 in. by 22 in., and the production of gas would be 8000 feet per mouthpiece, whereas they now obtained from 5000 to 6000 feet. He did not think that Mr. Peaty's remarks were very happy. He said it was not necessary to produce the gas separately for each retort-setting, nor was it absolutely necessary. Attempts had been made in Germany to work two or more retort-settings with one generator, but the result had always been a loss, through radiation, before the gases arrived at the burners. If the gases were made at a distance, and brought to the retort-settings cold before being used, they would have to be heated again, because unless they were heated up to a considerable temperature they would not ignite when the air supply was introduced. Either the gas must be re-heated, as Dr. Siemens did in his regenerative furnace, or else the air supply must be heated, for if both were cold they would never burn. It must be remembered that they had not to deal with coal to begin with, but with coke; they did not want a generator of an enormous producing capacity, for a moderate-sized one would make all the gas required, nor did they require a strong pressure or draught. They had to deal with gas from coke only, whereas in Dr. Siemens's process the gas was produced from coal or slack, and was carried from the generator by iron tubes along a condenser, by which it became condensed; the tar and heavy hydrocarbons being deposited and left in the condenser, whereas the gas, after being purified, went forward into the furnace. They did not want to cool the gas at all, but to get the gas straight away from the furnace, so as to save loss by radiation. There was considerable loss in a generator built separately from the retort-setting, though if built with duplicate walls, and the inner and outer space filled in with air-tight, non-conducting material, the loss would not be very great. He put it down at 20 per cent., but this was not 20 per cent. of the whole heat produced in the process, but 20 per cent. of the heat produced in the generator, which was about one-third of the total. If the men working in front of the generator felt a great amount of heat coming out of it, this was only part of what was produced in the first combustion, and more than twice as much was produced afterwards in the secondary combustion. Another question was the awkwardness of having so deep an excavation. The depth shown was only 10 feet to the bottom, but he proposed, in designing the setting, to commence building from the bottom; and if a stage house were built, he would simply commence from the coke-floor level, and build the piers straight up instead of building arches, as was usually done in a stage house. The portion not required for the generating flues could afterwards be filled up with concrete, and remain so permanently. Once constructed, the generating flues would last as long as the whole bench. Nothing would require to be touched again except the retorts, and in a few years' time the generator would require re-lining. As to the time the retorts lasted, of course the higher the temperature the sooner they burnt out; but there was a great saving effected from the equable temperature maintained. He found that although the retorts required renewing sooner than when worked at lower heats, the wear and tear, per 1000 feet of gas produced, was not greater. The increased make of gas he referred to last year, and therefore he did not think it necessary to bring it forward again, though it was certainly a very important consideration.

The PRESIDENT said time was going on so fast that he found he should not be able to say what he had intended on this subject; but there were one or two observations made by various speakers to which he must direct attention. The question of comparative economy was one that naturally came to the front, and the first thing to be considered was whether they approved of the increase of heat which these generators would afford. The tendency of working had been gradually to increase the heat of the retorts, and if they endorsed this policy the regenerative principle came in as a most powerful aid. Ordinarily, if they increased the heat of the retorts by hard firing, they lost a large portion of the heat at the outlet; but this the regenerative principle would enable them to return to the furnace, and this, he apprehended, was the chief value of it. Mr. Chew had asked for facts and figures. Figures had frequently been before the Association, but not such figures as commended themselves apparently to the mind of Mr. Chew. He should remind him, however, that it had been frequently stated that by the regenerative system a very much larger make of gas per mouthpiece had been the result. They

had been told, over and over again, of what had been done on the Continent; and Mr. Greenough had been able to tell them that wherever he and his friends had been, this system was in use, and that large yields per mouthpiece had been attained—not by enlarging the retort, but with an ordinary-sized retort almost double the yield they in England had been accustomed to had prevailed. He could endorse this statement, having paid a short visit to Germany last year, and seen several of the works to which Mr. Greenough had referred. He had also the privilege of seeing Dr. Schilling, who had studied this subject perhaps with greater care than any one, and had carried out the system to a very high degree of perfection. In his furnace the exit gas would ordinarily have a temperature of 2000° Fahr. If this were the outlet of an ordinary furnace, they could easily imagine what a loss of fuel would result; but by his system of regeneration he was able to bring the air for the secondary combustion into contact with the hot surfaces produced by this 2000°, so that at the outlet his whole gas went away at a temperature of not more than 1000°, the other 1000° being returned to the furnace. The result of this was that although the apparatus was somewhat more expensive to construct, his fuel account was reduced by somewhere about 2 lbs. per 100 lbs. of coal carbonized. The Germans had a different mode of estimating their fuel account to ourselves; they estimated so many pounds of fuel to 100 lbs. of coal carbonized, and Dr. Schilling's fuel account was 15 lbs. to 16 lbs., being a decrease of about 2 lbs. on what was done anywhere else. The question had been asked whether the Birmingham people were in a position to say anything on this subject. He must say he did not think they were in a position yet to say anything very definite. At present they were in the position of scholars, and it did not become scholars to speak very much. They had made several experiments, but they could see very well that this matter was one which required most careful handling, and complete success could only be obtained by a gradual succession of steps. They had arrived at this, however, that there was no doubt they could get any amount of heat for the retorts, but they had not yet attained to an economy of fuel. This, however, was a matter which it was perfectly evident must come. The present result he attributed entirely to the fact that they allowed too much heat to go away at the exit-flues; or, in other words, that they had not yet applied, in a sufficiently perfect manner, the regenerative principle.

[The publication of the remainder of the papers read is deferred to the next number of the JOURNAL.]

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held at the London Offices, 60, Gracechurch Street, E.C., on Tuesday, the 21st inst.—Mr. J. B. PADDON in the chair.

The SECRETARY (Mr. F. A. Duffield) read the notice convening the meeting, and the following report of the Directors was presented:—

The Directors beg leave to present to you their report and the audited statement of the Company's accounts for the year ended March 31, 1881.

There has been a considerable decrease in the value of residuals at Malta, but the gross earnings of the Company have not been greatly reduced. A satisfactory improvement in the business of the Sicilian stations has taken place.

During the current year it is intended to make some enlargements and extensions of mains and works, for the purposes of increased business and further economy.

From the profits earned the Directors recommend that, in addition to the first and second preference dividends, a dividend of 3 per cent., free of income-tax, on the ordinary shares be declared, that the sum of £500 should be placed to the reserve fund, and that the balance of £209 12s. 6d. be carried forward to the next account.

One Director, Mr. John Romanes, retires by rotation, and offers himself for re-election. The Auditors, Mr. James le Geyt Daniell and Mr. Alfred Hersee, retire, and offer themselves for re-election.

Dr. Profit and Loss Account, for Twelve Months ending March 31, 1881.				Cr.				
Coals	£7,235	5	10	Gas	£21,025	8	10	
Gas-making (salaries and wages)	2,174	1	2	Coke	2,363	3	4	
Charges on street lights	1,187	7	8	Tar	139	10	6	
Maintenance	1,271	5	9	Fittings and meters	293	14	5	
Purifying materials	71	7	7	Interest and discount	30	5	3	
Rents	77	8	2	Transfer fees	7	0	0	
General trade charges	723	13	10					
Depreciation of stock	300	0	0					
Bad debts and allowances	276	17	5					
Taxes on meters	122	8	7					
Treasurer's commission at stations and audit fee at Malta	277	9	8					
Inspection of stations	128	13	0					
London expenses	938	11	1					
Law expenses	43	5	8					
Exchange	379	3	9					
Income-tax	46	9	11					
Balance	8,606	13	3					
£23,859				2	4	£23,859	2	4

The CHAIRMAN, in moving the adoption of the report, stated that on previous similar occasions he had had to refer to the stereotyped character of the accounts, but no such description applied to the history of the Company's affairs for the past year. The chief incidents of the year had been those relating to the contract for the public lighting. The streets of Valletta, Floriana, Vittoriosa, Cospicua, and Senglea had been lighted by the Company under a contract with the Government for a term of fifteen years. This term would come to an end next May. In November last the Government advertised very extensively for tenders for this lighting. In due course the tender of the Company was sent in, but from that time

up to the present the Directors had not had any formal notification of either its acceptance or rejection. What they did know was that it was the only tender received, and they also knew that some negotiations had been proceeding during this time, and that the Government had resolved upon inviting tenders again. This had only been within the last few days. When the time came they would again send in their tender, and await the result. In the course of the preparation of these tenders it was evident to the Board that it was desirable that one of their body should go to Malta for the purpose of depositing the tender, and initiating negotiations. The member of the Board best fitted for the purpose was Major Stuart, who kindly consented to go; and he (the Chairman) was in a position to say that the interests of the Company were very ably and fully represented by this gentleman. Major Stuart was detained there a long time, and this time he turned to advantage in making a careful examination of the property, and the mode of keeping the accounts, and he also paid a visit to the Company's Sicilian stations for the same purpose, and returned with a copious roll of notes, which had been found of great value. The charge on the Company had chiefly resulted from the alterations made in bringing the books of their accounts from Malta to the London office, and keeping them there, and the various matters suggested and arising from the examination of the works. These things had brought about changes which had been beneficial, but it was not so much in the present that they would be felt as in the future. He really believed the Company would experience great benefit from the changes now made, and it was their intention to carry them still further with regard to other stations, and to get the business of the Company as much as possible into the London office. The effect of the changes made had been to double the duties of the Directors. For many years these duties were almost judicial, but now they were largely administrative. There was, however, nothing to regret in this. The knowledge of the Directors as to the concern had been considerably extended; and some of the consequent changes appeared in the present accounts. In the profit and loss account, it might be said that all its merits—and there were really some very good points in it—were obscured, almost neutralized, by the decreased value of coke at Malta and Corfu. This was not due to one cause, but to several; and, if taken in comparison with the accounts of last year, it would show that there was a decrease of about 25 per cent. in the total value. He might say that the accounts of last year were exceedingly high, and, looked at by the light of present events, perhaps a little too high. In order to maintain prices last year, a considerable stock was accumulated, and was brought over to the accounts of this year at the average price obtained for it last year, such being the custom; but these prices had not been realized, and this made a loss. Then there had been a slightly smaller yield of coke per ton of coal, and a rather larger fuel account. The two together amounted to about 7 per cent., and they were accounted for by the increased yield of gas per ton of coal. The chief cause of the unfavourable working at Malta was the reduction in the selling price of coke. In the hope of obtaining better prices they had an accumulation of coke, which he thought was larger than they ought to have had, and probably larger than they would ever have again; but finding that the price did not increase, and that there was no prospect of its doing so, the Directors thought it was best not to run the risk of further deterioration, but to realize, and to do this large quantities were sold at a low price. They sold 287 chaldrons more coke last than in the previous year, and received £818 less. The reduction in the selling price amounted to an average of about 4s. 7d. per chaldron. It was not often that so many adverse circumstances came together in one year, and he did not think they ever would again. Going to the first item in the profit and loss account, that of coal, it was slightly higher than in the previous year, and this was chiefly due to a small advance in freights. The next item, gas-making (salaries and wages), was one of the things which showed the advantage of the late examination of the Company's affairs, and the alterations the Board had made. There was a decided economy. The items of charges on street lights and maintenance, if taken together, would be found practically the same as before; and of all the other items he might say that they varied but little, the variation, however, being in the right direction. There was about £480 less expenditure than in the year ending March, 1880. On the other side of the account there was a very small increase in the rental. Coke he had already referred to; tar was a little better; and the profit on fittings and meters chiefly came from the Sicilian stations. The capital raised was practically the same as it was last year—there was a difference of about £30. The debentures were also about £200 less, and the saving in interest was beginning to make itself felt—not largely as yet, but still it was showing some benefit for what had been attempted. With regard to the debentures, there was no disproportion now between the amount raised on debentures and the amount raised as capital; but a number of debentures would be falling due on the 1st of July, and about £1100 would then be cleared off—he would not say permanently cleared off, as it might be to the interest of the Company, if they could renew them on advantageous terms, to do so. As to the items of sundry creditors and reserve fund, if they were compared with those in the preceding balance-sheet they were such as to excuse the Directors if they felt some little pride in them, as they showed undoubtedly an improvement. Since the Shareholders last met there had been an expenditure on capital account of about £520, which had gone in additional mains and lamps. He thought the Directors might say that the whole of this expenditure would be profitable. The other items he thought spoke pretty well for themselves. With regard to the stations at Malta, he was sorry to say that there was a further decrease of rental. Trade was said to be bad there, and the prospects of improvement poor. He mentioned this because if the Company should be called on to make any further expenditure of capital, it would be a matter for the gravest consideration. At Corfu also there was a decrease of rental, but this ought not to be thought too seriously of, as Corfu had been an improving station for some time, and it was considered that the little check there had been in the past year was easily accounted for by the unsettled state of the country, and it was thought would be only of a temporary character. At the Sicilian stations, however, the increase in the rental had been sufficient to make good the deficiency of three large stations, and to show a slight increase upon the whole. The Shareholders might look upon the accounts of these stations being no longer a drag on the Company, but a source of considerable assistance. During the last seven years the rental had increased about 30 per cent. there. In the past year these stations yielded a profit of £1550; and had the whole of the accounts of the other stations been as good as those of the Sicilian stations, the Shareholders would have had a very pleasant state of things before them.

Mr. JOHN ROMANES seconded the motion.

Mr. HARVEY asked in what the reserve fund of £2949 was invested.

Mr. STOKES thought there was very little prospect of any other Company undertaking the new contract referred to, so he considered the Company were pretty safe on this point.

The CHAIRMAN, in reply, stated that the reserve fund was not specially invested. It was used practically as working capital, and he did not know that the Directors could put it to a better use than this. Were they to invest it they would be in this position—that they would be raising

capital at 7½ per cent. and investing it at 3, or at most 4 per cent.; and the Company were not rich enough to do this. So long as it kept within its present very moderate proportions, it would, no doubt, be used as working capital. He might say that whatever confidence Mr. Stokes felt respecting the street lighting tender for Malta was fully shared by the Directors.

The report was then put, and unanimously adopted.

On the motion of the CHAIRMAN, seconded by Mr. S. ANDREWS, resolutions were passed declaring dividends of 7 and 7½ per cent. respectively on the first and second preference shares for the year ending March 31 last, deducting payments already made on account. A dividend of 3 per cent. was next declared for the past year on the ordinary shares, on the motion of the CHAIRMAN, seconded by Mr. STOKES.

The retiring Director and Auditors having been re-elected,

Mr. W. T. MORRISON proposed, and Mr. CRAVEN seconded, a resolution voting 100 guineas to Major Stuart, in recognition of his services at the Malta and Sicilian stations, and the motion was carried unanimously.

Major STUART, in returning thanks, observed that he went out with some reluctance; and though he could not get any answer from the Government officials, he thought the time had been well spent. It had given one of the Directors some personal knowledge of four of the five of the Company's stations, and he hoped this would eventuate in good.

On the motion of Mr. HARVEY, seconded by Mr. STOKES, a vote of thanks was then passed to the Chairman and Directors.

The CHAIRMAN acknowledged the vote, and in replying to a remark of Mr. STOKES, stated that the Sicilian stations were now in some respects approaching the limit of their capacity, and the third paragraph of the report referred to this. There had been little or no money spent on them for some time; and it was for these stations alone that further capital would be required.

Mr. MORRISON next moved, and Mr. HARVEY seconded, a vote of thanks to the Secretary and the staff.

The CHAIRMAN having briefly supported the motion, it was carried unanimously.

The SECRETARY returned thanks on behalf of his colleagues and himself, and the proceedings terminated.

BRIGHOUSE LOCAL BOARD GAS AND WATER SUPPLY.

At the Meeting of the Brighouse Local Board last Friday,

The CHAIRMAN (Mr. Bottomley) moved—"That a discount of 10 per cent. be allowed off the present price charged for gas (2s. 6d. per 1000 cubic feet), to all consumers who pay their gas accounts on or before the last day of the second month in each quarter; and that such discount commence with the Midsummer quarter's gas accounts, due July 1, 1881." He said he was very glad to find that the profits accruing from the gas-works, after all charges had been met, justified him in asking the Board to reduce in this way the price of gas; and he took this opportunity to say that the results of the manufacture of gas reflected great credit upon the Manager (Mr. James Parkinson), who, he was quite sure, had spared no pains in endeavouring to bring about such a satisfactory state of things. It had been his (the Chairman's) good fortune to be privileged to move that a reduction should be made in the price of gas three years in succession. In 1879 the price was lowered from 3s. 4d. to 2s. 11d. per 1000 feet; again, in 1880, it was reduced from 2s. 11d. to 2s. 6d.; and he had now once more to ask a further reduction. It had always been the custom of the Board to charge both large and small consumers at one uniform rate, and although the principle of discount was to be introduced, the price would continue uniform. The arrears, bad debts, and loss of interest to the Board had been very considerable; in fact, the Auditor had drawn attention to the great amount of arrears, and the principle of discount was introduced with a view of offering an inducement to punctual payment of gas accounts. He was glad to say that the arrears were £900 less last year than they were the previous one. His resolution would mean that all who paid their gas accounts within two months of their being due would have their gas at the rate of 2s. 3d. instead of 2s. 6d. per 1000 feet.

Mr. R. SUGDEN asked if the large consumers were not paying more than their fair share, judging by the profits made.

The CHAIRMAN pointed out what he had stated before, that the custom had always been to charge one uniform rate. If any gentleman wished to alter the system, it would be open to him to propose a resolution to this effect. He was wishful, however, that the people living in cottage property should have a chance of keeping their houses bright and clean.

Mr. KERSHAW thought that large consumers took the gas solely for their own benefit. He endorsed what the Chairman had said with respect to the excellent management which had produced such satisfactory results in the gas department. The Chairman had not stated, however, what the amount of profit was.

The CHAIRMAN said that the reduction in the price of gas was equal to the profit made.

The resolution was then seconded by Mr. ORMEROD, and carried.

The CHAIRMAN also moved the following resolution:—"That the price of water supplied for trade purposes be reduced to all consumers within the district of the Local Board, from 1s. to 10d. per 1000 gallons, and to all consumers outside the district, receiving a supply from the Board for trade purposes, from 1s. 6d. to 1s. 3d. per 1000 gallons; that such reductions commence and take effect on and after the 1st day of April; and that all hydrants be free." This motion was seconded by Mr. KERSHAW, and, after some conversation, was carried unanimously.

CHELSEA WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Office, Commercial Road, Pimlico, on the 23rd inst.—JOHN DEEDES, Esq., the Governor, in the chair.

The SECRETARY (Mr. Albert Gill) having read the notice convening the meeting, and the minutes of the last half-yearly meeting, the following report for the six months to March and the accounts were presented:—

The revenue for the half year, exclusive of interest on moneys invested and deposited, amounted to £50,617 2s. 9d., showing, as compared with the revenue of the corresponding period of last year, an increase of £1092 4s. 10d.

The charges for maintenance and management were £17,156 4s. 1d., and show, as compared with the charges for the same period of last year, an increase of £718 2s. 11d. The account is charged with unusually heavy expenses incident to the severe frost which set in in January last. The disturbance of roadways for the extension of wood paving continues to swell the working expenses. That work has been completed in many parts of the Company's district, but some further expenditure of the same kind may be looked for in other parts, where the authorities have signified their intention to use wood as the covering for some of the principal thoroughfares.

In accordance with the report presented to the Proprietors in December last, the law costs incurred in opposing the Lower Thames Valley main sewerage scheme, and the costs of the proceedings in the matter of the proposed Purchase Bill of last session, amounting together to £1704 13s. 9d., have been provided for out of the contingency fund. The same account has also been charged with the sum of £241 16s., paid as compensations for damages incident to the bursting (in October last) of a 24-inch main at Walham Green.

The expenditure on capital account during the half year amounted to £267 7s. 3d. The outlay is again chiefly due to the extension of mains in the suburban portions of the district in the direction of Fulham. During the half year 92 houses have been pulled down and 302 new houses laid on. From this source, and the steady increase in the quantity of water supplied by meter, considerable additional revenue is anticipated,

though its development is, for the present, retarded to some extent by the unusual number of houses returned as empty.

The quantity of water pumped from Surbiton to the covered service reservoirs on Putney Heath during the half year amounted to 1515 million gallons, being about 36 millions in excess of the quantity pumped in the corresponding period of last year, though the cost of coal was rather less. The inspection of water fittings is still in active operation.

The Engineers report that the whole of the Company's works and property are in excellent order, that the intake at Molesey continues to act satisfactorily, that the flow of water to the screen tanks was in no way checked by the severe frosts of the past winter, and that little inconvenience was caused by the floods, the store in the reservoirs having been replenished at every opportunity, and the water maintained in good condition.

No reliable information has reached the Directors as to whether or not the Government have still the intention of introducing a Bill with reference to the several London Water Companies; but should any action be taken, it will engage the most careful consideration of the Directors.

A Bill has been introduced into Parliament authorizing the Metropolitan Board of Works to construct a new bridge to replace the present wooden bridge across the Thames at Putney, and involving the removal of the Company's aqueduct. Clauses have been inserted in the Bill for the protection of the Company's rights and interests and the continuance of their water supply across the river by means of a temporary iron structure to be erected and maintained by the Metropolitan Board during the progress of their works. The Bill further provides that on completion of the new bridge the Metropolitan Board are to lay down (under the footways of their new bridge) mains of the same number and diameter as are now carried by the aqueduct bridge, and to provide and leave under the footways space sufficient for the admission of two additional 24-inch mains.

Another Bill, entitled the Kingston and London Railway Bill, authorizes the construction of a line from the railway station at Fulham Bridge through Putney and underneath Wimbledon Common. The line will pass by tunnel near to the Company's service reservoirs on Putney Heath, and clauses have been inserted in the Bill, by arrangement, for the protection of the Company's interests.

The Directors feel that they may congratulate the Proprietors on the soundness of the Company's financial position, on the thorough efficiency of their works, and on the excellent quality and abundant quantity of the water supplied to the district. They recommend that a dividend on the ordinary stock at the rate of 6½ per cent. per annum be declared and paid as usual on the 5th of July prox.

Three Directors—Sir William Henry Wyatt (Deputy-Governor), Mr. Francis Stephen Clayton, Col. Sir Wilford Brett—go out of office this year by rotation, but offer themselves for re-election. Mr. James Alfred Hallett, one of the Auditors, also goes out of office by rotation, and offers himself for re-election.

Dr.—REVENUE ACCOUNT, FOR THE HALF YEAR ENDED MARCH 31, 1881.

<i>Maintenance.</i>		
Maintenance and repair of impounding and service reservoirs, &c., including materials and labour . . .	£716 18 0	
Maintenance and repair of mains, pipes, &c., including materials, labour, &c. . .	£2564 2 2	
Do., withdrawn from contingency fund . . .	241 16 0	
	2,805 18 2	
Pumping and engine charges, including cost of coals, wages, &c. . .	3,675 11 5	
Filtration, including the cost of materials and labour . .	434 15 2	
Salaries of Engineer, Inspector, Superintendent, and Clerks, and wages of Turncocks . . .	2,106 10 0	
Thames Conservancy . . .	1,000 0 0	
Rates and taxes, exclusive of income-tax . . .	2,438 16 1	
	£13,178 8 10	
<i>Management.</i>		
Allowance to Directors . . .	£630 0 0	
Allowance to Company's Auditors . . .	41 7 0	
Salaries of Secretary, Accountant, and Office Clerks . .	1,137 17 0	
Superannuation of servants of the Company . . .	367 11 0	
Commission to Collectors . . .	1,301 12 2	
Stationery, printing, and general establishment charges .	355 0 3	
Law and parliamentary expenses . . .	328 6 10	
Do., withdrawn from contingency fund . . .	1704 13 9	
Official Auditor and Water Examiner . . .	57 17 0	
	5,924 5 0	
Dividend and interest account for transfer of profits . .	30,490 18 8	
Balance carried to next account . . .	3,000 0 0	
	£52,593 12 6	

Cr.—REVENUE ACCOUNT.

Balance brought from former account . . .	£3000 0 0	
Sums written off as losses, viz.: . . .		
Empty houses . . .	£2832 9 3	
Bad debts . . .	171 2 0	
	3003 11 3	
	£3 11 3*	
Water-rates accrued to date of this account . . .	£50,388 5 6	
Less, as above . . .	£3 11 3	
	£50,384 14 3	
Rents of houses and lands accrued to date, and owing to the Company . .	245 16 0	
Fees received for registration of stock, transfers, &c. . .	16 12 6	
Contingency fund . . .	1,946 9 9	
	£52,593 12 6	

The GOVERNOR, in moving the adoption of the report, said he thought the Directors might congratulate the Proprietors upon its being satisfactory in all respects. It showed an increase of revenue in the half year up to March 31 last of £1092, but on the other side there was an increase in the charges for maintenance and management of £718. This increase was principally accounted for by two circumstances—the unusually severe frost which lasted so long, and the expenses to which the Company were put by the laying of wood paving; the pipes being examined when the wood paving was laid down. There was likely to be a further increase on this head, from the paving of Whitehall, Victoria Street, and the Broad Sanctuary, with wood. The report referred to the expense incurred in opposing the Lower Thames Valley Main Sewerage Bill, and also the costs of the proceedings in respect to the Metropolitan Water Supply Bill of last year, which amounted together to £1704, and the burst of the main at Walham Green, which further increased the amount to £1945. This sum had been charged against the contingency fund. Fortunately, there was a good contingency fund, which, under the Company's Act of Parliament, was made available to meet contingencies—a very wide expression—or for enlarging, repairing, and improving the works. The report further stated that "during the half year 92 houses have been pulled down and 302 new houses laid on. From this source, and the steady increase in the quantity of water supplied by meter, considerable additional revenue is anticipated, though its development is, for the present, retarded to some extent by the unusual number of houses returned as empty." The increase in the quantity of water supplied by meter was for trade purposes, and as regarded the "empties," the state of the case seemed to be this: They were mostly in respect of new houses. At Michaelmas, 1879, the total supplies in the whole district amounted to 29,945, and the empties at the time were 1616. At Michaelmas, 1880, the supplies were 30,375, being an increase of 430, and the empties were 2226, an increase of 616. He had very little doubt that in course of time these new houses would become occupied, and money would then be received from them. Another paragraph referred to the action of Parliament with respect to the Companies, and he had nothing to say on this head. Rumours were afloat from time to time, but there was nothing to put one's finger upon to show any certainty of action this session on the part of the Government, and he presumed that none would take place. With reference to the new bridge across the Thames, the Directors did not expect any litigation in regard to the matter. Clauses had been agreed upon which would obviate this, and the whole thing seemed to have gone on

agreeably to all parties. The report mentioned another Bill—the Kingston and London Railway Bill—and there again everything had gone on smoothly. With respect to the quality of the water, he would read some short extracts from the reports of three gentlemen of distinction and eminence—Mr. Crookes, Dr. William Odling, and Dr. Meymott Tidy. The reports of these gentlemen were sent to the President of the Local Government Board, and their observations were made daily, though the reports were made monthly. In their report for the month ended April 20 they said: "Of the 23 samples from the mains of the Chelsea Water Company, the whole were bright, clear, and well filtered." Further on in the same report they said: "The improvement we had occasion to mention as having taken place in the appearance of the metropolitan waters in our last report has been still further noticeable during the past month, and, taken as a whole, they leave nothing to be desired in respect of colour, wholesomeness, complete aëration, or absence of suspended matter." Again, in their report for the month ended May 19, they said: "Of the 26 samples from the mains of the Chelsea Water Company, the whole were bright, clear, and well filtered;" and this report they closed by saying, referring to the waters supplied by the Companies generally, "Examined chemically, they have shown excellent aëration and great freedom from organic matter. They leave nothing to be desired for dietetic purposes." He thought those reports must be regarded as satisfactory.

Mr. G. F. ASTON seconded the motion, which was carried unanimously.

On the motion of the GOVERNOR, seconded by the DEPUTY-GOVERNOR (Sir William Henry Wyatt) the following resolution was passed:—"That the accounts as laid before the meeting be received and entered on the books;" and further resolutions were afterwards passed authorizing the Directors "to set apart out of the profits of the Company so much money as will be sufficient to pay the dividends which will become due on the 5th day of July next on the several preference stocks issued by this Company," and declaring a dividend for the past half year at the rate of £6 10s. per cent. per annum on the ordinary capital stock of the Company.

The GOVERNOR next moved the re-election of the retiring Directors, and the motion having been seconded it was carried unanimously; as was a further resolution re-electing the retiring Auditor.

Mr. CHESHIRE, F.R.S. (Birmingham), urged the Directors to direct their attention to giving a constant supply. Cisterns were, he said, very much neglected, and the consequence was that the Companies were frequently blamed as to the badness of the quality of the water supplied, when in reality the blame was due to the neglect of the consumer to keep his cistern properly cleansed.

The GOVERNOR, in reply, said he was happy to inform the Shareholders that the Company certainly did not receive complaints. He might state that the question of the constant supply was invariably prominently before the Board. Wherever it could possibly be applied, especially in new houses, it was put on.

The DEPUTY-GOVERNOR thought it right to mention that it would not make the least difference as to the cisterns if the constant supply were general, for cisterns must be used. No water company in London could answer that there would not be a momentary suspense from some accident or some cause or other, and if the cisterns were abolished people would, in such event, be without a supply of water.

Mr. CHESHIRE said he believed that at Birmingham the constant supply had been used without any cisterns whatever, excepting the cisterns at the closets; and he did not see why, if the pressure was sufficiently kept up, they should not have the constant supply without any cisterns, except those at the closets.

The DEPUTY-GOVERNOR: I should not advise it.

A vote of thanks was then passed to the Governor and Directors for their care and attention to the affairs of the Company in the past half year, and the proceedings closed.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

If Dean of Guild Scott, of Montrose, is desirous to earn a reputation for consistency, the sooner he reconsiders his recent utterances the better. Nine months have come and gone since the electors of Montrose were called upon to select and elect municipal dignitaries, and although many events of national and local importance have occurred in the interim, the passionate and eloquent appeals of Dean of Guild Scott, on the gas question, have not been forgotten. Just nine months ago the Dean, in his zeal for the welfare of the town, the management of the affairs of which is partly entrusted to him, wanted to make a raid on the Gas Company, to acquire from them the property they possessed, and in this way give to the community cheaper gas than they were at the time getting. Winding up a somewhat pithy address to the electors with "go in for the gas," one would naturally expect to find him, during these nine months, working hard to achieve for his constituents the very thing that he so warmly urged them to acquire; but somehow or other this is not the case. Not only is he not rendering assistance to attain this object, but he is throwing the weight of his influence, such as it is, into the scale against the acquisition of the gas-works, and one could imagine that if only Dean of Guild Scott could see the Gas Company compelled "to kick the beam," he would, in the exuberance of his joy, don the national garb, and physically gyrate as much as he has already done mentally. It will be gathered that Dean of Guild Scott, who nine months ago advised the community "to go in for the gas," is prepared to go in for something else; but it would not be in the least degree startling if, before the November elections come round again, he should be found seriously considering the position. Meanwhile he says it is truly refreshing to see the Council, with scarcely an exception, following his lead in this matter. Do not let it be supposed that when Dean of Guild Scott uses these words he means his nine months' old lead; he speaks of the electric light, the dazzling rays of which seem to have penetrated even into Montrose, and he appears determined to do all he can to compel the burgh to spend funds which he and his brother councillors are pledged to conserve. It is unfortunate when the Dean is in this frame of mind, and when he has those in the Council prepared to follow his lead, that the Gas Company should not have met the representatives of the town, when they were talking over the purchase of the works a short time ago, in a more frank and considerate spirit. As the Provost sarcastically told the Council on Tuesday night, the Committee appointed to confer with the Gas Company's Directors had received every kindness from these gentlemen, who sought to withhold nothing but information. It is said that the Directors declined to lay their balance-sheets before the Committee, or give any statistics to show whether the consumption of gas was increasing or decreasing in the town. All they would admit was that the dividend of £3 per share had been fairly earned, and that the utmost farthing had been divided. From what transpired at the conference, the Provost said he believed the Company would sell the gas-works for something like £25,000, which the Provost thought would only be a fair price. If I am not mistaken, the value of the works which was brought out by professional gentlemen in November last was something between £17,000 and £18,000. Some of the

members of Council who entered that body pledged to acquire the gas-works think they have, in the electric light, a sufficient ground for violating their pledges, and I understand that the result of the meeting of the Town Council is that, on account of the progress of the electric light and the difficulty of obtaining information from the Gas Directors, no further steps are to be taken in the meantime with a view to negotiate the transfer. Suppose, when gas was first introduced, the candle makers had met and passed a resolution that, owing to the progress which gas-light was making, they should cease their manufacturing operations, what would have been the verdict by all men of sound common sense at the present day? Much in the same way, it may safely enough be predicted, the generation which succeeds the one now in possession of the boards will look back and wonder that their predecessors had such a miserable opinion of the valuable lighting and heating agent which the application of science had placed within easy grasp.

I mentioned last week that the Edinburgh Town Council had resolved to spend £400 in experimenting with the electric light in the city, and that the Brush system had been recommended for adoption. It is said the North British Railway Company have also made arrangements to have the Waverley Station lighted by electricity during the progress of these experiments. I have frequently heard certain rumours that in these experiments there is an under-current of motives, which, if true, are the reverse of creditable. Any one acting for the supposed good of the community should be, like Cæsar's wife, "above suspicion," and if at all interested—peculiarly, of course—in the advancement of any particular system of electric lighting, that one should shun taking part in any contemplated arrangement. In saying this much, I do not for a single moment attribute unworthy motives; but when parties have an interest in the system which they are recommending to their fellow-townsmen, they cannot be too careful in the part they act.

The Committee who have to do with the exhibition of gas apparatus in Aberdeen met on the forenoon of Saturday last, and made final arrangements for advertising the exhibition, and for communicating with the various firms likely to contribute apparatus. The exhibition will be opened in Marischal College on the 20th of September, and will remain open for a fortnight.

In the month of November last the Commissioners of Alva adopted the Burghs Gas Supply (Scotland) Act, 1876, and thereafter entered into negotiations with the Gas Company for the acquisition of their works. The Commissioners in due course made an offer of £7800 for the works, this offer being based on a valuation by Mr. Clinksbill, of Glasgow. The Company wanted £8500, but, after consideration, they, at a meeting held on Monday evening, agreed to accept the offer of the Corporation.

The annual meeting of the Dunfermline Gaslight Company was held on Wednesday, and the minutes of former meetings having been read by Mr. Mackenzie, the report of the Directors, showing highly satisfactory results on the year's working, was submitted to the meeting and approved of. A dividend of 8 per cent. was declared. Messrs. G. Wilson, J. Drummond, and J. Sampson were elected Directors in room of Messrs. D. Russell, R. M. Wilson, and Henry Reid.

The people of Forfar are now looking forward to the speedy introduction of their new water supply. The main-pipe has been filled for twelve months, and not a single leak has occurred for half this period. The house connections are to be proceeded with immediately, but it has been found necessary, owing to the great pressure of the water, to increase the weight of the lead service-pipes.

For a considerable time past complaints have been made in various districts in Aberdeen as to scarcity of water, and at last the City Surveyor, Mr. Boulton, C.E., was called upon to report on the matter. If there is not abundance of water at the reservoirs, there is at least sufficient for all purposes in Aberdeen, and the cause of the complaint, therefore, is not on this score, but rather that the main-pipes have not sufficient diameter to pass the requisite quantity. Mr. Boulton has drawn up a comprehensive scheme for improving the mains and services, the carrying into effect of which is estimated to cost from £8000 to £9000. At the reservoir the outflow bye-pass and inflow-pipes, 27 inches diameter, are, in Mr. Boulton's opinion, all too small, and he proposes to substitute pipes of 36 inches diameter. If these operations are sanctioned by the Council—at present they are under consideration—the water will require to be shut off from the town for ten or twelve hours.

Several years ago the town of Dunfermline resolved upon introducing an extensive water scheme, and for this purpose they obtained powers to borrow £70,000. A supply of water was obtained from Glensherup, and it was understood to be both plentiful and pure. At a meeting of the Council last week, however, a question was put to the Master of Works, whether all the water coming into the town was being filtered. It was explained that the water coming in by Milesmurk and Townhill could not be filtered. The gentleman who put the question then produced from his pocket a bottle containing "a horsey eel, black in colour, about 18 inches long, and about the thickness of a stocking wire," which he had found in the water coming to his house. The Provost explained that it was believed these creatures came from Craigluscar, where the water was comparatively stagnant, and part of which came through the unfiltered pipe at Milesmurk. Such an explanation is pleasant for those who get their domestic supply from this source, but there is a certain amount of consolation in the fact that the whole of the town will soon be supplied with water from Glensherup.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, Saturday.

A reduction of 5d. per 1000 cubic feet has been made in the price of their gas by the Grangemouth Gas Company, the charge to the consumer now being fixed at 4s. 1d. per 1000 feet. For 27-candle gas in a little provincial town, this is certainly not a high price; but it should be noted in passing that there is a meter-rent of 2s. 6d. per annum.

The Bo'ness Gas Company have resumed operations for giving a larger supply of gas to the consumers. The old 4-inch pipes have been lifted throughout a large portion of the town, and replaced by 9-inch mains, and thus it is confidently anticipated that there will be a decided improvement as regards the quantity of gas available for consumers. This matter being now attended to, a hope is expressed that the quality and price of the gas will next occupy the attention of the Gas Company. I may mention that the price at present is 5s. per 1000 feet for 27-candle gas, with a meter-rent of 2s. per annum.

The annual meeting of the Gourrock Gas Company, Limited, was held last Wednesday—Mr. J. Paton presiding. The balance-sheet was submitted and approved of, and a dividend at the rate of 7½ per cent. per annum was declared. In the course of his remarks, the Chairman congratulated the Shareholders on the improvements which had been effected at the gas-works in the course of the past year, and he considered that since those improvements had been completed the works would compare favourably with those of any town of the same size in the United Kingdom. Mr. W. Turner, Mr. J. Simpson, and Mr. W. Lang were elected Directors for the current year, in room of those retiring.

On Tuesday evening the annual general meeting of the Catrine Gaslight Company was held, at which there was a large attendance of Shareholders.

From the report which was submitted by the Treasurer (Mr. A. Cowan), it was shown that the financial condition of the Company was not satisfactory, although the works and plant were in first-rate order. The report was adopted, and a dividend of 2½ per cent. declared. It is said that the dividend has not been so low since the formation of the Company. The price of the gas is 6s. 8d. per 1000 cubic feet. It may be mentioned that Catrine is an important seat of the cotton manufacture in Ayrshire.

A very different state of affairs was shown at the annual general meeting of the Auchinleck Gas Company, which was held on Friday, the 17th inst. From the report, which was submitted by the Secretary on behalf of the Directors, it appeared that the Company were in a more flourishing state than had been known for several years. It was unanimously agreed, on the recommendation of the Directors, to declare a dividend of 5 per cent.

The annual meeting of the Muirkirk Gaslight Company was held last Monday—Mr. Charles Howatson, of Glenbuck, in the chair. The usual dividend of 10 per cent. was declared, and the price of gas was continued at 6s. per 1000 cubic feet, which was regarded as moderate, considering the great length of pipeage for the small consumption. But it ought likewise to be mentioned that the Muirkirk Gaslight Company have a large deposit of excellent cannel coal at their very door.

I incidentally referred in last week's "Notes" to the annual report of the Hawick Gaslight Company, and now proceed to notice it more in detail. It embraces the 50th annual balance-sheet and statement of affairs of the Company. After dealing with the movement for removing the entire works to a new and more eligible site, as was agreed upon by a special meeting of the Shareholders last December, it states what the intentions of the Directors are as to the execution of the wishes of the Shareholders as expressed at the meeting. As mentioned last week, the past year's increase in the consumption of gas was upwards of 4 million cubic feet, and for every ton of coal delivered at the works 9200 feet of gas were sold. The percentage of loss by condensation and leakage was sensibly reduced during the year, notwithstanding the fact that the streets were more than ordinarily disturbed, owing to the laying of sewage connections and the new water-supply pipes. During the year ending the 1st of February last the sum of £4712 was received for gas supplied, and the profits earned during the year are set down at £1073—a result which speaks very favourably for the entire management of the Company's business. A year ago the price of gas was reduced from 3s. 9d. to 3s. 6½d. per 1000 feet, and still the guaranteed dividend of 10 per cent. has been earned, besides carrying forward a balance of £148. The sum of £100 13s. 6½d. was paid as discount during the year to large consumers, as against £70 10s. 2d. in the preceding year. This fact shows that the staple trade of the town has been in a more flourishing condition during the past than during the preceding year.

Glasgow Corporation 9 per cent. Gas Annuities were firm yesterday at £227, and buyers were willing to purchase at that rate, but sellers held out for £230.

The new water-works for the parish of Blantyre (in the middle ward of Lanarkshire), which have been in course of construction since last September, and are now approaching completion, were lately inspected by Mr. A. G. Murray, C.E., Edinburgh, as Commissioner for the Board of Supervision. This inspection was rendered necessary by the application of the Local Authority for the recommendation of the Board to a loan of £10,000 from the Public Works Loan Commissioners, to defray the cost of the works. The Board have now recommended the loan, and state that they are satisfied as to the nature of the works executed and to be executed, and the mode of execution; and having regard to the durability of the works and the amount of rates charged and proposed to be charged upon the district, they are of opinion that the loan may be safely spread over a period of 50 years. The result of the Board's recommendation is that the Local Authority will be able to obtain a loan, repayable in 30 years at 3½ per cent., in 40 years at 4 per cent., or in 50 years at 4½ per cent.

On the 11th of June the supply of water in the various reservoirs belonging to the Greenock Water Commissioners amounted to 423,428,428 cubic feet, being equal to a supply for all purposes for 121 days, as against a supply for 101 days at the same time last year.

Messrs. Leslie, Engineers, Edinburgh, have devised a water supply scheme for the town of Lockerbie, which is estimated to cost £3300.

It is probable that arrangements will be made by the Irvine Water Commissioners to supply Nobel's Explosives Company with water at the rate of 4½d. per 1000 gallons, on condition that the quantity taken is at least 5 million gallons per annum.

The water supply is assuming a serious aspect at Wishaw, owing to the limited amount contained in the reservoirs and being yielded by the springs and streams.

A very large amount of business has been done this week in the Glasgow pig iron market, and prices yesterday afternoon were—sellers, 47s. 7d. cash and 47s. 9d. one month, buyers offering 1d. per ton less.

Little or no change for the better can be reported in regard to the Scotch coal trade. Many of the gas companies and corporations have now completed their gas coal contracts for the ensuing year, but the Glasgow Gas Committee are still in the market for about 200,000 tons.

BURNLEY CORPORATION GAS AND WATER SUPPLY.—The Borough Auditor of Burnley (Mr. G. Gill) has issued his annual report on the finances of the Corporation for the past year, in which it is stated that, in the gas-works department, the net profit, after appropriating £2500 as reserve fund, amounts to £2371 2s. 7d. The capital account showed that £8756 was expended on works in connection with the gas undertaking, and £6072 on the water-works. The total storage capacity of the three reservoirs is 172 million gallons, and there are now 12,780 water consumers, as compared with 4510 in 1855. The gasholder capacity is given as 786,000 cubic feet, but it is stated that when the additional gasholder now being erected is finished the storage will be increased to 2 million cubic feet.

TICHBURST GAS COMPANY.—The annual general meeting of this Company took place last Saturday week—Mr. E. Currie in the chair. The report which was presented stated that owing in part to the reduction, two years since, in the price of gas to 5s. 10d. per 1000 cubic feet, the consumption had rapidly increased, showing for the past year a total of 2,506,300 cubic feet, realizing the sum of £731 0s. 1d., while the amount received for coke, tar, &c., reached the sum of £159 3s. This was effected with a carbonization of 312 tons of coal, showing that 8033 cubic feet of gas had been sold per ton of coal carbonized. The result proved that the coal was of good quality, that the mains and services were in a sound condition, and that industry and good management pervaded the works and business of the Company. The report having been adopted, a dividend of 5 per cent. was unanimously agreed to, and it was resolved to further reduce the price of gas to 5s. 5d. per 1000 cubic feet for the ensuing year.

Parliamentary Intelligence.

PRIVATE BILLS RELATING TO GAS, WATER, ETC.—SESSION 1881.

PROGRESS MADE TO SATURDAY, JUNE 25.

Title of Bill.		Petition for Bill Presented.	Bill Read the First Time.	Bill Read a Second Time.	Bill Reported.	Bill Read the Third Time.	Bill Received Royal Assent.
Aberdeen Corporation Bill	Lords	Commons Bill	March 29	April 7	May 13	May 31	..
Alnwick Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 8	March 28	..
Barrow-in-Furness Corporation Bill.	Lords	Commons Bill	May 5	May 13	May 19	May 23	} June 3
Beverley Water Bill	Commons	Jan. 27	Jan. 28	Feb. 7	April 5	April 28	
Bingley Water and Improvement Bill	Lords	Commons Bill	May 5	June 13	June 21	June 21	..
Birkenhead Corporation (Gas and Water) Bill	Commons	Jan. 27	Jan. 28	Feb. 2	April 8	May 3	..
Bradford Water and Improvement Bill	Lords	Commons Bill	April 8	May 12	June 17	June 23	..
Bray Township Bill	Commons	Feb. 4	Feb. 7	Feb. 15	March 22	April 7	..
Brighton and Hove Gas Bill	Lords	Commons Bill	March 25	April 4	May 31	June 3	..
Cambridge University and Town Gas Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 11	March 24	..
Caterham Spring Water Bill	Lords	Commons Bill	April 8	June 2	March 23	April 7	..
Cheltenham Corporation Water Bill	Commons	Jan. 31	Feb. 2	Feb. 7	March 23	April 7	..
Cleator Moor Local Board Bill	Lords	Commons Bill	April 8	May 19	March 18	April 8	..
Colne and Marsden Local Board Bill.	Commons	Jan. 27	Jan. 28	Feb. 4	May 21	May 31	..
Dudley Gas Bill	Lords	Feb. 18	Feb. 18	Feb. 25	..	..	..
Dundalk Water Bill	Commons	Lords Bill	June 2	June 20	..	..	..
Eastbourne Water Bill	Lords	Commons Bill	March 15	Feb. 14	March 3	March 14	..
East London Water Bill	Commons	Jan. 27	Jan. 28	March 21	March 22	March 25	} March 29
Egremont Local Board Bill	Lords	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	
Fylde Water Bill	Commons	Commons Bill	June 13	June 11	..	..	..
Goole and District Gas and Water Bill	Lords	April 29	May 11	May 23	May 31	June 13	..
Hexham Gas Bill	Commons	Commons Bill	May 6	May 16	May 27	May 31	..
Holland (Parts of) and Sutton Bridge Water Bill	Lords	Jan. 27	Jan. 28	Feb. 2	April 5	May 5	..
Hyde Gas Bill	Commons	Commons Bill	May 5	May 13	May 27	May 31	..
Irvine Burgh Bill	Lords	Jan. 27	Jan. 28	Feb. 7	March 15	April 25	..
Kirkcaldy and Dysart Water Bill	Commons	Jan. 27	Jan. 28	Feb. 3	March 15	March 21	..
London Sea Water Supply Bill	Lords	Lords Bill	March 23	May 23	June 3	June 17	..
Lower Thames Valley Main Sewerage Board Bill	Commons	Commons Bill	April 1	April 8	May 24	May 30	..
Matlock Water Bill	Lords	Feb. 2	Feb. 3	Feb. 15	March 22	March 31	..
Oban Burgh Bill	Commons	Jan. 28	Jan. 31	Put off for six months	..	..	..
Paisley Water Bill	Lords	Commons Bill	Jan. 31	May 12	May 19	May 23	} June 3
Reading Corporation Bill	Commons	Jan. 27	Jan. 28	Feb. 15	March 18	April 4	
Richmond Gas Bill	Lords	Jan. 28	Jan. 28	Feb. 8	March 7	March 11	..
Ryton Local Board (Water) Bill	Commons	Lords Bill	March 14	March 23	..	..	..
Sevenoaks Gas Bill	Lords	Commons Bill	April 5	May 9	June 24	..	..
Sheffield Water Bill	Commons	Jan. 27	Jan. 28	Feb. 2	March 11	April 4	..
South Metropolitan Gas Bill	Lords	Commons Bill	March 31	April 8	May 10	May 13	} June 3
Stalybridge Extension and Improvement Bill	Commons	Jan. 27	Jan. 28	Feb. 9	March 18	March 29	
Stirling Water Bill	Lords	Commons Bill	May 5	May 13	May 20	May 24	..
Westbury-on-Trym Gas (No. 1) Bill	Commons	Jan. 27	Jan. 28	Feb. 8	March 18	April 25	..
Westbury-on-Trym Gas (No. 2) Bill	Lords	Commons Bill	March 31	April 8	May 10	May 13	} June 3
Westgate and Birchington Gas Bill.	Commons	Jan. 28	Jan. 31	March 2	March 18	March 29	
Woking Water and Gas Bill	Lords	Commons Bill	April 1	May 23	..	..	..
"	Commons	Jan. 31	Feb. 2	Feb. 7	March 22	March 31	..
"	Commons	Jan. 28	Jan. 31	Feb. 14	March 25	April 5	} June 3
"	Commons	Jan. 31	May 17	May 27	May 31	June 3	
"	Commons	Jan. 31	Feb. 2	Feb. 7	April 1	May 16	..
"	Commons	Jan. 28	May 13	May 24	May 27	May 30	} June 3
"	Commons	Jan. 28	Jan. 31	Feb. 7	April 1	May 12	
"	Commons	Jan. 28	June 2	June 14	June 20	June 24	..
"	Commons	Jan. 28	Jan. 31	March 14	May 24	June 2	..
"	Commons	Jan. 28	Jan. 28	Feb. 1	Preamble	not proved.	..
"	Commons	Commons Bill	April 1	May 24	May 27	May 31	..
"	Commons	Jan. 27	Jan. 28	March 2	March 22	March 31	..
"	Commons	Jan. 28	Jan. 28	Feb. 1	March 11	March 22	..
"	Commons	Lords Bill	March 25	April 4	..	..	..
"	Commons	Commons Bill	March 22	March 31	April 5	May 5	} June 3
"	Commons	Jan. 27	Jan. 28	Feb. 4	March 4	March 21	
"	Commons	Commons Bill	May 27	June 3	..	..	..
"	Commons	Jan. 27	Jan. 28	Feb. 4	April 8	May 26	..
"	Commons	Commons Bill	March 29	April 7	May 12	May 16	} June 3
"	Commons	Jan. 27	Jan. 28	Feb. 7	March 15	March 28	
"	Commons	Commons Bill	March 25	April 4	April 5	May 31	..
"	Commons	Jan. 31	Feb. 2	Feb. 7	March 15	March 24	..
"	Commons	Commons Bill	March 22	April 4	April 5	April 8	} June 3
"	Commons	Jan. 31	Feb. 2	Feb. 21	March 15	March 21	
"	Commons	Commons Bill	March 11	March 21	March 31	April 4	} June 3
"	Commons	Jan. 27	Jan. 28	Feb. 7	March 1	March 10	
"	Commons	Commons Bill	May 31	June 13	..	..	..
"	Commons	Jan. 27	Jan. 28	March 4	May 20	May 31	..
"	Commons	Commons Bill	May 19	May 30	June 17	..	..
"	Commons	Jan. 23	Jan. 31	Feb. 7	March 15	May 17	..
"	Commons	Commons Bill	May 31	June 14	June 24	..	..
"	Commons	Jan. 31	Feb. 2	Feb. 7	May 24	May 31	..
"	Commons	Jan. 27	Jan. 28	Feb. 4	Bill withdrawn	..	..
"	Commons	Jan. 27	Jan. 28	Feb. 7	Bill withdrawn	..	..
"	Commons	Commons Bill	March 24	April 7	April 8	May 6	} June 3
"	Commons	Jan. 23	Jan. 31	Feb. 7	March 11	March 22	
"	Commons	Commons Bill	May 31	June 13	June 23	..	..
"	Commons	Jan. 23	Jan. 31	Feb. 7	May 17	May 30	..

HOUSE OF LORDS.

MONDAY, JUNE 20.

The Select Committee on the Birkenhead Corporation (Gas and Water) Bill reported that they had not proceeded with the consideration of the Bill, no parties having appeared in opposition thereto.

The Bradford Water and Improvement Bill was referred to a Select Committee, consisting of Viscount Lifford (Chairman), the Marquis of Hertford, Lord Beaumont, Lord Lovel and Holland, and Lord Moore; to meet on Thursday, June 23.

LOCAL GOVERNMENT (GAS) PROVISIONAL ORDER BILL.—This Bill was read the third time, and passed.

A MAN named Hyland, in the employ of the Mountmellick (Queen's County) Gas Company, has taken some land from which tenants had some time ago been evicted, and expressed his intention of grazing his cattle thereon in spite of the Land League. A demand for his dismissal not having been complied with by the Company, the inhabitants in nearly all the houses in the place have turned off their gas, and expressed a determination not to burn any more until Hyland is dismissed from his employment.

SALES OF GAS AND WATER SHARES.—Last Tuesday, at the Auction Mart, Tokenhouse Yard, E.C., Messrs. Fox and Bousfield sold by auction 300 £10 shares in the Lea Bridge District Gas Company, being the first issue of stock under the Company's Act of 1878, and bearing a dividend, subject to the sliding scale, of 7 per cent. The shares were disposed of at the following prices:—30 at £13 5s.; 20 at £13; 20 at £12 15s.; 30 at £12 10s.; 50 at £12 5s.; 80 at £12; 70 at £11 15s. The total amount realized by the sale was £3682 10s., or an average price of £12 5s. 6d. per share.

—On Thursday, Messrs. Cronk sold by auction, at Sevenoaks, some 10 and 7 per cent. shares in the Sevenoaks Gas and Water Companies. Lots 1, 2, 3, 4, each £50 stock in the Water Company, were sold for £71, £70, £70, £70. Lot 5, £66 13s. 4d. stock value, was knocked down for £86. Lots 6, 7, 8, 9, 10, each being two new £20 shares (£14 paid on each share), fetched the respective sums per share of £16, £17 10s., £17 10s., £20, and £18. Lots 11, 12, 13, 14, each consisting of four £10 fully-paid "A" shares in the Sevenoaks Gas Company, bearing 10 per cent. dividend, were all sold at £19 per share. Lots 15, 16, 17, 18, four £10 "B" (first issue) shares in the Gas Company (fully paid up), bearing 7 per cent., realized the following sums per share:—£13, £13, £12 10s., £12 10s. Lot 19, one similar share, was sold for £13. Lot 20, six similar shares, was bought at £12 10s.

Miscellaneous News.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.
(Concluded from p. 1104.)

After the proceedings reported in last week's issue there was the following

MISCELLANEOUS BUSINESS.

Mr. NIVEN said he would like to draw attention to the matter of the publication by the Association of the statistics in regard to gas supply in the West of Scotland. Last year they had not had any such publication, and whether this was from fault or failing he could not say; but he thought the fact he had mentioned indicated a conviction in the minds of the Committee that it was not necessary to publish the list yearly. He did not think it added anything to their knowledge to have the list put into their hands yearly—it would not prejudice the Association or their progress in knowledge, in regard to extensions, apparatus, or manufacture, to alter the publication of the statistical table from once a year to once in three years, and he therefore moved that it be published triennially.

Mr. WILSON (Stonehouse) seconded the motion.

Mr. M'GILCHRIST pointed out that, according to the rules of the Association, notice of such a motion must be given a year before any alteration could be made. While this was the case, he would at the same time mention that a great many subscriptions had been received by the Association on the distinct understanding that the report was to be published annually. He might assure the gentlemen present that it was from no fault on the part of the Committee that the report had not appeared last year, and he saw nothing, from a financial point of view, to interfere with its appearance annually.

Mr. S. STEWART (Greenock) said that, as an honorary member, he thought the publication should take a different and a more convenient shape.

Mr. RENFREW (Langbank) said that, as to the expense of the publication, he did not see why this should interfere with the appearance of the report. The finances of the Association were as good at present as ever they had been.

The PRESIDENT remarked that if members would only come forward and pay their subscriptions, there would be abundance of money to carry out all their schemes.

Ultimately, and after some further discussion, it was remitted to the Committee to consider Mr. Niven's statement, and deal with the matter of arrears of subscriptions as they might see fit.

Mr. AMBROSE (Bo'ness) afterwards exhibited two specimens of pipes which he had taken out of the ground at Bo'ness. Both malleable and cast-iron pipes were, he said, unable to withstand the chemical action of the soil, which was composed of salt-pan ashes. He thought the sea must have worked through it at some time. He should like the members to guide or advise him in the matter.

In answer to Mr. M'Gilchrist, Mr. AMBROSE said he had tried lead pipes, but was not yet prepared to say what the action was upon them. In the pieces of pipes he exhibited, he said there was not a portion of the original iron left.

The PRESIDENT thought that malleable tubes laid in wooden boxes 2 inches square, properly covered with pitch, might be a preventive against the chemical action of the soil. In Port-Glasgow, where the soil was sandy, and made up of ashes, this course had proved satisfactory.

Mr. AMBROSE said he had heard an observation from a gentleman that the pipes might be preserved by covering them with clay. When the Company started in Bo'ness, in the year 1844, nearly the whole of their pipes, both mains and services, had been covered with clay, and it was afterwards found that the parts that were covered were worse than those that were not.

Mr. WILSON corroborated the remarks of the President. In one part of Stonehouse he could not get a pipe to serve more than three or four years. In one instance where a pipe had been in for four years, it proved, upon examination, to have been completely eaten through. He then tried the wooden box and the pitch. This system had now been in use for three years, and there was no leakage in connection with the pipes so laid.

Mr. M'GILCHRIST: Is there a great percentage of leakage in Bo'ness?

Mr. AMBROSE: It is over 20 per cent.

Mr. M'GILCHRIST: In uncovering the earth and applying a light, would you have a flame all along.

Mr. AMBROSE: In the place where I took this pipe the gas burned at once. The pipe was broken in three or four places; and the gas burned in a radius of 8 or 10 feet, and one could scarcely tell where it burned strongest.

Mr. HAMILTON (Maybole) said he approved of malleable pipes coated. He had had pipes in the ground for 44 years, and they were as good now as the day they were put in.

Mr. NELSON said that no doubt the coating of pipes was a great advantage; but he approved of the system of laying pipes in a box, and covering them with pitch. He suggested, however, that a considerable saving of wood might be effected by laying the pipes, not in square boxes, but boxes having only two sides.

Mr. NIVEN said he would now pass from a consideration of the subject of pipes, and deal for a moment with that of purification. Those who read the JOURNAL OF GAS LIGHTING would have observed in its pages recently a suggestive contribution from the chemist of an important gas company in England, in which the writer dealt with the number of seconds taken in passing gas through purifiers. The same important element had been considered in reference to the form of the purifier—whether it was a parallelogram or a square, or, in other words, whether it had greater length than breadth. They all knew full well that far less lime, proportionately speaking, was fouled by gas passing through it in summer than in winter, because the gas took a longer time to permeate the lime. Now he would like, if the members would all assist him in his endeavour, to get up a paper on this question of time, by each of them furnishing data on the following points:—1. The quantity of gas passing through the lime in a purifier, before that lime was fouled, in the months of June, July, and August, and then in November, December, and January. 2. The number of purifiers. 3. Their respective lengths and breadths. 4. The depth of lime. He thought that if he had these particulars he could produce a formula that would be applicable, not only in regard to apparatus, but in regard to economy in the use of lime; and the paper might be interesting to the Association, because it would unify all the data he could obtain from the members. If they did him this favour, he would do the rest.

The PRESIDENT said he was sure every member of the Association would give Mr. Niven every assistance.

Mr. STEEN was then asked to explain one of Mr. W. Cowan's governors, which was exhibited to the meeting. He said the general experience of gas managers agreed with the observations of the Editor of "King's Treatise on Coal Gas," who, in writing about "every cone governor of the usual description," remarked that "any sudden change in the inlet pressure while the governor is in action, causes a variation in the delivery or outlet pressure to the extent due to the variation of the operating force of

the gas on the cone base and when extreme changes in pressure occur, as in the cupping of telescopic gasholders, the disturbing force becomes serious." There would therefore be no difference of opinion regarding the need for a simple means whereby so serious a defect might be remedied. In Mr. Cowan's governor, the power of the inlet pressure to disturb the equilibrium was neutralized by an equivalent force exerted above the roof of the bell. This was effected by the introduction of gas at the initial pressure into a fixed bell, suspended from the cross-bar; and forming a water slide in connection with an annular tank, which was fixed upon, and moved along with the governor bell. This small fixed bell, being of the same area as the cone base, was affected by the inlet pressure to the same degree as the cone itself. Hence the operations of cupping and uncupping telescopic gasholders did not, in this governor, affect the delivery. Three models were exhibited, with a view to show various modes of application; No. 1 model represented a governor of the kind usually known as an air vessel concentric governor, with the addition of Mr. Cowan's compensating slide. In this arrangement, weights were, as usual, employed to give the pressure, and these were formed in segments, and laid on the bell concentric with the annular tank. No. 2 model showed a concentric governor on the counterbalance principle, so far as the support in equilibrium of the bell was concerned. But in this case the loading for pressure was given by water, for which a tank on the roof of the bell was provided. One special feature was the beautiful syphon arrangement for withdrawing the water, and so reducing the pressure. This formed part of another invention by Mr. Cowan, but it was most advantageously applied here, and would be recognized as just the thing required to make water-loading absolutely perfect and generally applicable. No. 3 model showed the compensating slide divided into two portions, which together equalled in area the cone base. The object here was to avoid the necessity, which in some cases would arise, for an alteration in the counterbalance. The two slides were simply added, and no other change was necessary. The whole plan was simple, and appeared to obtain general approval. The evil to be dealt with was well known, and there were many people who would welcome so efficient a means for its removal.

Mr. M'GILCHRIST asked if the governor was yet in practical operation at any works.

Mr. STEEN replied that a few had been sent out, but they were not yet in a position to report upon its practical working.

The PRESIDENT said they were all much pleased at the explanations of Mr. Steen. Messrs. W. and B. Cowan had always been very kind in sending exhibits, and they deserved a hearty vote of thanks for their kindness. He moved accordingly.

NEXT MEETING.

Mr. RENFREW proposed that the next meeting of the Association be held at Dumbarton. It was, he said, ten years since the Association had met there.

Mr. M'GILCHRIST thought it would be in the interest of the Association that a more central place were fixed upon.

After some discussion, however, it was agreed that the next meeting of the Association be at Dumbarton.

This concluded the business of the meeting. In the afternoon the company dined together. Mr. Carlow occupied the chair, and Mr. Dalziel discharged the duties of croupier.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns—furnished to him by the London Water Companies—of the average daily quantity of water supplied to the Metropolis during last month. From them it will be seen that 152,426,353 gallons, or 692,543 cubic metres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 251 gallons (114 decalitres), rather more than a *ton* by weight, to each house, and 35'8 gallons (16 decalitres) to each person, against 35'2 gallons during May, 1880:—

COMPANIES.	Number of Houses, &c., supplied in		Aver. Daily Supply of Water in Gallons* during	
	May, 1880.	May, 1881.	May, 1880.	May, 1881.
Total supply	582,505	607,621	145,745,332	152,426,353
From Thames	279,750	292,465	74,614,416	76,845,609
„ Lea and other Sources . .	302,755	315,156	71,130,916	75,580,744
THAMES.				
Chelsea	30,071	30,656	9,108,100	9,406,300
West Middlesex	54,327	57,289	11,722,142	11,866,526
Southwark and Vauxhall . .	89,879	93,837	23,955,758	23,604,378
Grand Junction	41,352	43,588	13,554,816	13,809,765
Lambeth	64,121	67,095	16,273,600	18,138,700
LEA AND OTHER SOURCES.				
New River	130,373	133,219	29,703,000	30,885,000
East London	122,746	129,574	32,285,800	35,596,000
Kent	49,636	52,363	9,142,116	9,099,744

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for May, 1881, as compared with that for the corresponding month of 1880, shows an increase of 23,116 houses, and of 6,681,021 gallons of water supplied daily.

GLASGOW CORPORATION GAS AND WATER SUPPLY.

The report just issued by Mr. W. West Watson, F.R.S. the City Chamberlain, on the "Vital, Social, and Economic Statistics of Glasgow for 1880," contains references to the undertakings of the Gas Committee and the Water Commission; concerning which Mr. Watson says: "They have each been pursuing a steady commercial course, watched over and managed by able commercial men, who can have only the interests of the public and their own reputation to protect." The particulars given are as follows:—

THE GAS COMMITTEE.

The works of the Gas Committee have not required extension during the year, and may not speedily require much amendment, as they were wisely constructed upon a splendid, as well as an elastic scale. The illuminating power of the gas supplied has always maintained, and has generally exceeded, and often much exceeded, the statutory requirement of a light equal to that of 25 candles.

The various connections and extensions of the works are satisfactorily completed, and we may now reasonably expect that any important emendations of the important works of the Committee will not be called into requirement for years to come. The power of production which they possess amounts to the very large extent of 1,300,000 cubic feet per day, and it has never yet, upon any occasion, been taxed to nearly its full responsibility.

In an establishment so enormous, and connections so complicated, there must be an inevitable leakage and loss, and much labour has been

bestowed upon remedying defects and deficiencies, so that the quantity sold and accounted for during the year has been no less than 1,577,466,000 cubic feet. The gross revenue has amounted to £341,274 13s. 1d.; the gross expenditure (including £80,271 13s. 1d. written off capital, for depreciation), to £257,351 4s. 3d.; thus leaving a profit upon the year of £83,923 8s. 10d. to be applied to discharging the claims of the annuities upon stock, the interest upon borrowed money, and the requisite contribution to the statutory "sinking fund." These three items have absorbed £70,141 1s. 3d., leaving upon the operations of the year a surplus balance of £13,782 7s. 7d., and when this is combined with the gain carried forward from the previous years' accounts, there was available for the year commencing on May 31, 1880, a balance of £48,290 13s. 10d. In these circumstances, the Committee felt themselves justified in again reducing the rates; and from 3s. 10d. per 1000 cubic feet, the price to the consumer now stands at 3s. 8d.

I now beg to present some idea of the enormous scope of the great industry which the gas-works encompass, and offer a sketch of this enormous industry, by presenting a *vidimus* of the gas production in the city of Glasgow, at intervals of five years each, during the long period which extends from 1832 to 1880. I have already alluded to the inevitable leakage and absorption which is sustained during the manufacture and distribution of gas, and of course it cannot be expected for a moment that, in the conduct of this great industry, the whole produce was or could, in connection with so ethereal an element, be realized from a commercial aspect:—

Quantity of Gas Manufactured in Glasgow during the Years from 1832 to 1880.

1832.—Quantity of gas made . . .	100,068,200 cubic feet.
1837. " " " . . .	162,605,800 "
1842. " " " . . .	198,522,500 "
1847. " " " . . .	391,353,000 "
1852. " " " . . .	505,285,000 "
1857. " " " . . .	697,378,000 "
1862. " " " . . .	821,849,000 "
1867. " " " . . .	1,119,842,000 "
1872. " " " . . .	1,559,190,000 "
1877. " " " . . .	1,817,163,000 "
1878. " " " . . .	1,777,846,000 "
1879. " " " . . .	1,833,678,000 "
1880. " " " . . .	1,859,582,000 "

THE WATER COMMISSION.

The total revenue for last year amounted to £140,897 10s. 4d., being almost exactly that of the preceding year, or, at all events, presenting only £318 18s. 6d. of increase. The total expenditure, exclusive of the sum carried to the sinking fund, was £116,944 6s., exhibiting a diminution upon the expenses of the year to the considerable extent of £23,854 5s.

The rates remained unaltered, viz. :—Domestic rate within the city and royal burgh of Glasgow, being the limits of compulsory supply, 8d. in the pound; the public water-rate within the same limits, 1d. in the pound. The domestic water-rate, beyond the limits of the compulsory supply, has remained also as before, at 1ld. in the pound; and the rates within the general limits of supply for other than domestic purposes are charged according to a published and varying scale.

The purity and abundance of our supply of water remain unaltered; indeed, they are unexcelled in the United Kingdom. As a passing illustration of the former attribute, I may mention that when spending a brief holiday last year at Llandudno, the great watering-place of North Wales, I found that a water supply had just previously been introduced, and that large "card" placards were being distributed to every house, intimating the important fact, and further, that the quality of the water was almost, if not quite equal to that of the famous Loch Katrine, which supplied the city of Glasgow. As to quantity, it is yet unimpaired, for during last year the official returns report the average supply to have been—

From the Loch Katrine works	34,038,249 gallons per day
From the Gorbals works	3,258,152 "

Together 37,296,401 gallons per day.

The revenue for the year amounted to £140,897 10s.

The unapproached purity of our water supply I have adverted to, and it is fully admitted by Dr. Frankland, the Analyst of the City of London; yet how difficult it is to please all men, for in the fierce contest waged over the Loch Katrine Water Bill, between parties in the committee-rooms of Parliament, it is an actual fact that the purity of the water was in reality adduced as an insuperable objection. The opponents of the Bill led evidence to prove that so pure was it, and its influence so potent, that the leaden supply-pipes would be corroded and destroyed, and the inhabitants of Glasgow must inevitably be consumed by lead-poisoning. The scientific evidence on this subject did, I confess, seem very serious, but as the time has long gone by, and the actors in this civic drama have almost all passed away, I may, without mentioning names, allude to an incident in connection with the matter. The fight was tedious, costly, and exhausting, and terms of compromise were at last not unwillingly approached, when a very straightforward friend of mine, but of the opposite party (who told me himself), remarked, "This is all very well, but what of this lead difficulty?" "Don't trouble your mind about that,"

said one of his own advocates. "If the compromise is arranged, our witnesses may possibly become their best evidence." I do confess my ears tingled somewhat.

Years passed on, and the old idea was revived by a scientific friend, who prophesied that the abnormal purity of the water would endanger the numerous steam-boilers around us, and corrode and destroy even our domestic culinary utensils. The latest craze of all is that the rising generation must, from the use of such pure water, and in the absence of certain adulterating ingredients, grow up rickety and worthless. None of these alarming prophecies have yet been realized within my experience, and it does seem to be a little odd that while these vaticinators argue so clearly, they never appear to think of suggesting a remedy. It reminds me of an anecdote I read very long ago, of two rather famous men—Dr. Benjamin Franklin and Thomas Paine, who were unfortunately, in some of their ideas, rather unanimous; when, after a discussion, the sagacious old philosopher wound up the debate by saying, "But don't you think, Tom, that before we abolish the Bible it would only be reasonable to have something as good ready to put in its place?"

HUELVA GAS COMPANY LIMITED.

The Annual General Meeting of this Company was held yesterday at the Offices in Glasgow, when the Directors, in their report for the period which elapsed from the starting of the works of the Company up to March 31, stated that favourable results had accrued "despite the difficulties and losses incidental to the commencing of a new business."

On the 15th of last July, the works and connections to the lamps in the streets were so far completed that the lighting was inaugurated, the formal ceremony of turning on the gas being performed by the Governor of the Province of Huelva, and the Company being represented by Don Francisco Jimenez, the resident Director in Huelva. The number of lights was at first very small, and the increase came but slowly, as the price of gas was found too dear as compared with oil, and the first cost of the necessary fittings kept many back. Finding that tar and coke could be sold in larger quantities at high prices, and that a lower price for gas would stimulate consumption, it was agreed to reduce the price to 1½ reales per cubic metre, instead of 1½ reales; that is, from about 8s. 6d. to 7s. 1d. per 1000 feet, and this has had the expected result, as the Municipality have increased the number of the street lights, and wish still further to do so, and the Rio Tinto Company, and other large consumers, have taken gas, until the number of lights is now about 1000, and tending to increase.

The works of the Company are a thoroughly well built and substantial structure, completely adapted for the manufacture of gas, and are so arranged that any extension necessary from increased consumption will be made at a mere fractional increase of cost. They are situated about ¼ mile from the centre of the town, and within 250 yards of the first lamp, and are on the main road, along which the town will extend. All the coke and tar produced is being sold at good prices. The buildings and accessories are insured against loss by fire. The terms of the concession are being faithfully carried out by the Municipality of Huelva, and all accounts are promptly paid. The accounts are rendered and collected monthly.

The expenditure of capital has been larger than was at first estimated, owing entirely to the large quantity of ground purchased, the erection of a house for the Manager, the greater extent of mains and pipes which the growing consumption demanded, the necessity for providing fittings to be held for sale, and meters to be hired out. The number of £10 shares issued is 1401, leaving of the present capital 99 to place. The net result of the working of the Company since gas was lit until March 31 this year shows a profit of £326 17s. 3d., after debiting all loss by leakage, &c.

It is only since the Company was formed that Huelva has been placed in railway communication with the other parts of Spain by the line to Seville, and now the town is steadily extending, vacant places being built upon, old buildings modernized and shops enlarged. A new railway from Huelva to the Province of Estremadura has just been authorized, and will be commenced this summer. This will bring largely increased trade and movement to the port, and probably cause new industries to be commenced. The Harbour Board have in contemplation the erection of large quays, which are needed, and would result in economies to all consumers of raw material; and a large hotel is about to be built. It is thus hoped that the operations of the Company will extend year by year, and result in growing benefits to the shareholders.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

- 2645.—PINKNEY, C. W., Smethwick, Stafford, "Improvements in gas engines." June 17, 1881.
 2669.—ANDERSON, G., Westminster, "Improvements in the construction, setting, and working of gas-retorts, and in the pipe appendages connected therewith." June 18, 1881.
 2734.—BREWER, W. J., Rood Lane, London, "Improvements in automatic regulating gas-burners, and in appliances relating thereto." June 22, 1881.

RETURN to the Metropolitan Board of Works of the testings made at the gas-testing stations during the week ending June 22, 1881.

Company.	District.	Illuminating Power. (In Standard Sperm Candles.)			Sulphur. (Grains in 100 Cubic Feet of Gas.)			Ammonia. (Grains in 100 Cubic Feet of Gas.)			Sul- phuretted Hydrogen.	Pressure.
		Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.		
The Gaslight and Coke Company . . .	Notting Hill	18.1	16.8	17.7	9.4	8.4	8.8	0.4	0.0	0.1	None.	In excess.
	Camden Town	18.0	17.3	17.7	11.3	9.9	10.7	0.2	0.0	0.1	"	"
	Dalston	18.3	16.9	17.4	13.4	7.5	11.4	0.0	0.0	0.0	"	"
	Bow	17.5	16.9	17.3	15.7	9.8	12.4	0.9	0.7	0.8	"	"
	Chelsea	17.4	16.8	17.0	11.3	8.9	10.4	0.4	0.0	0.2	"	"
	Kingsland Road	17.7	17.4	17.6	12.2	10.3	11.3	0.3	0.1	0.2	"	"
South Metropolitan Gas Company .	Westminster (cannel gas) . .	21.9	21.5	21.6	8.8	6.1	7.6	0.0	0.0	0.0	"	"
	Peckham	17.0	16.5	16.7	11.0	9.1	10.0	0.2	0.0	0.1	"	"
Commercial Gas Company	Old Ford	17.7	16.8	17.2	9.8	8.3	8.8	0.5	0.3	0.4	"	"
	St. George-in-the-East . . .	17.7	17.0	17.4	7.6	5.6	6.5	0.6	0.3	0.4	"	"

(Signed)

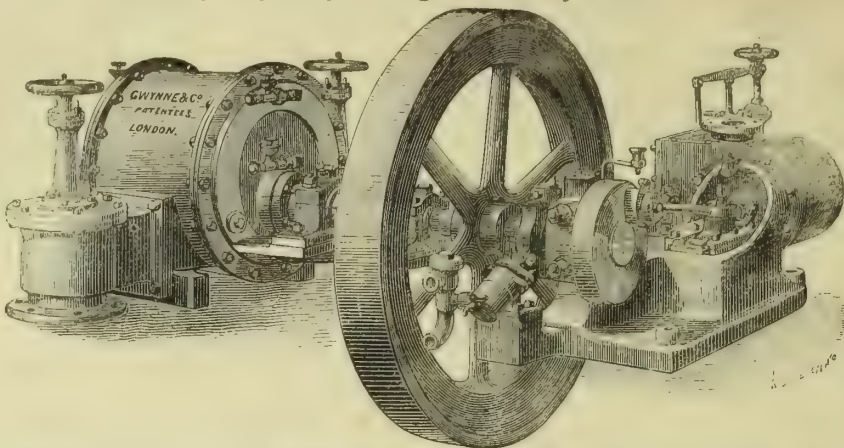
T. W. KEATES, F.I.C., Consulting Chemist and Superintending Gas Examiner.

Note.—The standard illuminating power for common gas in the Metropolitan is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 20 grains in the 100 cubic feet of gas at Peckham station, and 17 grains at all other stations. Ammonia not to exceed 4 grains in the 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of one inch of water; between midnight and sunset, six-tenths of an inch.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

Can be made on their Patent principle to pass the gas without any Oscillation or Variation in Pressure.

THE GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & Co., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.



GWYNNE & CO.
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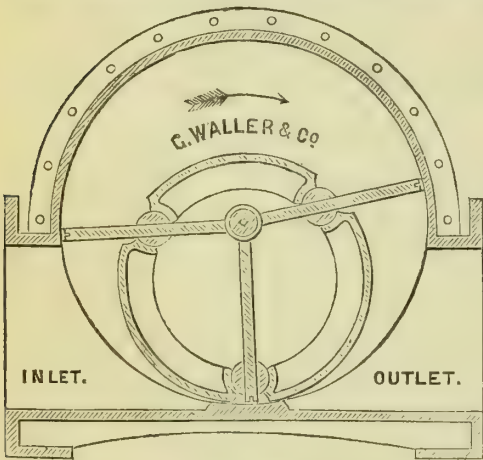
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WANTED, Second-hand, two Purifiers, about 6 or 8 ft. square, in good condition. Address **R. KEMP, Bagshot, SURREY.**

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THE Gravesend and Milton Gas Company have **FOR SALE,** Four 12 ft. square **PURIFIERS,** 4 ft. deep, with 12-in. Connections and eighteen 12-in. **DONKIN'S VALVES,** together with Lifting Apparatus, all in fair condition, and can be taken possession of immediately; also one 10-in. **GOVERNOR,** by A. Wright and Co., Westminster. One **SCRUBBER,** 26 ft. high, 8 ft. diameter. For further particulars apply to the undersigned. **S. SOWDON,** Manager.

FOR SALE—An Annular Condenser, Tower Scrubber, Station-Meter, Beale's Exhauster, two Boilers, some Hydraulic Mains and Retorts, and some Slide-Valves. Apply at the Gas-Works, **MAIDSTONE.**

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THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections. Exhauster (Jones) to pass about 15,000 feet per hour. Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above. Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes. Two 12-in. four-way faced Valves, by Cockey. For further information, &c., apply to the undersigned, **R. MORLAND, Engineer.**

COCKERMOUTH GAS COMPANY.
THE above Company invite Tenders for the Purchase of their Surplus **TAR** and **AMMONIACAL LIQUOR** for a term of One, Two, or Three years from the 1st of July next. Tenders to be sent to me not later than July 10. Further particulars on application to **JOHN PATTINSON, Secretary, Cocker-mouth, June 16, 1881.**

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